

Literature review: independent driving in the driver training and on-road assessment protocols — building an evidence base

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**LITERATURE REVIEW: INDEPENDENT DRIVING IN THE
DRIVER TRAINING AND ON-ROAD ASSESSMENT
PROTOCOLS — BUILDING AN EVIDENCE BASE**

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**LITERATURE REVIEW: INDEPENDENT DRIVING
IN THE DRIVER TRAINING AND ON-ROAD
ASSESSMENT PROTOCOLS — BUILDING AN
EVIDENCE BASE**

**Client: Driving Standards Agency (DSA), Department
of Applied Research
(Bob Hannigan)**

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Executive summary

Background

Having passed the practical driving test, newly qualified drivers are immediately entitled to drive unaccompanied. As such, they suddenly find themselves without the support of an experienced and qualified driver and have to face a plethora of new and demanding challenges. These include: navigation to destinations without instruction; decision making for road and traffic hazards; and coping with situations potentially not experienced in their driving lessons (e.g. driving in rain, driving in the dark and driving with passengers).

It is well established that the learning process continues long after passing the practical test. There is a concern that the sudden withdrawal of support at the point of passing the test, and the requirement to drive independently, may result in increased accident liability. Statistics show that newly qualified drivers are at a higher risk of being involved in a road traffic accident than are more experienced drivers.

The study

TRL was commissioned by The Driving Standards Agency (DSA) to conduct a review of the technical literature concerning independent driving. Independent driving has previously been defined as follows:

"Independent driving means that candidates make a responsible choice based on their own abilities and the requirements of the task."

The aim of this review is to provide DSA with an evidence base on which to inform (policy) decisions regarding the implementation of an independent driving element into the UK training and testing protocol. Specifically, it:

1. Presents evidence pertaining to:
 - novice driver accident rates;
 - the transition from being an accompanied learner driver to being a solo qualified driver;
 - the extra demands placed upon novice drivers at the point of transition;
 - the psychological and cognitive demands of independent driving, and
 - feedback from drivers on their views of the current UK training and testing regimes
2. Presents current evidence regarding the inclusion of independent driving in the training and assessment protocols of other countries.

Literature was identified through searches of literature databases and internet search engines. The evidence regarding the inclusion of independent driving in the training and assessment protocols of other countries fell into two parts: from EU-funded studies into driver training and testing, and case studies in a small number of countries which have introduced, or are currently introducing, independent driving into their training and testing procedures. The findings from the recent UK 'Cohort II' study, which explored the transition between learner and solo driver, were exploited. Contact was also made with other relevant research organisations.

Results of the literature review

The main findings from the review were as follows:

1. The excess accident liability of newly qualified drivers is a widely recognised problem. Accident rates are highest in the first few months of (independent) driving after passing the practical driving test, after which they decrease during the remainder of the first 12 months and beyond. TRL's Cohort II study showed that on average, almost 1 in 5 (19%) drivers in the study had had at least one accident in the first six months after passing their test and 70% had experienced a 'near miss' at least once. In the second six month period 12% had at least one accident, and 69% at least one 'near miss'.
2. Some of the challenges facing solo drivers include poor opportunity for feedback, involvement in a variety of traffic conditions, different driving manoeuvres, unexpected actions of other drivers, different types of roads and distraction. Training and testing of independent driving skills offer the possibility of better preparing pre-solo drivers for such aspects of driving.
3. Although novice drivers quickly acquire the skills needed to control a vehicle, it takes much longer for them to develop higher-order perceptual and cognitive skills which are necessary to safely interact with the driving environment. Skill deficits include:
 - poor appreciation of their own abilities;
 - poorly developed mental models of driving; and
 - poorly developed hazard perception and visual scanning.
 - Novice drivers also have limited driving experience and are not used to the demands of independent driving.
4. EU-funded studies into driver training and testing made recommendations relating to the incorporation of higher order skills such as independent driving into current training and testing protocols.
5. TRL's Cohort II study showed that the drivers in the survey reported a continuing need to improve aspects of their driving, including judging what other drivers will do, parking and driving in snow and fog. Respondents reporting driving offences were in a small minority.
6. Several countries incorporate independent driving into their practical testing to some degree (e.g. Western Australia, Spain, France, Sweden and Austria). Only the new practical driving test in the Netherlands dedicates a (significant) proportion of time to the specific assessment of independent driving skills. The specification for the new Dutch test involved the inclusion of elements that enable the assessment of higher order skills such as hazard perception and self-reflection. As such, the test involves learner drivers being more closely examined in respect of independent driving. The independent driving element is implemented by the examiner requesting the candidate to:
 - drive to or from a known destination without any directions;
 - use navigation equipment; and
 - drive to a specific destination based on three to five sets of instructions.

A pilot of the Dutch practical driving test was conducted in 2007, results of which were reported to be promising regarding the usefulness and effectiveness of independent driving elements in the training and testing protocol. It was reported that independent driving appeared to be of *“great value for the driving test as well as for the training of novice drivers”*. While these conclusions are not based on robust scientific evidence of a safety benefit from including independent driving in the driving test, the Dutch pilot study does indicate that meaningful independent driving elements can be introduced into testing.

7. Drivers’ perceptions of the driving test suggest that the way in which people drive for the driving test is not representative of real life driving. There are indications from qualitative research in Britain that new drivers felt that practice of driving in real life situations as would be covered by independent driving training would have been a valuable part of the learning-to-drive experience.

Conclusions and recommendations for independent driving

- Giving more emphasis to independent driving in driver training should help address some of the challenges that novice drivers face in the early period of post test driving.
- Including elements of independent driving in the driving test should encourage instructors and learners to take such training seriously.
- It should also give examiners new opportunities to observe more ‘typical’ driving behaviour, and thereby to reach a more robust assessment of competence.
- Several countries incorporate independent driving into their practical testing to some degree (e.g. Western Australia, Spain, France, Sweden and Austria).
- Only the new practical driving test in the Netherlands dedicates a significant proportion of time to the specific assessment of independent driving skills.
- It will be important to monitor closely results from any future studies of improved driver training and testing to provide robust evidence on the benefits of these developments.
- Further consideration of what constitutes an assessment of independent driving is warranted, given that pre-test restrictions mean that learner drivers are not permitted to actually drive on their own until after licensure.
- In terms of the feasibility of introducing an independent driving element into the UK training and testing protocol, based on the evidence found here the next logical step is to pilot the independent driving element, as planned in the DSA prototype drive.
- It will be vital that the prototype drive is fully evaluated to establish the benefit, or otherwise, of independent driving elements.
- Both short- and long-term evaluation measures will need to be used. The short-term impact on driving could be assessed using questionnaires and interviews (completed by learners, driving instructors and examiners).
- It is only in the longer-term, and through wide-scale studies, that any effect on novice driver accident rates will be visible.

1 Introduction

Background and objectives

- 1.1 The current learning-to-drive protocol in Great Britain necessitates that learner drivers are always accompanied by an experienced and qualified driver; the reason for this is to provide guidance and instruction to learner drivers. Having passed their practical driving test, newly qualified drivers are immediately entitled to drive unaccompanied but it is well established that the learning process continues long after passing the practical test and that this is accompanied by substantial falls in accident liability.
- 1.2 Novice drivers suddenly find themselves without the support of an experienced and qualified driver and have to face a plethora of new and demanding challenges. These challenges include navigation to destinations without instruction, decision making for road and traffic hazards and coping with situations that perhaps were not experienced in their driving lessons (e.g. driving in rain, driving in the dark). Furthermore, newly qualified drivers may not have anyone with them to answer any driving-related questions which may arise. Research suggests that learner drivers believe that "real driving" is fundamentally different from the driving required to pass the test and that some drivers experience the loss of their instructor as a negative event. The loss of the driving instructor at the post-test stage may result in driving errors that ultimately result in near misses or accidents. The lack of supervision also allows the novice driver's own goals and characteristics to come into play - again with potential effects on accidents.
- 1.3 The Driving Standards Agency (DSA) is interested in exploring means of smoothing the transition from being an accompanied learner to being an unaccompanied newly qualified driver. This literature review provides an evidence-base on which DSA will be able to assess the feasibility of introducing an independent driving element into British driver training and assessment in the future.
- 1.4 There is a concern that sudden withdrawal of assistive support at the point of passing the practical driving test results in a highly demanding situation for the newly qualified driver. This demand on the ability to drive independently may result in cognitive overload and subsequent enhanced accident liability. This concern will be investigated as part of the literature review.
- 1.5 This review will allow DSA to make informed, evidence-based decisions regarding the implementation of an independent driving element into the training and assessment protocol for learner drivers. The research will specifically include the following elements:
 1. Analysis of current evidence regarding the inclusion of independent driving in the training and assessment protocols of other countries, e.g. the Netherlands.
 2. Analysis of evidence pertaining to:
 - novice driver accident rates;
 - the transition from being an accompanied learner driver to being a solo qualified driver;

- the extra cognitive demand placed upon novice drivers at the point of transition;
- the psychological demands of independent driving, and
- feedback from drivers on their views of the current UK training and testing regimes.

Independent Driving

A working definition

- 1.6 The ability to drive a vehicle independently is a necessity for any licensed driver. The attributes of independent driving as a skill relate to being able to competently deal with unfamiliar driving situations, such as self-navigation to destinations, hazard detection and avoidance, unfamiliar weather and lighting conditions, choosing when and where to complete special manoeuvres (e.g. a turn in the road), and unfamiliar traffic situations. An independent driver must safely contend with all aspects of driving unsupported. A working definition of independent driving in the context of driver assessment has been proposed (Vissers et al., 2007b):

"Independent driving means that candidates make a responsible choice based on their own abilities and the requirements of the task."

This definition will be used throughout this report.

Why use independent driving?

- 1.7 The importance of developing responsible drivers is well documented. Responsibility develops with awareness, and awareness comes from experiences as a result of being encouraged to think individually and make independent decisions and choices (CIECA, 2007).
- 1.8 In a recent report on independent driving, CIECA (2007) argue that making the driving test more realistic gives examiners better insight into the core driving skills of the candidate; this is for two reasons. Firstly, the candidate has to 'multi-task' to a greater extent; way-finding, for example, is a supplementary skill which must be performed in addition to the vehicle manoeuvring skills. If the candidate's core driving skills are not sufficiently automatic, this weakness will be exposed when the additional – yet essential – skill of dealing with traffic is added on top. Secondly, removal of instructions from the examiner means that the candidate cannot use these instructions as 'cues' to prompt them into action. Candidates are responsible for deciding on the timing of their actions independently and without external support. For systems where the content of the test dictates what is taught in training, the integration of independent driving tasks into the test is likely to influence how the learner is prepared.
- 1.9 CIECA (2007) also argue that independent decision-making can be encouraged over time by driving instructors. Driving instructors should be constantly considering whether their actions are giving or taking away responsibility from the learner driver. Allowing learners progressively more decision-making in the learning-to-drive process will encourage the learner to assume responsibility for his/her own driving over time.

Structure of the report

- 1.10 Section 2 of this report details the approach employed to identify relevant research regarding independent driving. Sections 3, 4 and 5 respectively report the findings from the literature review in terms of novice driver accidents, challenges faced by novice drivers and independent driving in other countries. Section 6 gives an insight into young drivers' perceptions of the role of the driving test and how it relates to 'real-life' driving. Section 7 draws conclusions and makes recommendations relating to the feasibility of introducing an independent driving element in relation to the research evidence.

2 Approach

Literature searches

- 2.1 Searches of the TRL Knowledge Base were conducted in order to identify literature to be reviewed. The Knowledge Base comprises a number of databases, including the Transport Research Abstracting and Cataloguing System (TRACS). This is the main catalogue of transport research publications held both in the TRL library and elsewhere. It contains bibliographic references and abstracts of English and foreign language articles from journals, books and research reports. It is the English language version of the worldwide ITRD database (International Transport Research Documentation) and contains abstracts from publications in the USA, Australia, Scandinavia, the Netherlands and Canada, in addition to UK material. The database has been updated daily since 1972 and now comprises 260,000 items. This is the prime literature resource for transport research. The Knowledge Base also includes the PROJEX database that contains summaries of current and recently completed research projects undertaken in ITRD member countries. In addition to searching the Knowledge Base, search engines such as Google and Google Scholar were used. The investigation of the Knowledge Base and search engines was conducted using the following key words:

- Independent driving elements
- Solo/unsupervised/free driving
- Driver testing protocols
- Accompanied driving
- Multi-phase training
- Driver training
- Newly qualified drivers/new drivers/novice drivers

Contact with other research organisations

- 2.2 TRL enhanced the literature search by utilising links with international researchers in the field of driver training and testing. Contact was made with VicRoads in Australia and with Dr Jan Vissers at DHV in The Netherlands. This latter contact was especially important given the very recent developments in the training and testing of drivers in Europe (e.g. the introduction of the 2008 Netherlands Driving Test with the inclusion of an independent driving element- see section 0).

Scope of review

- 2.3 The formal training and assessment of independent driving prior to obtaining a full licence is the primary focus of this review and searches for this subject were broad. In order to provide a targeted evidence base, specific criteria were used to focus a potentially large literature on the concept of cognitive workload issues. The objective here was to ensure that evidence remained directly relevant to the cognitive processes involved with the transition from accompanied to solo driving.
- 2.4 Whilst the field of Graduated Driver Licensing (GDL) is potentially relevant, it is largely associated with post-test measures and, therefore, is less relevant to the present project.

3 Novice Driver Accidents

Summary of Section 3

- Novice (especially young novice) drivers have high accident rates.
- Research has shown that newly qualified drivers have difficulty coping concurrently with vehicle handling *and* higher order skills, both of which are crucial parts of safe vehicle operation.
- The types of accidents that novice drivers are over-represented in are presented, along with the errors typically associated with increased accident risk.

- 3.1 The excess accident liability of newly qualified drivers is a widely recognised problem, and concern is intensely focused on the first few months of independent driving. Statistics show that newly qualified drivers are at a higher risk of being involved in a road traffic accident than are older, more experienced drivers (e.g. Maycock, et al., 1991; Carcary, Murray & Power, 2001). In Great Britain, the first investigation into the “new driver problem” on a large scale began in 1988 in the first Cohort Study (Forsyth, 1992a, b; Forsyth et al., 1995; Maycock & Forsyth, 1997). The results of that study showed that, once statistical modelling had been used to adjust for differences in annual mileage, the accident liability (i.e. the statistically expected number of accidents per year) for 17-18 year olds was 40% higher in the first year of driving compared to the second year of driving.
- 3.2 This situation has not changed substantially since the original Cohort study. A Cohort II study began in 2001 and data from that study shows that about 20% of newly qualified drivers have an accident in their first year of driving (Wells, et al., in press). These findings for Great Britain have also been replicated in other countries including Australia (Adams, 2003), Canada (Mayhew et al., 2003), Sweden (Engstrom et al., 2003), the Netherlands (Stipdonk et al., cited in Vissers, Mesken, Roelofs & Clasen, 2007) and the USA (McCartt et al., 2003). The results of these studies show that accident rates are highest in the first few months of driving after passing the practical driving test, after which the accident rate decreases during the remainder of the first 12 months and beyond.
- 3.3 The Royal Society for the Prevention of Accidents (RoSPA) conducted a review of young and novice drivers’ education training and licensing, in an attempt to

identify the causes for such high novice driver accident rates. A quote from their conclusion summarises the complexity of the “new driver problem”:

- 3.4 “There are a wide range of reasons why young and novice drivers have a higher accident risk, including age, lack of driving experience, overconfidence in their abilities, under-estimation of risk, poor hazard perception, poor attitudes to driving (which are usually linked to personal characteristics and general social attitudes), gender, peer pressure (from passengers), parental influence”.(RoSPA, 2002).
- 3.5 Maycock (2002) reported that novice drivers were over-represented in most types of accident but particularly in the following:
- Single vehicle accidents in the dark (i.e. evenings and early mornings);
 - Accidents involving bends and speed;
 - Accidents in adverse driving conditions; and
 - Accidents with passengers in the vehicle.
- 3.6 By definition, novice drivers have limited driving experience, and inexperience is known to be a major factor that contributes to road traffic accident involvement (e.g. Gregersen, 1996; Fisher et al, 2002; Maycock, 1995; Maycock& Forsyth, 1997; Maycock, 2002; Mayhew, Simpson & Robinson, 2002 and McKnight, 2003). McKnight’s (2003) research in the USA showed that inexperience was associated with a number of driving errors which increase the risk of an accident. These were typically errors in:
- Attention
 - Visual search
 - Speed relative to condition
 - Hazard recognition and emergency manoeuvres
- 3.7 Mayhew and Simpson (1995) argue that inexperienced drivers lack the necessary driving skills and capabilities to cope with basic tasks (e.g. steering and braking) at the same time as higher order tasks (e.g. hazard perception and problem solving), both of which are crucial parts of safe vehicle operation. As Grayson (1991) stated “A new driver is learning not just new skills, but also formulating new rules, developing a new repertoire of strategies, and learning new patterns of interaction” (Grayson, 1991). The problem is that much of this learning process takes place in an unstructured and informal way, with no guarantee that what is learned is the most appropriate for the safety of the traffic system (Grayson, 1991).

4 Solo driving

Summary of Section 4

The transition to solo driving poses new challenges to the novice driver, including:

- overcoming limited experience of situations
- having to cope alone with road and traffic situations and to navigate independently – which involves the higher order cognitive processes involved in decision making and which may impose a high workload on drivers who are still relatively inexperienced at the basic control skills
- being free of supervisory control and therefore (a) more susceptible to influences from journey and personal goals and characteristics, and (b) dependent on self-evaluation rather than on feedback from the instructor or supervising driver.

Newly qualified drivers demonstrate:

- Poor appreciation of their own abilities
- Poorly developed mental models of driving
- Poorly developed hazard perception and visual scanning

- 4.1 The ability to drive a vehicle independently is a necessity for any licensed driver; however, the limited driving experience of newly qualified drivers may adversely affect their understanding of the real challenges of driving. These challenges will be discussed here and (skill) deficits that are characteristic of novice drivers will be highlighted for consideration in the development of independent driving elements.

4.2 Challenges faced

- 4.2 Driving unaccompanied for the first time can be a daunting and challenging experience (LARSOA, 2007), particularly in busy or unfamiliar traffic situations, as the accompanying driver is no longer there to act as an extra set of eyes and ears or to provide advice. Other challenges (based on those identified by Baughan 2006 and VicRoads, 2007) for solo drivers include:

- New journey goals
- New driving subtasks- e.g. route choice, direction-finding, decision making
- Poor intrinsic feedback – when driving independently, formal opportunities for feedback are sparse; forgiving road and traffic environments mean that unsupervised drivers receive very poor feedback on their performance, i.e.

most errors having no adverse consequences, most violations remaining undetected and most journeys are accomplished safely.

- Involvement in a variety of traffic conditions – from light traffic on local roads to heavy rush hour traffic
- Unfamiliar weather conditions such as rain, fog or icy conditions
- Different driving manoeuvres e.g. driving around roundabouts, making U-turns or turning at different types of crossroads
- Effects of the time of day on visibility, e.g. night driving or glare from the sun when driving at dawn or dusk
- Unexpected actions of other drivers and riders such as stopping quickly, merging or turning without warning
- Types of roads: motorways are always a particular issue in the UK as learner drivers are not permitted to use motorways until they have passed their practical driving test and as such, have no experience of motorway driving.
- Imperfect road surfaces – potholes, gravel or slippery surfaces
- Handling any of these challenges when faced with distractions inside the car e.g. the sound of the radio, noisy passengers, navigation systems or mobile phones.
- Different vehicles

- 4.3 Training and testing of independent driving skills offers the possibility of better preparing pre-solo drivers for such aspects of driving.

Characteristics of novice drivers

- 4.4 Although novice drivers quickly acquire the skills needed to control a vehicle, it takes much longer for them to develop higher-order perceptual and cognitive skills which are necessary to safely interact with the driving environment (Deery, 1999). The (skill) deficits that are characteristic of novice drivers are now discussed.

4.2.2 Limited Experience

- 4.5 The high collision risk amongst novice (particularly young novice) drivers may be because a limited number of critical traffic conditions have been encountered and mastered. The collision risk of young drivers falls steeply during the first year of licensure while independent driving experience is being acquired (Maycock et al., 1991); reductions are particularly large in the first six months of licensure (Sagberg, 1998). Norwegian research (Sagberg 2000), the Finnish BASIC survey results (Laapotti et al., 2003, cited in Hatakka et al., 2004), and findings from the USA (Mayhew, Williams and Desmond, 2002) collectively suggest that the most dramatic collision reduction occurs between three and seven months after licensure.
- 4.6 Detailed information on the transition from accompanied driving to solo driving was provided by the recent completion of TRL's Cohort II Study of new drivers (Wells, et al., in press). This six-year study funded by the Department for Transport (DfT) examined how 'cohorts' of learner drivers in Great Britain

undertook driver training and testing, and their subsequent experiences as new drivers.

- 4.7 An important element of the study was the collection of self-reported data concerning the first months of independent driving. Driver Experience Questionnaires (DEQs) were sent out at six, 12, 24 and 36 months after the date of passing the practical driving test. These questionnaires covered drivers' accidents, exposure and offences, as well as attitudes and reported behaviour. The DEQs also included a version of the Driver Behaviour Questionnaire (DBQ). This questionnaire scale was designed to measure the frequency with which respondents made driving errors, slips/lapses, violations, aggressive violations, and inexperience errors. The repeated questionnaires allowed investigation of the changes in risk as drivers become more experienced and also enabled the tracking of behavioural and attitudinal development.
- 4.8 DEQ respondents were asked how often they drove. The results showed that new drivers tend to adopt regular patterns of driving when they have passed their test. In each survey period, just over half of new drivers said that they drove every day, and about 90% that they drove at least once a week. There was very little difference between males and females in the frequency of driving. It was found that long journeys (more than 100 miles in a day) do not make up a large part of the experience of new drivers. On average, slightly more respondents made longer journeys in the second six months after passing the practical driving test than in the first six months, and in the third year of driving than in the second year. Even in the third year, about one third claimed not to have made a journey of more than 100 miles in a day. There were, however, gender differences, in that males were more likely throughout to have undertaken long journeys than were females.
- 4.9 Respondents were also asked to provide 'as good an estimate as they could' of how far they had driven in each survey period. The distribution of annualised mileage rates for each time period showed that by the later periods, more of the respondents were doing higher mileages. In addition to the total amount of driving, respondents were asked how often in the survey period they had driven in a variety of driving conditions and environments. The results showed that females were less likely than males to have driven on motorways or fast dual carriageways at all stages. Both males and females were slightly less likely to have driven on motorways in the first six months than in the second six months, and in the second year of driving than in the third year. It was clear that driving in urban environments, in the dark and in the rain were all part of almost all new drivers' experience in each survey period.
- 4.10 Respondents were asked whether they thought they needed to improve their ability for a range of driving skills and situations. These included specific manoeuvring skills, different road environments (e.g. motorways, roundabouts) as well as weather conditions (e.g. fog, snow). In general females saw more need for improvement than did males and the overall perceived need for improvement decreased over time. However, even three years after passing their driving tests, one third of respondents still recognised a need to improve one or more of the skills considered.
- 4.11 Respondents reporting driving offences were in a small minority. However one in nine males and one in twenty females reported being stopped by the police and warned without charge in their third year of driving and similar proportions reported this during the second year.

- 4.12 Some authors suggest that the effect of inexperience is exacerbated by overconfidence; the problem of overconfidence is discussed further in Section 4.2.3.

4.2.3 Poor appreciation of their own abilities

- 4.13 Overconfidence is commonly addressed in driver training literature (e.g. Roadcraft, 1997; Engström et al, 2003; Grayson & Elliott, 2004; Grayson, 2004; Christmas, 2007). Overconfidence may be a problem for novice drivers in that it can lead to them driving beyond their capability because they believe that they are better than they actually are. This may mean that drivers find themselves in risky situations which they are unable to handle. The need for accurate self-assessment of driving ability and hence task difficulty is recognised as a prerequisite to safe 'self-pacing' of the driving task in contemporary theories (e.g. Kuiken and Twisk, 2001; Fuller, 2005. Lonero (1999) found that the safety potential of improving drivers' skills appears to be offset by overconfidence and increased exposure to risk and it is widely recognised in the research literature that training in vehicle control skills has the potential to increase accidents.
- 4.14 In a paper exploring the issues faced by novice drivers, Grayson (2004) asked a sample of newly qualified drivers (from the Cohort II study) to rate their confidence in their driving ability: (a) immediately after passing their practical driving test, (b) six months after passing, and (c), twelve months after passing. A four-point scale was used to rate the drivers' confidence (ranging from very confident to not at all confident). The results showed that novice drivers had high levels of self-confidence immediately after passing their test. Self-confidence levels were found to drop with experience of the 'real' driving world and showed no signs of recovery even after a year of driving. Further analyses by Grayson and Elliott (2004) showed that only after two years of driving did confidence scores begin to increase and, even then, not to the levels shown shortly after taking the practical driving test.
- 4.15 This suggests that the problem of overconfidence becomes less important over the first few years of driving as drivers experience their limitations, although the fact that newly qualified drivers appear to need experience to realise their limitations is a problem in itself. According to a number of authors, it would be far better if overconfidence was tackled early on in driver training rather than being addressed by drivers experiencing their limitations in risky driving situations. In other words, training should improve drivers' insight into risk and self-limitations (e.g. Bartlett et al, 2002; Siegrist, 1999).
- 4.16 When it comes to the perceived ability to prevent hazards from developing into accidents, novice drivers tend to believe themselves to be more skilful than the average driver (e.g. Brown & Groeger, 1988, Deery, 1999, DeJoy, 1989; Delhomme, 1991; Guppy, 1993; McKenna, Stanier and Lewis, 1991).
- 4.17 There are two main approaches for measuring self assessment of driving skills. The first more traditional approach is comparing the drivers' assessment of their own skills with a group average. This approach was employed by McKenna et al. (1991) who investigated the factors underlying the reasons why drivers rate their driving skills as being better than average. Two possible explanations were suggested: either a "positive self" or a "negative other" bias. In other words, drivers either make judgements that they are more skilful than the average driver, or they have low estimates of the others' driving skills. In order to differentiate between positive self judgement and negative other judgement, participants (n=99) were asked to rate themselves and "the average driver" on

10-point scales ranging from very good to very poor. Participants were asked to give ratings for 20 different aspects of driving skill; these components were chosen either because they played a significant part in the practical driving test, or because they were judged (by a panel of four people) to be important aspects of the driving task. The components judged included:

- Overtaking
- Reversing
- Three-point turns
- Changing driving to suit wet/icy/foggy conditions

The full list of components can be seen in A.1.1.1Appendix A.

- 4.18 The results of the study showed that drivers judge their own skills as superior to those of average drivers across a wide range of driving scenarios. On scales of 1-10, drivers (on average) scored the average driver as being slightly greater than 5, which indicates that they do not have a negative view of the average driver. When looking at the drivers judgements of their own skills on the other hand, it is clear that they have a positive estimation of their own skills. On this basis, the authors conclude that the reasons why drivers rate their driving skills as being better than average are more consistent with positive self rather than negative other. In a critique of the McKenna et al. (1991) study, Groeger (2000) points out that asking drivers to compare themselves with the average driver could be misleading, because 'average' may be a negative rather than a neutral descriptor.
- 4.19 The second approach used to measure self-assessment of driving skills involves drivers' assessments being compared to an examiner assessment. For example, Masuura (2005) compared drivers' ratings of their own skill with observed driving skill. He found that young groups were more overconfident than older groups, but that experienced groups were more overconfident than novice groups. Gregersen (1996) conducted an experiment in which drivers' ratings of their skill were compared to observed skill. The participants in the study were asked to estimate how many (out of five) trials of braking on a skid track they believed that they could manage correctly at 70kmph. The estimations process was followed by the second task, in which the drivers were told to drive and the actual number of failures and successes were counted. The results suggest that training novice drivers to improve 'skills' produces more false over-estimation than training *insight*.
- 4.20 In a report by SWOV (the Dutch Institute for Road Safety Research), Kuiken and Twisk (2001) conducted a review of the literature relating to two main areas of critical factors in safe driving; namely the ability to detect hazards and risks, and the role of self-assessment in driving performance. The authors assumed that the essential issue in safe driving is not so much the development of specific skills, but rather the ability to balance task demands and skills accurately. They argue that drivers have an ongoing dynamic control over several of the determinants of task difficulty. This balancing of demands and capabilities is also known as 'calibration'. The hypothesis underlying their paper is that calibration is a core issue in driving and as such, the authors studied the relevant literature in order to substantiate this claim. The paper explores theories relating to calibration and investigates whether, and how, to incorporate the issue of calibration in formal driving instruction.
- 4.21 The authors' review of the literature found that current driver training does not prevent 'miscalibration', and may even stimulate it. This is because driver training does not incorporate enhancing learning conditions for the driver after qualification. For instance, drivers are not taught how to assess the degree to

which they have actually mastered certain skills and which skills they still need to develop to what degree. The inherent caution with which novice drivers operate, will partly diminish on account of the fact that they have received formal training. This allows them to think they have acquired all necessary skills, while in fact they have not.

- 4.22 Kuiken and Twisk believe that correct calibration of task demands and coping abilities largely depends on the amount of practice and the amount and quality of feedback that a driver receives. It is suggested that driver training should incorporate methods which match self-assessed ability to actual ability. Drivers should learn to actively search for, and use, the feedback that the driving environment provides them with.

4.2.4 Poorly developed mental models of driving

- 4.23 In contrast to Twisk and Stacey's (2007) view that safe drivers are made and not born, some young drivers appear to believe that driving ability is innate. In an exploratory qualitative study into young drivers' perspectives on good driving and learning to drive, (Christmas, 2007), many participants took the view that driving ability is a matter of natural talent. Even when they recognised the importance of experience in the driving process, some participants still argued that driving is a natural talent, which is realised by experience. The author argues that drivers who believe that driving ability is innate have potential to make the post-test phase much more dangerous as they are more likely to:
- See driver training and the requirements of the practical driving test as artificial constraints and dismiss what they have been taught, believing that they know better
 - Dismiss feedback:
 - from family or friends who are often considered to be nervous drivers;
 - from other drivers who can be seen as the cause of problems; and
 - from accidents which could be blamed on any number of excuses including other drivers, bad luck, or an inadequate car.
 - Take on extreme challenges that they think they are capable of rather than increasing the level of challenge by small increments.
- 4.24 An example of a young driver holding the belief that safe driving is innate was identified in a Transport for London study of London drivers (Holder, 2006):
- "I drive quite fast sometimes, but I know I'm safe. I've never had a crash and if I do, it won't be my fault"*
- 4.25 A sobering finding from Christmas (2007) was that the only method identified by young drivers as serving to change perceptions of ability from participants' points of view was accident involvement. Furthermore, participants suggested that only serious accidents would correct these perceptions; in some cases, 'mere' near misses were even found to reinforce impressions of talent.
- 4.26 Changing drivers' perceptions of their capabilities may be difficult, especially if the belief that driving is a natural talent is prevalent across contemporary culture. The findings of Christmas (2007) indicate that the behaviour of those believing in so-called talent models might be improved by doing more to emphasise the social and emotional aspects of driving and qualities such as wisdom and maturity in driver training and testing.

Poorly developed hazard perception and visual scanning

- 4.27 Lack of experience is likely to mean that the basic task of controlling the vehicle demands much of the novice driver's attention, and the resulting lack of spare capacity for other subtasks will contribute to poor hazard awareness. However it does not fully explain the deficiency (Lee, 2007). Another contributing factor is that young drivers lack the internal model needed to adapt their scanning behaviour to detect hazards effectively. Mayhew and Simpson (1995) reviewed the literature relating to novice drivers' perceptual skills. It was found that when compared with experienced drivers, novice drivers:
- have smaller horizontal scans of the road environment,
 - look closer to the front of the vehicle,
 - check mirrors less frequently,
 - glance at objects less frequently and
 - fixate on fewer objects.
- 4.28 Novice drivers were also found to demonstrate inefficient use of peripheral vision as well as fixating more on stationary objects, whereas experienced drivers were found to fixate more on moving objects.
- 4.29 Research also suggests that experienced drivers perceive the road environment holistically, whereas novice drivers see it in a fragmented way (Milech, Glencross & Hartley, 1989, cited in Deery, 1999). In a (peer reviewed) report on hazard and risk perception among young novice drivers, Deery (1999) proposed a model of the processes mediating behaviour around traffic hazards. Literature on novice drivers was critically reviewed within the framework provided by the model. In the model, novice drivers assess traffic hazards on the basis of a single characteristic; in contrast, experienced drivers consider traffic hazards on the basis of multiple characteristics, which they can use to differentiate between levels of potential risk. For example, a novice driver might perceive all wet roads as being equally dangerous, whereas for an experienced driver, wet motorways pose different risks from wet country lanes or urban roads, and risk can be assessed accordingly. With experience, people are more able to integrate information quickly, and consider hazardousness as a holistic attribute.
- 4.30 Laboratory and on-road studies at the University of Nottingham (e.g. Chapman & Underwood, 1998; Chapman, Underwood & Roberts, 1998; Crundell & Underwood, 1998) have compared the performance of drivers soon after passing the driving test with that of more experienced drivers. They found that experienced drivers generally had more appropriate patterns of eye movements than the newly qualified drivers. In particular, experienced drivers showed more extensive visual search patterns, the effect being greater on dual carriageways than on other road types. Newly qualified drivers were not aware of this deficiency they often failed to check blind spots or mirrors when driving on dual-carriageways.
- 4.31 Most drivers change their patterns of eye movements in dangerous situations to focus more on sources of danger. Newly qualified drivers were particularly likely to take longer to focus on a potential hazard than were experience drivers, furthermore, novices tended to become fixated on a single hazard rather than watching out for others. In many simpler on-road and laboratory measures the newly qualified drivers did not seem to be particularly dangerous they often drove more slowly, and with longer headways than more experienced drivers. However, when followed up over the year they were more often accident involved than the experienced drivers.

- 4.32 Poorly developed hazard perception skills relate to a potential for crashes, especially for inexperienced drivers, (Quimby et al 1981, Maycock et al 1991). The 'trainability' of hazard perception was first demonstrated in an experiment by McKenna and Crick (1994), which was a before-and-after study of drivers participating in a RoSPA advanced driving course. Drivers taking the course showed significant improvements in performance on a hazard perception test following the course compared with a group of matched controls, even though the course did not deal specifically with hazard perception. A later experiment (McKenna and Crick, 1997) suggested ways in which the content of training could be made more efficient, and found that 2 - 3 hours of classroom training using video material could improve the hazard perception performance of novice drivers to the level of experienced ones. A study of over 200 newly qualified young drivers (Mills et al., 1998) also showed that scores on Hazard Perception tests could be improved by training. The authors reported that on-road plus classroom training was the most effective in improving test performance (though the duration of training was greater for those receiving both forms), but classroom training alone was capable of achieving significant improvements.
- 4.33 Grayson and Sexton (2002) showed that three hours of hazard perception training resulted in learner drivers obtaining similar average hazard perception scores to those of experienced drivers. These findings were important because they provided evidence that hazard perception was related to experience, and it was capable of improvement through training. It thus became a candidate for inclusion in the licensing system.
- 4.34 The statistical modelling in the Cohort II project (Wells et al., in press) aimed to assess the impact that introducing hazard perception testing to the theory test has had on new driver safety. It was found that introducing the hazard perception component within the theory test appears to have been associated with a reduction in subsequent accident liability. The size of the estimated effect varies with the type of accident and was found to be largest for reported non-low speed accidents on a public road where the driver accepted some blame. The size of the accident reduction in the first year of driving for those who had taken the hazard perception test (having controlled for age, sex, experience and exposure), compared to those who had not, was for this type of accident at least 3%.
- 4.35 Furthermore, there is a predictive relationship between the hazard perception score and reported accidents in the first year of driving for this accident type: those in the highest scoring group (with a central score of 63 on the hazard perception component of the test) have an accident liability estimated to be at least 4.5% lower than that of the lowest scoring group (with a central score of 41).

Cognitive demands of independent driving

- 4.36 Variables such as age, sex and driving experience are correlated with accident risk. Younger drivers, male drivers, and less experienced drivers have been found to have a higher risk than older drivers, female drivers, and more experienced drivers (e.g. Maycock, Lockwood, Lester, 1996; Maycock & Forsyth, 1997). While this knowledge is important, these variables provide only descriptive information. They do not explain *why* people have higher or lower accident liabilities, nor are they readily amenable to change via road safety interventions. As a result, they provide little information about how to influence accident risk. This sub-section therefore deals with driver behaviours that have been found to increase accident risk and cognitions that underpin those behaviours. Such driver behaviours and cognitions potentially explain why inexperienced drivers have higher accident

liabilities than more experienced drivers, and how behaviours may be changed through driver training.

- 4.37 When examining driver behaviour in relation to road safety, it is important to distinguish between what a driver is *capable* of doing (behaviours that are detrimental to road safety can result from a driver lacking the appropriate skills) and what a driver *chooses* to do (behaviours that are detrimental to road safety can result from a driver choosing an inappropriate course of action, even if he or she has high levels of driving skill and knowledge about what is appropriate, e.g. Baughan and Keskinen, 2005). If “unsafe” driver behaviour is a result of lack of skill, then the form of remedial action that is required is likely to be different from the type of remedial action that is required if the “unsafe” driver behaviour is a result of the drivers’ choice. Further training to improve skills may be required to improve drivers’ capabilities – that is, giving them the ability to overtake safely, judge safe following distances, select safe speeds, and so-on. In addition, improved skills and knowledge to enable people to recognise and avoid risky situations would be appropriate. Regarding drivers’ choices, road safety education designed to influence drivers’ attitudes and motivations is likely to be more appropriate for promoting safer driver behaviour when that behaviour is a result of what a driver chooses to do. This involves persuading and assisting drivers to put their abilities into practice and not have them ignored or misused under the day-to-day influence of factors such as journey-related and personal goals.
- 4.38 This distinction between what a driver is capable of doing and what a driver chooses to do is evident in the GDE matrix which was developed as part of the EU GADGET project, discussed further in section 0 (see Figure 4-1). The basic assumption of the matrix is that driver behaviour is organised into four hierarchical levels with the higher levels (i.e. personal and journey-related goals and characteristics) influencing the way that drivers use their lower level skills of vehicle control and dealing with traffic. On each level, the essential contents of training should relate to three approaches: knowledge and skills, risk-increasing factors and self-evaluation.
- 4.39 The lower two levels of the GDE matrix (vehicle manoeuvring and mastery of traffic situations) are concerned with drivers’ capabilities; the top two levels (driving goals and context, and goals for life and skills for living) are more concerned with the choices that drivers make (or factors, such as peer pressure that can influence those choices). With regard to the lower two levels of the GDE matrix, research has shown that novice drivers typically have deficiencies in a number of skill areas, including steering control (e.g. Forsyth, 1992a; Lestina & Miller, 1994; Mayhew & Simpson, 1995), visual search (e.g. Harrison, 1997; Lestina & Miller, 1994; Mayhew & Simpson, 1995) and hazard detection (e.g. Crundell, Underwood & Chapman, 1999; Harrison, 1997; Hosking, Young & Regan, 2006; Mayhew & Simpson, 1995; Mourant & Rockwell, 1972; Senserrick & Haworth, 2005; Wheelan et al, 2002). Basic driving skills are taught to a large extent in pre-test driver training and there is little or no evidence to suggest that increasing the amount of skills training taken by drivers, either pre- or post-test, makes any substantial improvement to the accident liabilities of new drivers (Rainer et al, 1999). Many authors therefore conclude that it is important for novice driver training to take into account higher order cognitions such as driver attitudes and motivation (Gregersen, 1995; Hatakka et al, 1999, 2002; Mayhew & Simpson, 2002).
- 4.40 Higher order cognitions which influence motivation (or intention) include: attitudes and intentions, perceived social pressure, perceived control over one’s own performance of the behaviour, moral norm, and anticipated regret. These are the main components of the Theory of Planned Behaviour (see Elliott, 2004 for an

overview). These variables are mainly located in the higher levels of the GDE matrix, which cover how journey related goals and goals for life can influence driving behaviour. According to the findings of various EU-funded projects on driver training it is these variables that need to be addressed in driver training programmes in order to promote 'safe' driver behaviour.

Figure 4-1: The GDE matrix: Hierarchical levels of behaviour

		Essential curriculum		
		Knowledge and skills	Risk-increasing factors	Self-evaluation
Hierarchical levels of behaviour	Goals for life and skills for living (general)	Knowledge about/control over how life-goals and personal tendencies affect driving behaviour <ul style="list-style-type: none"> lifestyle/life situation peer group norms motives self-control, other characteristics personal values etc.	Risky tendencies <ul style="list-style-type: none"> acceptance of risks self-enhancement through driving high level of sensation seeking complying with social pressure use of alcohol and drugs values, attitudes towards society etc.	Self-evaluation/awareness of <ul style="list-style-type: none"> personal skills for impulse control risky tendencies safety-negative motives personal risky habits etc.
	Driving goals and context (journey-related)	Knowledge and skills concerning <ul style="list-style-type: none"> effects of journey goals on driving planning and choosing routes evaluation of requested driving time effects of social pressure inside the car evaluation of necessity of the journey etc.	Risks connected with <ul style="list-style-type: none"> driver's condition (mood, BAC, etc.) purpose of driving driving environment (rural/urban) social context and company additional motives (competitive, etc.) etc.	Self-evaluation/awareness of <ul style="list-style-type: none"> personal planning skills typical driving goals typical risky driving motives etc.
	Mastery of traffic situations	Knowledge and skills concerning <ul style="list-style-type: none"> traffic regulations observation/selection of signals anticipation of the development of situations speed adjustment communication driving path driving order distance to others/safety margins etc.	Risks caused by <ul style="list-style-type: none"> wrong expectations risk-increasing driving style (e. g. aggressive) unsuitable speed adjustment vulnerable road-users not obeying regulations/unpredictable behaviour information overload difficult conditions (darkness, etc.) insufficient automatism or skills etc.	Self-evaluation/awareness of <ul style="list-style-type: none"> strong and weak points of basic traffic skills personal driving style personal safety margins strong and weak points for hazard situations realistic self-evaluation etc.
	Vehicle manoeuvring	Knowledge and skills concerning <ul style="list-style-type: none"> control of direction and position tyre grip and friction vehicle properties physical phenomena etc.	Risks connected with <ul style="list-style-type: none"> insufficient automatism or skills unsuitable speed adjustment difficult conditions (low friction, etc.) etc.	Awareness of <ul style="list-style-type: none"> strong and weak points of basic manoeuvring skills strong and weak points of skills for hazard situations realistic self-evaluation etc.

Source: Siegrist (1999)

- 4.41 The GDE matrix is not the only theoretical perspective that makes a distinction between what a driver is capable of and what a driver chooses to do. Parker and Stradling (2001) theorised that drivers progress through three stages when learning to drive. In the first phase, the "technical mastery phase", the driver learns how to control, position and manoeuvre a vehicle in order to make smooth progress. The second phase is the "reading the road phase" and in this stage drivers learn which cues to use in order to anticipate the actions of other road users. These two stages are largely consistent with the lower two levels of the GDE matrix. The technical mastery and reading the road phases of Parker and Stradling's (2001) model of learning to drive are therefore mainly concerned with driving skills and capability.
- 4.42 The third phase of Parker and Stradling's (2001) model of learning to drive is the "expressive phase". In this phase drivers begin using the manner in which they drive to give expression to their personality, attitudinal and motivational characteristics (this stage is largely consistent with the top two levels of the GDE matrix). Drivers can potentially have deficits that are related to each of Stradling and Parker's (2001) three phases of driving, and this is likely to affect their safety as drivers. However, the expressive phase, which is largely concerned with what a driver chooses to do, is the phase in which newly qualified drivers are at most risk of an accident (Stradling & Parker, 2001). Therefore, consistent with the conclusions drawn from the GADGET report, Parker and Stradling's (2001) main conclusion for driver training is that driver training should focus on driver attitudes and motivations – factors that influence driving in the expressive phase.

4.2.5 Errors and Violations

- 4.43 Unsafe driver behaviours can be a result of an error or a violation. The main difference between these two forms of behaviour concerns the role of motivation (intention). Errors are not driven by motivation – people do not intend to make errors when driving. Errors are therefore underpinned by cognitive failures (e.g. not noticing other road users through distraction or through losing concentration). In driving, distraction can be caused by many factors, including passengers, in-car devices, and the driver's own thoughts and feelings. Violations, on the other hand, are driven by motivation (intention). Violations are deliberate deviations from "safe" driving practices (see Reason et al., 1990).
- 4.44 Violations tend to occur during unsupervised (independent) driving, so it might be argued that this is another reason for including independent driving in the practical driving test. However, it seems unlikely that sufficient independence could be provided in a 'normal' driving test to allow driving behaviour to be fully realistic in this respect, though some examiners believe that drivers tend to 'revert to type' during longer tests (Baughan et al, 2005a). Extended tests using in-vehicle data recorders to monitor behaviour over a long period might, in future, offer more potential here (Baughan, 2006).
- 4.45 Distraction can have a substantial effect on driving behaviour. For example, in a study of gap acceptance and close following, Horswill & McKenna (1999) manipulated the amount of distraction experienced by drivers by using a verbal secondary task. When distracted, drivers tended to accept smaller gaps when merging with a stream of traffic and they tended to drive closer to the car in front than when they were not distracted.

5 Current evidence regarding the inclusion of independent driving in the training and assessment protocols of other countries

Summary of Section 5

- Several EU-funded projects have investigated developing the higher order skills content in driver training and concluded that the proportion of training spent covering these skills should be increased.
- Developments have recently been made in the training and testing protocols in the Netherlands, Norway and Australia. Training programmes are designed in multiple stages with the aim of building up higher order skills.
- In the Netherlands, a new practical driving test dedicates a significant proportion of time to the specific assessment of independent driving skills. Pilot studies of the Dutch practical driving test have produced encouraging results.
- DSA is about to pilot a practical driving test which includes an independent driving task
- In addition to incorporation of independent driving into training and testing protocols, the literature suggests that accompanied driving offers learners an opportunity to gain experience in an informal environment with the accompanying driver acting as a passenger rather than an educator.

- 5.1 The evidence regarding the inclusion of independent driving in the training and assessment protocols of other countries is largely divided here into two sub-sections. Firstly, EU-funded studies into driver training and testing are discussed and recommendations are made relating to the incorporation of independent driving into current training and testing protocols. Secondly, case studies are presented from countries which have introduced, or are currently introducing, independent driving into their training and testing procedures.

EU-funded Studies

- 5.2 There were very few studies reported in the literature which were specifically about independent driving. Several studies explored the testing and training protocols in European countries and made recommendations for the inclusion of independent driving elements as part of either driver training or testing and so will be discussed here.

Guarding Automobile Drivers through Guidance Education and Technology (GADGET)

- 5.3 A major study into driver training and education is the GADGET Project (Siegrist, 1999). This project addressed the issues relevant to driver training and in

particular, the training of novice drivers. The GDE Matrix discussed in section 0 of the present report was developed as part of this study, though based on driver models developed over a period of 30 years.

- 5.4 The project was divided into 'Work Packages', the most relevant of which to this review was "WP3 Summary: Driver Education, Training and Testing". The objective of this work package was to assess different models of driver education, training and testing with respect to their safety benefit and to develop recommendations for best practice. The assessment of measures was based on the GDE matrix (see Figure 4-1).
- 5.5 The study also assessed licensing systems; the results of this assessment made it clear that driver training is more effective if it is part of a well-designed licensing system and if self-evaluation and social-psychological influences on driving are emphasised more. It has not been possible to establish the detailed methodology in this study, but it included reviews of literature coupled with expert views of the specialist researchers involved – in particular concerning the assessment of licensing, testing and training against the framework of the GDE Matrix. The following recommendations for best practice were made:
- The use of Graduated licensing systems is beneficial (several evaluations have shown a reduction in accident involvement).
 - It makes sense to increase 'protected experience' i.e. gaining experience under protected conditions.
 - No system (in 1999) covered all of the cells of the GDE Matrix, which indicates that there is considerable scope for the development of overall systems
 - If the social and psychological contexts, as well as self-analysis methods of behaviour, are covered in the education, many of the well-known accident related factors particular to young novice drivers may be addressed.
 - A combination of a graduated system and an educational content, moving towards the upper rightmost corner of the matrix, seems to be promising in terms of safety.
- 5.6 GADGET showed that the practical driving test plays an important role in training and licensing systems and revealed good potential for improving the reliability and validity of current driver testing in Europe. Specific recommendations were provided regarding how to improve the testing itself or to improve the level of readiness of candidates who come forward to take the test.
- 5.7 The following were the key recommendations for best practice:
- make better use of minor faults as failure criteria,
 - add to the range of weather conditions covered,
 - improve the use of the test as a training opportunity,
 - improve the standard of candidates coming forward for an existing test,
 - improve coverage of higher-order skills such as hazard perception and self-evaluation,
 - add attitudinal items which predict future unsupervised driving behaviour and accidents.

- 5.8 Adding to the range of weather conditions covered may be easier said than done; however, it would better prepare learners for the challenges of driving in inclement weather as solo drivers. In terms of the status of this study, it would appear that the conclusions are based upon partly upon expert judgement and not always upon research findings from robust scientific studies. Nevertheless, they are consistent with other findings identified in the literature.

Towards European Standards for Testing (TEST)

- 5.9 The TEST project (Baughan, et al., 2005b) was mainly focused on the driving test; it aimed to define the relationship between how long a test lasts, where the test takes place and what is dealt with in the test. The project also aimed to examine whether the driving tests conducted in different countries in Europe or in different test centres in the same country are comparable, and if they require the same skills and attitudes from the candidates. The final objective was to discover whether current driving tests are suitable for successfully differentiating between different drivers. To do this, it discussed the training needs of drivers as structured by the GDE framework, and suggested future developments in testing that might be used to encourage improved training and testing, covering the whole of the GDE framework.
- 5.10 The study examined 3,150 driving tests in 45 different test centres across the six countries (Great Britain, Spain, France, The Netherlands, Sweden and Austria) involved in the project. Half of the tests considered dated from before the implementation of a new directive in 2003, and half after. The test assessments were made using a centrally designed and systematic protocol or audit form which was filled out by a selected and specially trained team of auditors. On the form, auditors were asked to record information about how many times driving tests were covering different elements or how much time was spent on these items; one of the elements included in the audit was independent driving. In addition to the protocol forms, examiners in the participating countries were approached and asked to complete a series of questions to gauge their opinion of the driving test and how it could be improved.
- 5.11 The amount of time spent on particular topics in the practical driving test was also investigated. The amount of time spent by the pupils doing independent driving varied across each of the six countries; with Great Britain being the only country of those studied which did not involve any independent driving (see Table 5-1). Recently (since publication of the TEST results in 2005) a revised practical driving test in the Netherlands dedicates a much larger proportion of time to the specific assessment of independent driving skills (see Section 0). No information on the role of independent driving in Spain, France, Sweden or Austria could be identified.

Table 5-1: Duration of test spent driving independently

		Great Britain	Spain	France	The Netherlands	Sweden	Austria
Independent driving	Minutes	0.0	0.2	0.4	0.9	13.8	4.2
	% of test	0.0	0.8	1.9	2.7	41.7	12.4

- 5.12 The authors concluded that current driving tests are not yet incorporating the results of research conducted in recent years, which recommend introducing more behavioural elements into the driving test and focussing less on only vehicle

control. However, it stated that some countries are beginning to consider how this could be done and that some ideas have already been launched.

5.13 The authors made the following recommendations:

- That extra thought needs to be given to how to incorporate the higher levels of the GDE matrix into driver testing and in doing this it is important to look at more than just driver testing but also to involve the training sector.
- That in order to have more complex items in the practical driving test (such as independent driving, respecting the safety of all road users, hazard perception), there must be enough time to deal with all these in addition to the items already being tested.
- That increasing the length of on-road time in the practical driving test is also more likely to enable the examiner to observe the 'normal' driving behaviour of the candidate, rather than the optimal behaviour (which, according to CIECA (2007) can only be maintained for a limited period).
- The introduction of stepwise driver training systems (see Section 0) or GDL.
- Retesting after 2 years.
- Where possible, improved coverage of the higher levels of the GDE matrix by means of tasks and freedom of action such as route-following (i.e. independent driving) should be included in the training and testing protocol. It was felt that this would probably need to incorporate some questioning from the examiner about how and why choices were made.

SUPREME (Summary and Publication of Best Practices in Road Safety in the Member States)

- 5.14 The EU-commissioned Summary and Publication of Best Practices in Road Safety in the Member States (SUPREME) project focused on best practice measures in the field of road safety (KFV, 2007). The objective of the project was to identify best practice measures in place in Europe and to communicate these measures to policymakers. In total, 31 national and international road safety organisations were involved as project partners.
- 5.15 The methodological approach involved the project partners holding comprehensive discussions to define Best Practice and using that as a foundation tool for development of questionnaires. Data collection took place in 27 countries (25 EU-Member States plus Norway and Switzerland) and was organised and supervised by a network of country experts. A questionnaire was used to gather information from key road safety experts in European, as well as international, road safety institutions. Subsequently, an in-depth-analysis of all collected measures was carried out in order to select the final set of Best Practice measures. All 27 country experts were asked to give feedback to the selection of Best Practice measures and to report about state of implementation from a national perspective as well as about the intended dissemination strategies at national level.
- 5.16 The SUPREME project covered a large variety of road safety measures at various levels, the most relevant of which to this literature review concern Driver Education, Training and Licensing. This category focused primarily on the initial licensing process for learner / novice drivers of category-A (motorcycles) and B (passenger car) vehicles. This included initial driver training, the driving test and

post-licensing measures for novice drivers (it also included second-phase training, probationary periods, and other restrictive measures which fall outside of the scope of the current review). Member states were asked to make recommendations for best practice.

- 5.17 A total of 27 measures from 16 European countries were submitted for consideration as potential best practice measures. In addition, recommendations from the world of graduated licensing (North America, Australasia) were taken into account, despite being outside the geographical scope of the project. In total 26 of these measures were carried forward for analysis.
- 5.18 To determine best practice, a three-step analysis was undertaken, based on the following selection criteria:
- Costs and benefits,
 - Acceptance,
 - Sustainability, and
 - Transferability.
- 5.19 Firstly, the measures had to have been scientifically evaluated to be considered in the next phase of analysis. The quality of the evaluation, and the results, were then analysed in step 2. The final step, involving only the measures to have passed the criteria in step 2, focused on more detailed selection criteria such as costs and benefits, acceptance of the measure and how well the measure can be transferred from one country to another.
- 5.20 The authors identified five areas where effective changes in the overall driver licensing process could be sought, these are as follows:
- Improvements to the quality of the methods used in formal driver training (e.g. Danish initial training)
 - Significant increases in the quantity (and quality) of accompanied practice (e.g. Sweden's 1993 reform which lowered the minimum age for training- see Section 0)
 - Imposing post-test measures such as obligatory 2nd phase training (with an emphasis on discussion of experiences and strategies for safe driving, and avoiding skills-based training which could lead to overconfidence)
 - Training and testing of higher order skills (such as self-reflection regarding lifestyle factors, independent decision-making, motives in life and personal strengths and weaknesses), such as in Norway (see Section 0) and various 2nd phase training programmes.
 - Imposing post-test probationary periods with restrictions for novice drivers and tougher penalties for offenders (Austria, Germany, etc).

Basic

- 5.21 The 'Basic' project (Hatakka, et al., 2004) was one in a series of studies on driver training. Others, which largely focus on post test interventions (and as such fall outside of the scope of this review) include DAN (Description and Analysis of post-licensing measures for Novice drivers, Bartl, 2000), ANDREA (Analysis of Driver Rehabilitation Programmes, Bartl et al., 2002) and ADVANCED (Description and Analysis of Post Licence Driver and Rider Training, CIECA, 2002). The general aim of these studies and development projects was to increase safety among young and novice drivers. The Basic project was co-ordinated by the University of

Turku in Finland, and had contributions from the UK, the Netherlands, Sweden, Switzerland, Germany and Austria. The project's authors examined recent developments in basic education for category B drivers. Basic education in this case referred to driver education aimed at obtaining a driving licence.

5.22 The specific aims of the project were:

- 1) To review the new models in use and under development in Europe.
- 2) To analyse and evaluate the new models (aims, contents, methods) concerning: support for learning and pedagogical and didactic solutions, functionality and internal consistency, costs and benefits and cultural and structural demands for the application of new methods.
- 3) To evaluate the effectiveness of models (possible safety and other effects) and possible restrictions of use, (e.g. effects of self-selection)
- 4) To make recommendations concerning new models in driver training in Europe.

While earlier work on describing the driver training systems around Europe concentrated on structure and practical aspects such as the duration of training, the distribution of theoretical and practical training and licensing requirements (GADGET-report, 1999; Lynam and Twisk, 1995; TRAINER-project, 2001), the focus of the BASIC study was to look at qualitative features of the systems and their essential components; it focused on investigation of studies into:

- driving school instruction;
- layman instruction;
- short training periods;
- extended learning periods;
- combined models;
- multi-phase models, and
- liberal models.

5.23 Evaluations were made of the various systems described above and the following recommendations were made relating to independent driving:

- Training should start in a structured way from the two lowest levels of the driving hierarchy (GDE matrix- see Figure 4-1) and then continue to allow drivers to learn these skills automatically in traffic with an accompanying person.
- An integrated approach is especially important for the youngest learner drivers before allowing them independent access to traffic.
- Accompanied driving should include not only a minimum amount of driving but also a structure and methods to control it.
- The interventions of professionals after the accompanied driving phase should clearly support more risk awareness and self-evaluation, rather than being technically oriented.

Case Studies

5.24 There is acknowledged scope to train the tasks of independent driving and then assess them to determine how effectively a driver will cope with them once they achieve full licensure and drive solo. It is hoped that this will better equip newly qualified drivers and perhaps hold back from licensure those that are not ready

for independent driving. Developments have recently been made in the training and testing protocols in the Netherlands, Norway and Australia; these will be reported here as case studies and the feasibility of incorporating independent driving elements into the UK testing procedure will be discussed. Additionally, at the time of writing, DSA is about to pilot a prototype drive designed to assess independent driving. An example of questionable driver training practice was identified in the Belgian Initial Driver Training System; this system will also be evaluated.

Norwegian driver training curriculum

- 5.25 The Norwegian Public Roads Administration (NPRA) is responsible for the driving test in Norway; unlike in Great Britain, Norwegian driver training can only take place at private traffic schools. In Norway, the minimum age for on-road driver training is 16 years, while the licensing age is 18. The core aim of this delay is to facilitate more driving experience before licensing and independent driving (for more detail, see Sweden's 1993 reform- Section 0). In Norway the licence test consists of a computer-based theory test and a practical driving test; the theory test must be passed before the driving test can be applied for. An educational model has been developed for use in all aspects of driver training. This is based on the GDE Matrix (Figure 4-1 in Section 0), with a particular emphasis on the upper levels, in an effort to improve education within traffic safety.
- 5.26 The Norwegian educational model emphasises the importance of developing automatic actions so as not to overload the cognitive system during driving. The education is executed in four steps, with clear competence objectives at each step, as follows:
- Step 1 deals with the road traffic system and basic understanding of risk
 - Step 2 deals with the vehicle knowledge and technical driving skills
 - Step 3 deals with driving in varied traffic and knowledge of the road traffic legislation
 - Step 4 deals with in-depth understanding of risk and the road traffic system
- 5.27 The driving skills displayed determine at which step the individual learner is. Steps 1-3 include describing what is necessary to benefit properly from the training in the next step. It is the intention that the contents in each step should be carried forward into the following step. Topics that cannot be tested during the driving test are subject to mandatory training.
- 5.28 The concept of independent driving arises in steps 3 and 4 which will therefore now be amplified.
- 5.29 Step 3 is concerned with learning and driving on the road. The main objectives are that the learner driver shall be capable of driving in a clear, safe and *independent* manner in varied traffic. The learner driver shall also be able to assess his/her own competence with respect to driving a car in traffic.
- 5.30 The objectives state that the learner driver shall:
1. be able to explain the road traffic system, groups of road users and conflicts of interest, and private car use in an environmental perspective
 2. be able to explain roads, road markings, signs and other means of regulating traffic

3. be able to explain clear, safe and efficient behaviour on the road and the rules applicable to car driving
 4. acquire information systematically and automatically
 5. be able to drive in a decisive manner in residential areas, built-up areas and urban environments
 6. be able to make use of a precise driving technique on high-speed roads
 7. be able to drive in an efficient, comfortable, environment-friendly and economical manner in a varied road environment in proper cooperation with other road users
- 5.31 After completing Step 3, the learner should be close to meeting the requirements for passing the driving test. The learner should be able to drive in an efficient, comfortable, environmentally friendly and economical manner in a varied road environment in proper cooperation with other road users. At this point the skills demonstrated should approach the level where the driver is capable of independent driving. When this level is reached, independent driving lessons take place and involve learner drivers driving longer distances than usually covered within lessons with minimal input from the instructor (CIECA, 2007). No stipulations are made about the number of lessons required for this step. At the end of Step 3, the learner and the instructor are required to complete an evaluation and guidance lesson – this is a joint assessment of whether the learner possesses adequate driving competence to drive independently in varied traffic.
- 5.32 After completing Step 4, the learner driver should have developed a willingness to accept responsibility, to take precautions and to cooperate in traffic. The learner driver must also complete an on-road safety course and must have had adequate driving practice (the number of hours or distance driven in order for adequate driving practice to have been achieved were not specified).
- 5.33 The on-road safety course is in four parts:
- Part 1: The hazards of driving
 - Part 2: Driving on the open road and overtaking
 - Part 3: Final driving in a varied road environment
 - Part 4: Concluding theory
- 5.34 The course comprises thirteen lessons in total. It begins with two classroom lessons devoted to the hazards of driving a car (up to sixteen learners may take part in this). Each learner then has five lessons which involve practising highway driving and overtaking, during which time there may be up to two learner drivers in the car at the same time. The third part consists of four driving lessons conducted in a varied road environment; each learner has at least three lessons of driving practice. The remaining time is devoted to planning and summing up this part of the course. The course concludes with two lessons for reflection and summing up in the classroom.
- 5.35 The system was introduced in 2005; due to a rather extensive transitional period lasting to mid 2006 it is only in the last six months to a year that candidates who experienced the training are starting to be seen on the roads. While no formal evaluations exist at the time of writing, additional research is in progress, and will hopefully be completed within the next couple of years; unfortunately, therefore, it is too early to say anything about the effectiveness of the training (Haslie & Eriksen, 2007). The success of the training is largely dependent on the cooperation of the driving schools and driving instructors, as well as the learners

and their relatives. It is essential that the driving instructors adjust their teaching methods in accordance with the new curricula and that the learners are motivated and follow up the intentions of the curricula.

- 5.36 Whilst there has been no formal evaluation, the NPRA believes that this is the right way to go to reduce the fatality rate for novice drivers.

Driver training Stepwise- The Netherlands

The training

- 5.37 For some years now, the Netherlands has had the 'Stepwise' or 'Driver Training in Steps' (DTS) driver training programme in place. The goal of DTS is safe traffic participation; it also covers topics that are not examined in the driving test - for example, getting learner drivers to practise finding their way in traffic on their own (i.e. an element of independent driving). The DTS is a modular pre-test driver training programme which differs from the traditional driving school-based training in two fundamental respects, namely:

- The pupil learns how to drive in a series of highly-structured steps
- The pupil is only allowed to enter the next stage of learning if he/she shows complete mastery of the previous stage. At the end of each learning stage, there is a test to assess whether the pupil has obtained the required level.

- 5.38 The modules are arranged to meet clear training objectives which rank from simple to difficult:

- **Module 1:** Vehicle operation and vehicle control.
- **Module 2:** Mastering simple vehicle manoeuvres and traffic situations.
- **Module 3:** Complex vehicle operation, and control of complex traffic manoeuvres and situations.
- **Module 4:** Safe and responsible traffic participation.

- 5.39 A number of special elements incorporated into the DTS training are:

- Training "difficult conditions"
- Independent driving
- Energy-efficient driving
- Homework for learner drivers
- Integration of theory and practice

The safety value of the DTS

Course content

- 5.40 The final report of the European Basic project about driver training models (Hatakka et al., 2004) describes the ideal driver training as:

- having clear learning objectives and contents;
- giving enough feedback to improve behaviour and to learn;
- theoretical and practical training supporting each other;
- offering the possibility to gain enough experience*;

- provide a realistic environment to practice the necessary skills;
- having a learning period which is long enough to let the skills and learning climate which focuses on safe traffic behaviour*.

According to SWOV (2006) the DTS meets most of the criteria and recommendations formulated by the Basic project, but not those marked with * which are believed to be inherent in a graduated driving licence.

Test pass rate

- 5.41 In 2001, in a small scale study of the effect of the DTS on the practical driving test pass rate, it was found that, for the 109 learners included, the pass rate on their first test was 83% (Nagele & Vissers, 2001). In the period immediately before the DTS, the pass rate for the regular learners at the same driving schools was 46%. Furthermore, DTS learners did not require any more lessons than the group of regular learners. A large scale follow-up experiment was conducted between January 2002 and April 2003 involving 557 DTS learners (Nagele & Vissers, 2003). In this study, the practical driving test pass rate (first test) was 75% compared with 53% for the regular driver training. This time, the number of driving lessons for DTS learners was slightly larger than for those who followed a traditional course; however, the difference was not statistically significant.
- 5.42 In addition to the pass rate, the quality of the learners' performance during the practical test was studied. It was found that DTS learners achieved statistically significantly higher scores than regular learners for:
- Technical handling of the vehicle
 - Traffic insight
 - Application of traffic rules
 - Using a more cost effective and environmentally friendly style of driving
- 5.43 Without a doubt, the DTS is associated with a high pass rate; however, a problem with these findings stems from the fact that learner drivers themselves choose the driver training intervention that they wish to take part in. For example, the type of drivers who choose the DTS programme may have greater safety awareness than those who choose traditional training methods. As such, any differences in pass rate cannot be attributable solely to DTS, but also to the drivers' personal characteristics. To avoid this self-selection bias, learners would need to be randomly allocated to a condition - either DTS or traditional training. In addition, pass rate on its own cannot determine whether the safety value of the course is high.
- 5.44 The most recent study into whether DTS learners are *safer* solo drivers was an assessment based on a test drive (Vissers et al., 2004). This was part of a study into the effect of a refresher course after having been in the possession of the driving licence for approximately six months. The course participants comprised DTS learners as well as non-DTS learners and the supervising examiners did not know which type of driver training the participants had followed. Twenty skills were addressed. Solo driving was rated as being better for the DTS learners than for the non-DTS learners (although the difference was not statistically significant). Statistically significant differences ($p < 0.05$) between the two groups were found for the following skills (in all cases, DTS learners scored statistically significantly higher than non-DTS learners):
- Vehicle operation
 - Defensive driving behaviour: anticipating, and

- Driving economically

Note that this study too may have been affected by self-selection bias.

2008 Netherlands Driving Test

- 5.45 At the time of writing, a new practical driving test was being implemented in the Netherlands. Contact was made with Dr Jan Vissers (DHV) in order to gain detailed understanding into the processes behind its implementation. The main reason behind its introduction is that accident risk in the Netherlands has been found to be declining for drivers in all age groups, except those aged between 18 and 24 years of age. The Dutch Traffic Department therefore commissioned the Driving Test Organisation (CBR) to develop and implement a new practical driving test. The revised driving test was developed in close co-operation with researchers, the driving school sector and traffic safety organisations. The stated purpose of the new testing protocol is to reduce the number of traffic accidents amongst recently qualified drivers.
- 5.46 The CBR believed that independent driving could be a relatively easy way of introducing elements from the higher levels of the GDE matrix (see Figure 4-1) into the driving test, especially level 3 (Vissers et al, 2007). Vissers et al. argued that requiring candidates to demonstrate responsibility and independent decision-making in the practical driving test goes beyond merely learning vehicle control and applying traffic rules. Furthermore, in countries where driver training is not regulated and where there is no obligatory second phase training, the introduction of independent driving into the practical driving test would cause it to be incorporated into driver training.
- 5.47 In early 2007, several pilot studies were conducted, in which a range of new elements were tested as part of a 'Learner Interim Test'. All learner drivers have the possibility of taking this test (on a voluntary basis) around two thirds of the way through their training (this is similar to the 'mock test' sometimes conducted in UK driver training). After several pilots, new elements were added to the 'Learner Interim Test'. Based on these pilots, the most workable elements were selected and integrated into a new set-up for the practical driving test.
- 5.48 The new practical driving test in the Netherlands was gradually introduced from 1st January 2008. The specification for the new test involved inclusion of new elements that enable the assessment of higher order skills (in line with the GDE matrix- Figure 4-1 in Section 0) such as hazard perception and self-reflection. As such, the test involves learner drivers being more closely examined in respect of the following skills:
- driving independently,
 - recognising danger,
 - driving in traffic jams and
 - driving in an environmentally aware manner.
- 5.49 These elements formed new test components which will be discussed below, with particular attention being paid to the independent driving element. In the new practical driving test, the independent driving element is implemented by the examiner requesting the candidate to:
- drive to or from a known destination without any directions (the candidate is asked to drive towards a certain "co-ordination point" such as a railway station, hospital or school);

- use navigation equipment (the examiner enters a destination in the navigation system and the candidate then has to follow the directions given by the system);
 - drive to a specific destination based on three to five sets of instructions (the examiner gives the candidate a series of instructions comparable to a situation in which someone asks the right way when s/he is in unfamiliar surroundings).
- 5.50 The independent driving task is designed to take up around 10 minutes of the test. En route (in contrast to the previous testing regime), the candidate receives no further instruction. This component is intended to establish whether the test candidate is capable of combining independent execution and safe behaviour on the road. Driving skills are also be assessed in the event of a traffic jam. Navigation equipment would only be used if the driving school has given the candidate an opportunity to get used to it.
- 5.51 Another form of independent driving piloted in the development of the new practical testing was 'fixed task' independent driving; this involved candidates being continuously instructed to take the second street on the left followed by the second street on the right. This form of independent driving was not integrated into the new driving test as it was found to lead to a quite unnatural way of driving (Vissers, 2007).
- 5.52 Independent driving measures, as well as the measures considered in the GDE matrix (Figure 4-1 in Section 0), are designed to increase the validity of the driver testing (and/or training) protocol. The validity of the test is the extent to which it effectively assesses the full range of driving competencies needed to be a safe driver (CIECA, 2007). At the same time, the reliability of the test is also important, that is to ensure that each candidate is assessed according to the same conditions and criteria, regardless of the location or specific examiner in question. With regard to independent driving, a balance is needed between giving the candidate enough freedom in the practical test to feel responsible for his own driving (validity) and maintaining enough control and structure to the test so the examiner can be assured that the test norms have been observed (reliability).
- 5.53 Special manoeuvres replace the previous component directed at testing special skills. Under this component, the candidate could be asked to do a U-turn, park or stop the car. The examiner chooses two of these three assignments. Additionally, the candidate could be asked to carry out the familiar hill-start.
- 5.54 Under the third new component, covering situational questions, the examiner will ask the candidate to consider several options. After resolving a traffic situation, candidates may be asked to pull up at the side of the road to explain their actions. Additionally, before the test, the candidate completes a questionnaire that provides insight into his or her strengths and weaknesses. The examiner only reads and discusses the answers with the candidate after completing the test.
- 5.55 The principles of new-style driving reappear in the practical test under driving in an environmentally friendly manner. Important assessment points here include attention for tyre pressure, gear-changing skills and anticipating traffic situations in particular. These points not only lead to decreased fuel consumption, they result in safer driving behaviour.
- 5.56 At this early stage, no evaluations of the effectiveness of the modified testing protocol are available. However, in June 2007, a large scale pilot study was conducted to investigate these new elements and their role in the practical driving test. The study involved about 150 candidates who were in the final stage

of their driver training; they had approximately 6 weeks of practising with the new elements. Then participants took a Learner Interim Test (which included the new elements), administered by the CBR; additionally, the instructor, candidate and examiner filled out questionnaire evaluation forms. The questionnaires were designed to assess the effectiveness of the procedures for the new elements and included open and closed questions about:

- a. the difficulty of practising the new elements
- b. the perceived usefulness of the new elements for the practical test
- c. the perceived possibility of assessing higher order skills by means of the new elements

- 5.57 Each candidate was tested on one of the four methods of independent driving (including the fixed task element described above); they were also tested on special manoeuvres and either hazard perception or self-reflection during the test.
- 5.58 Not all questionnaires were completed, so in total 109 candidates' datasets were used for analysis. With the exception of slight over-representation of older candidates in the study, the sample was representative for the population of CBR candidates for the practical driving test. Sixty five percent of the candidates were 18 or 19 years of age, and 15% were between 20 and 25 years of age; the remaining 20% were over 25.
- 5.59 The questionnaires were completed by instructors, candidates and examiners immediately after taking the Learner Interim Test.
- 5.60 The 2007 pilot study firstly revealed that independent driving is a process which takes some time to master. The study showed that the learner drivers found driving to a co-ordination point the easiest of the independent driving tasks, with 49% of participants rating this method (very) easy to learn and perform. The least easy was found to be the fixed task; only 30% of learner drivers described this as (very) easy. This was consistent with both the driving instructors' and examiners' opinions of the fixed task.
- 5.61 The authors concluded that independent driving is of "*great value for the driving test as well as for the training of novice drivers*" (Vissers, et al., 2007). Instructors and examiners felt that by applying independent driving during the practical driving test, candidates were forced to show a higher level of driving performance. Furthermore, it was felt that test candidates had more opportunities to demonstrate 'productive' driving behaviour; test candidates had to make their own choices in traffic and as a result, were found to be more aware of other traffic participants and the traffic environment. Examiners reported greater insight into the way candidates handled traffic situations and said they that were able to trace the way that the candidate went through the cognitive processes involved in driving, and in responding to changes in driving situations. Note that these conclusions are not based on robust scientific evidence of a safety benefit from including independent driving in the driving test. Such evidence could only come from much larger studies. However, the Dutch pilot study does indicate that meaningful independent driving elements can be introduced into testing, meet with the approval of instructors and examiners, and appear to have beneficial effects on testing and on the standards of performance required from candidates.

Australian VicRoads campaign- guide to driving solo and learners kit

- 5.62 VicRoads in Australia (part of the Victoria State Government) is responsible for the driver testing system. In Victoria, learners must be at least 16 years of age and a Victorian resident to obtain a learner's permit. For the full licence (or permit), learners must pass a Car Learner Permit Knowledge Test and an eyesight test.
- 5.63 After 1st July 2007, the following restrictions also applied, and some of them (see in particular "Stage 4" below) are relevant to independent driving:
- If under the age of 21, learners are required to undertake a minimum of 120 hours (including at least 10 hours of night driving) of supervised driving before taking the licence test. Learners must record these hours in an official learner log book which must be signed by both the driver and the supervising driver (either an Approved Driving Instructor or a lay supervisor).
 - If under 21 years of age, learners must hold their learner permit for at least twelve months before taking the practical driving test.
 - If 21 years of age or over but under 25 years of age, learners must hold their learner permit for at least six months.
 - If over 25 years of age, learners must hold their learner permit for at least 3 months.
- 5.64 As well as the introduction of tighter restriction, to prepare for the practical driving test, learners are required to study the "Road to Solo Driving" handbook which can be downloaded from the website and is split into four parts aimed at giving learner drivers some preparation for solo driving:
- Part 1 covers the challenges facing new solo drivers.
 - Part 2 covers the process of learning to drive and the importance of supervised driving practice.
 - Part 3 looks at the risks of driving and strategies for new solo drivers to manage these risks.
 - Part 4 details the rules and responsibilities.
- 5.65 Part 4 is not dissimilar to the UK's Highway Code; however, the other parts are specifically tailored to prepare learners for life as a solo driver. The handbook stresses the importance of learners having the right structure for their practice as it is believed that this will help to ensure that they really are ready to drive solo by the time they take their practical driving test. The handbook advocates four stages that need to be worked through as a learner in order to become a safe solo driver:
- **Stage 1** is solely about controlling the car. It is believed to be the shortest stage, and aims to enable drivers to start, stop and steer safely in a quiet area without traffic (i.e. vehicle manoeuvring- the lowest level of the GDE matrix- Figure 4-1 in Section 0).
 - **Stage 2** is about applying new car-control skills and looking out for other road users on quiet roads with little traffic.
 - **Stage 3**, it is advised, takes longer and uses both Stages 1 and 2 skills on busier roads and in more difficult driving situations. This is the point at which it is believed that learners start becoming real drivers, because they learn to deal with traffic and other hazards and become safe in varied driving situations.

- **Stage 4** can be the longest stage. It involves learners driving as if they are a solo driver (i.e. engaging in independent driving). Whilst they still have their L-plates on the car and a supervising driver beside them, they are encouraged to learn to make most of the driving decisions themselves. The aim is to build up lots of different experiences where they act like a solo driver so that when they are exposed to the road on their own, they will be ready.
- 5.66 All of the stages are discussed in more depth in a second publication by VicRoads (Guide for Learners - Learner kit, VicRoads, 2007). Stage 4, engaging in independent driving, will be discussed further at this point as it would be possible to translate this into the UK testing protocol.
- 5.67 In this final stage of the learning-to-drive process, the idea is that learner drivers use their cars as if they are already a solo driver – the only difference being that they will still have their supervising driver sitting beside them. However, the supervising drivers' role changes and is now more of a passenger. They can still offer advice and suggestions and will help learners to look for potential hazards, but most of the responsibility and decision making belongs to the learner. By the end of this stage, learner drivers are expected to be ready to drive safely as a solo driver in a broad range of conditions.
- 5.68 Table 5-2 shows the goals used while rehearsing solo driving and could be taken into consideration in the development of an independent driving element in the UK testing procedure.

Table 5-2: Goals in rehearsing solo driving

Goals
Drive safely in light and heavy traffic
Detect and respond to hazards
Keep a safe distance from other cars
Choose safe and legal speeds
Leave a safe gap when turning across other traffic
Drive safely on a variety of road types in different conditions
Choose your own driving routes to get from your starting point to your destination
Drive safely without help from your supervising driver
Make safe decisions about driving, i.e. when to drive and when not to, and taking safe routes
Handle unexpected situations safely
Understand how to use a car safely as part of normal, every day transport
Manage moderate levels of distractions in the car, such as passengers and music and know how to reduce distractions to stay safe
Handle complex tasks such as merging on a freeway (UK motorway), reversing from a driveway, parallel parking and changing lanes in busy areas, hook turns (UK U-turns) and busy intersections.

Source: VicRoads Guide for Learners (2007)

- 5.69 In terms of achieving the goals highlighted in Table 5-2, VicRoads suggested that learner drivers should take their time getting to this stage, as it will not work without the contribution of the preceding stages. Other suggestions made to help learner drivers accomplish the above goals include becoming the family driver to give the learner more opportunity to practise (and get used to practising with passengers in the car). It is also recommended that learner drivers are proactive about their ongoing needs, for example, they should arrange extra practice sessions around areas which they have little experience in (e.g. asking for extra practice in wet weather or on rural roads).
- 5.70 Contact was made with VicRoads to establish how the guides were developed and whether any evaluations have been conducted to examine their effectiveness. VicRoads advised that the Learner Kit (including the Guide for Learners, Learner Logbook, and the Guide for Supervising Drivers) was published as part of the introduction for Victoria's new Graduated Licensing System and has only been available since the 1st July 2007. The development of the resource involved several road safety experts engaged by VicRoads and also testing with groups of learners and parents. VicRoads reported that while an evaluation of the whole GLS is planned, a specific evaluation of the Learner Kit is not planned.

The Western Australian Practical Licensing Test

- 5.71 The Western Australian practical licensing test was introduced in 2001 and aims to discriminate between candidates rather than on drivers' ability to perform driving sub-tasks (Drummond, 2002). With emphasis being placed on integration of vehicle manoeuvring and higher order skills, it is claimed to be difficult for novices to pass without substantial practice. Part of the assessment requires candidates to make their own decisions in typical driving situations rather than following instructions so that specific performance criteria can be assessed at a pre-determined point on a set route as this is what candidates would be expected to do as solo drivers.
- 5.72 The test itself is divided into seven sections and lasts for approximately 45 minutes. Four of the test sections involve point-to-point driving where the candidate follows broad directions from the examiner. The remaining three sections require the test candidates to make decisions on the best way to complete certain exercises after they have been explained by the examiner. The exercises combine two low speed manoeuvres into an every day driving situation (such as "I've left something behind" and "stopping for shopping"). The assessment measures are as follows:
- **Flow:** how well candidates combine driving skills
 - **Movement:** how smoothly the candidates drive the car (forwards or backwards), and how well they manage speed.
 - **Path:** whether the candidate selects the most appropriate road position for the manoeuvre they want to do.
 - **Responsiveness:** whether the candidate notices and responds to hazards in an appropriate way.
 - **Look behind:** whether the candidates use mirrors and head-checks to interact safely with other traffic.
 - **Signal:** whether the candidate signals their intentions to turn.
 - **Vehicle management:** assessment of important tasks that the candidates should be doing before and during the test.
 - No scientific evaluations of this test have come to light during this literature review.

DSA trial drive

- 5.73 At the time of writing, DSA is about to pilot a practical driving test which includes an independent driving task where learner drivers are taken through an on-road event lasting approximately 35 minutes. They will be asked to complete a research questionnaire about various elements of the drive. The learners will use their instructor's car for the session. A BSM or AA instructor will act as the accompanying driver, with a DSA staff member in the rear seat of the vehicle providing the information required to enable the learner to complete the new tasks. The trial includes three different forms of independent driving (one of these being linked with making a special manoeuvre). Also included are two occasions where the learners' situational judgement is tested (i.e. one 'pre' traffic situation and one 'post' traffic situation). Once the on-road drive has taken place, both the instructor and the learner driver complete a questionnaire on their experience.

- 5.74 In terms of the independent driving element, the intention is to explore three options:
- following signs/road markings to a specific destination
 - following a verbal set of directions to a specific destination
 - combining independent driving with a special manoeuvre
- 5.75 The proposed instructions for the independent driving are as follows:
- *"For a short period of time follow information from road markings and traffic signs to a destination (such as follow all the road markings and direction signs to 'a location')"*
 - *"Follow a short series of verbal directions (between 3 – 5) given to you in a way that will be similar to those you would get from someone you had asked for directions (such as can you tell me where the hospital is?)"*
 - *"Within a pre-determined road turn your car around to go back in the opposite direction. This will be like a situation where you had lost your way and needed to re-trace your steps. It will be up to you **how, where and when** you turn the car around"*

Initial Driver Training, Belgium

- 5.76 One example of questionable driver training that emerged in the literature searches was the Belgian Initial Driver Training System. In 1992, a reform of the driver training system was introduced in Belgium, whereby four different options for obtaining a Category B driving licence were available. The most popular of these options was the prescription of at least 20 hours of professional tuition, and then based on certification from the driving school, authorisation to drive unaccompanied for up to six months prior to taking their practical driving test. This option was chosen by approximately 60,000 drivers in 2005 (GOCA, cited in SUPREME).
- 5.77 In 2006, the driver training system was reformed again to encourage more driving experience among learner drivers. The new system again requires a minimum of 20 hours of professional training. However, this time, learner drivers are allowed to drive unaccompanied for up to 18 months before taking their practical driving test. Restrictions are in place which state that learners (who are of at least 18 years of age and who have taken at least 20 hours of professional tuition) may carry one passenger (who must be at least 24 years of age and in possession of a category B licence). One further restriction that applies is that 'solo learners' are not allowed to drive at night on weekends or at night on national holidays.
- 5.78 One evaluation of the Belgian system was identified; this was conducted by the Institut Belge pour la Sécurité Routière (ISBR) in 2000. This evaluation related to the previous six-month solo driving system. The results of the evaluation were of limited use owing to "small" numbers in the research population. However, the findings were indicative of higher accident involvement and higher numbers of traffic offences by solo learner drivers who took the initial driver training option than those who had followed other training options. In terms of pass rates, pass rates for drivers who took the initial training were barely any different from those drivers who had followed other training options.

- 5.79 There is no reliable evidence, in Belgium or elsewhere, to suggest that solo driving amongst learner drivers is safe. The inclusion of solo driving prior to licensure would seem to be inconsistent with the concept of accumulating driving experience in safe circumstances. From other countries, we know that the initial period straight after licensure, when unsupervised driving is allowed, is extremely high risk, therefore, letting even less experienced young people drive unsupervised would seem likely to have negative consequences.

Other methods to smooth the gradient

- 5.80 This sub-section discusses other attempts to train and assess learners' ability to drive independently which were identified in the literature.

Accompanied driving

- 5.81 Findings from a recent CIECA report suggest that private practice with friends or relatives is likely to complement driving school training because it implements what has been learned in driving lessons in a more natural and functional context such as driving to the local shops (CIECA, 2007). Increasingly in Europe, high levels of practice are recognised as a requirement for reaching higher cognitive skill levels. Private practice as a means of preparation for the driving test is allowed in many countries; however, very few European countries actively encourage high levels of practice (Twisk and Stacey, 2007). A CIECA review (cited in Twisk and Stacey, 2007) showed that accompanied driving is allowed in 15 of the 27 EU countries, but that, in general, it is not a popular option (Twisk and Stacey, 2007). Some GDL systems in the USA and elsewhere do require specified minimum amounts of pre-test practice.
- 5.82 The role of accompanied driving is to enable novice drivers to gain practical driving experience in comparatively safe conditions. Parents offer one such mechanism for encouraging the safe development of independent driving ability. Parents can take a dual role in this process: they may be an accompanying driver during the learning phase and they may place restrictions on the circumstances under which independent driving is permitted after licensure. Parents as accompanying drivers have an opportunity to oversee safe driving but allow for learners to make independent decisions.
- 5.83 The effects of accompanied driving practice have been investigated in three European countries. The findings of these investigations produced mixed results. In Sweden, promotion of private practice began in 1993 by reducing the minimum age for accompanied driving by learner drivers from 17.5 years of age to 16 years of age; however, the age for solo driving remained at 18 years of age. The result of this move led to an increase in the mean number of hours of accompanied driving accomplished before licensing (from mean = 47.6 hours before the change to mean = 117.6 hours after). The results of this study show that compared to a pre-reform period, the accident reduction after the reform was approximately 40% for those who utilised the extended training period. Drivers who actively engaged in prolonged training were shown to benefit from the reform whereas those who did not use the longer driver training period did not benefit. Across the whole novice driver population (i.e. users and non-users taken together) the driver training reform was estimated to have reduced the accident risk for young novice drivers by approximately 15% during a follow-up period of 2 years.

- 5.84 Norway also reduced the minimum age for driver training from 17 to 16; however, unlike the Swedish system the Norwegian changes did not result in a reduction in crashes for new drivers (Sagberg, 2000). In terms of the amount of driving done, the change in Norway led to an increase of 106km of practice per learner, compared to a much larger 1962km in Sweden. Despite much less accompanied driving taking place in Norway than in Sweden, Norwegian drivers who engaged in accompanied driving had a lower crash rate than those in Sweden. When it comes to the question of how much practice is actually needed in terms of time or kilometres, it has been tentatively concluded that between 5000 and 7000 km are enough for a significant reduction in post-test crashes (Sagberg, 2002).
- 5.85 In France in 1989, a scheme was implemented whereby the age for driver training was lowered from 18 to 16, but the age for licensing was retained at 18 (Baughan and Simpson, 2002). The scheme is known as l'Apprentissage Anticipe de la Conduite (AAC). Under it, people who wish to begin at 16 must sign a contract between themselves, an accompanying driver, and a driving school. Successful participants can obtain reductions in their insurance premiums. The training consists of:
- Completion of compulsory training in a driving school (20 hours) and a theory test.
 - Supervised driving - no restrictions except a speed restriction and must display 'AAC' on the back of the vehicle. During this period they must drive at least 3000 km, and the learner and accompanying driver must attend two sessions at a driving school.
 - Practical test for driving licence may be taken from age 18.
- 5.86 Learners may choose to learn under the traditional system, which permits them to start learning at 18 and requires the same 20 hours of compulsory training in a driving school. A practical and theory test must then be passed to obtain a full driving licence.
- 5.87 In their 2005 review of GDL systems, Baughan and Simpson reported that about 25 per cent of young learners in France opt for the AAC system. Early reports were of 70 per cent reductions in accident rates, implying that the problem of novice driver accidents was greatly reduced for those who used the system (Fafet, 1990). Later studies (Belloc and Ivaldi, 1990; Page, 1995) did not show such a reduction, but methodological difficulties mean that it is not possible to draw definite conclusions about the apparently contradictory findings. It appears that initially only 5-10 per cent of learners chose to use the new system, and this self-selected sample were more likely to benefit from the system and perhaps more likely to drive safely even without it. Chatenet and Leroux (1999) undertook a qualitative evaluation of the system, interviewing learners, their parents, trainers, examiners, insurance companies and others. Their findings indicated that the parents of the early AAC participants tended to be people who valued the system because of its safety and educational benefits. Nowadays, different groups of parents and learners, more interested in reducing their insurance premiums, tend to use the scheme. Chatenet and Leroux suggested that as well as being less strongly motivated by safety, these groups may be more likely to pass on undesirable behaviours such as speeding to their children.
- 5.88 An evaluation of the French system on the basis of insurance data (Page, Ouimet and Cuny, 2004), showed that contrary to predictions, the accompanied driving group did not have better crash rates in the two years following licensing than traditionally trained drivers. Reasons that the authors suggest to explain this

pattern include accompanied drivers not gaining adequate experience during their formal training and/or that the driving experience did not involve more complex driving situations. The study found that trips undertaken during accompanied practice were more standard (such as shopping trips), whereas in more complex situations, the driving task was taken over by the supervisor (Page, Ouimet and Cuny, 2004).

- 5.89 It is important to note that all the research in Sweden, Norway and France adequately controlled for other factors when assessing accident reduction, suggesting that the research findings are robust.
- 5.90 As such, Sweden can be seen as something of a success story. Based on the findings from the studies discussed above, the OECD and ECMT group (2006) concluded that high levels of accompanied practice before licensing for solo driving, conducted in a methodical manner that involves a variety of driving circumstances, will result in lower levels of fatalities. In terms of time spent, they recommended at least 50 hours of pre-test practice. However, as demonstrated in Sweden, increasing the number of pre-licence hours to approximately 120 resulted in crashes in the two years following licensing falling by approximately 40% for those taking part in the new scheme and 15% when taken across the whole novice driver population.
- 5.91 The Swedish study referred to above (Gregersen et al, 2003) indicates a substantial reduction in post test accident liability associated with an increase in pre-test experience with parents or instructors. However, a recent review of the international literature (Simons-Morton and Ouimet, 2006) found little other evidence of a beneficial effect of parental supervision and concluded that overall the evidence is currently inconclusive. This conclusion merits further examination, since most of the studies cited appear not to have investigated the effects of actual changes in amounts of parental supervision. Instead they appear to have investigated relationships between amounts of supervised experience that learners choose to accumulate and their subsequent accident rates; this is a research design that cannot show the benefits of increased supervised experience.
- 5.92 Even though little was known about the way in which parents performed as accompanying drivers, there was enough feedback from study participants in the reviewed literature to suggest that much 'team driving' was occurring, with parents taking on an observational role (Simons-Morton and Ouimet, 2006). Some post-test experiences of newly qualified drivers indicated that once they had become independent they actually found it more difficult to check blind spots because of their prior reliance on an accompanying parent. Whilst there is scope to develop a useful role for parents, evidence is required regarding the most effective way in which to provide accompanying support or manage post-test independent driving.

Multi-phase training models

- 5.93 Initial training and practice is not likely provide novices with extensive experience of the full range of situations regularly faced by drivers (Twisk and Stacey, 2007). For this reason, an advanced training module is often seen as beneficial for dealing with specific situations such as emergency braking, or for refresher training on knowledge about safety behaviour. Austria, Finland and Luxembourg all currently use two-phase licensing models where preliminary licensing is followed by a period of independent driving under 'learner status' before a final period of training (an overview of the Austrian two-phase system can be seen in

Appendix B). These two-phase models allow the separation of basic driving skills from higher level GDE tasks. Teaching of higher level tasks is thought to be improved because learners gain experiences of driving independently which can be used as a reference point for further development during the second phase of advanced training. This permits the teaching of independent driving skills, as outlined in the German 'Curricular guidelines for practical training for car drivers' (Bundesvereinigung der Fahrlehrerverbände, 1993, cited by Hatakka, et al. (2004). Evaluation studies in several European countries (e.g. NovEV, 2002) have confirmed earlier findings (e.g. Glad, 1988; Gregersen, 1996) that these multiphase training courses can be counter-productive if they focus on vehicle skills rather than higher order skills.

Graduated Licensing

5.94 Graduated Driver Licensing (GDL) systems are a more controlled option for managing post-test independent driving. A key element of GDL is to place restrictions on early solo driving (e.g. via passenger restrictions and driving curfews or via increased penalties for driving violations). However, in this context, the licensing system is being used to exert supervisory control over independent driving; it is not an overt attempt to train or assess the ability to drive independently prior to full licensure. The GDL system assumes that independent driving skills are developed autonomously, and can be safely developed during graduated exposure. Some GDL systems also include pre-solo components that may improve independent driving (Baughan & Simpson, 2005). Such components include:

1. Extending the pre-solo learning phase, by:
 - delaying the solo licensing age;
 - reducing the age at which people can learn to drive (e.g. Sweden, see Section 0); and
 - introducing minimum learning period.
2. Increasing training quality and/quality.

6 Drivers' Perceptions

Summary of Section 6

- Drivers' perceptions of the driving test suggest that the way in which people drive for the driving test is not representative of real life driving. There are indications from qualitative research in Britain that new drivers felt that practice of driving in real life situations as would be covered by independent driving training would have been a valuable part of the learning-to-drive experience.

6.1 One of the research specifications for this review was to include any available feedback from drivers in terms of their perceptions of the practical driving test. Examples of drivers' perceptions were found in a report for DfT (Christmas, 2007). This qualitative study sought to investigate the impact of young peoples' attitudes and mindsets on their driving and the possible implications for interventions to improve road safety among this group. Fifty five drivers aged

between 17 and 25 took part in two workshops, each lasting two hours and involving a range of activities.

6.2 Participants were recruited to ensure a mix of age, sex, social class, and ethnicity; however, there is no indication of how long they had held a licence, and as such, the findings of this study cannot be linked with experience. The main aims of the study were to understand:

- How young people experience the learning process,
- What they think its goal (i.e. *good* driving) looks like, and
- What the implications of these are for driver behaviour.

6.3 Analysis of individuals' definitions of a good driver revealed a simple structure behind the collective definitions. Namely, being a good driver was seen to involve the mastery of three different and parallel activities:

- Driving as a physical activity- i.e. safely controlled and guiding a physical object through a complex physical environment
- Driving as a social activity- i.e. operating in a shared space in a way that ensures that everyone is kept happy
- Driving as an emotional activity- i.e. preserving an appropriate frame of mind to drive well in the face of distraction and annoyance.

6.4 The study also explored the role of the driving test in becoming a good driver. The results of this part of the study showed that participants were sceptical about the relevance of passing the practical driving test in relation to being a good driver. This scepticism stemmed from the participants' views that the kind of driving behaviour required in the practical driving test fails to correspond with the real requirements of good driving,

"The test isn't the true way of driving"

Male, 20 years of age.

6.5 This perception of the test being disconnected from the realities of driving was also reinforced by the view that the learning experience leading up to it does not address real enough situations. It is believed that introduction of an independent driving element may enhance the likelihood of dealing with real situations- an example of which can be seen in the following quote:

"Our ideal learning situations would focus on realistic situations like going into a car park and going up the spiral. I remember the first time, thinking: do I go round in first? More realistic situations would be good, rather than tootling round the same old roads, and reversing round the corner."

Female, 19 years of age.

6.6 There is scope to integrate a situation like the one described above into the current protocols for both training and testing in the UK. Participants in the study not only thought that the learning experience leading up to the test was limited; they also thought that the actual nature of the assessment itself (i.e. a single, time-limited test) was inadequate. This was thought to be as a result of the participants being from generation accustomed to producing GCSE coursework and taking modular assessments; this notion was supported with the following quote:

"Rather than tick, tick, tick, just driving around and generally being evaluated, rather than just sitting there doing the points, ticking off a piece of paper and

then you fail, the whole learning process should be part of it. They should look at how aware you are."

Male, 21 years of age.

- 6.7 A number of participants in the study came to the conclusion that passing the practical driving test was not a guarantee of becoming a competent driver, some reporting that it was possible to 'fluke' through the driving test:

"I think people are getting passed too quickly. My sister only learned for three months. She's so impractical. When she got in the car afterwards she couldn't drive. It was like she was still learning. Me and my mum had to go out with her every night."

Female, 19 years of age.

- 6.8 Quotes like the one above suggest that young drivers are aware that not enough experience is being gained and that this has implications for independent driving.
- 6.9 This study provided direct feedback from drivers themselves in terms of the current testing protocol. It concluded that the cause of road safety is not served well while there are young people who consider the driving test and rules to lack credibility. No real solution was suggested to change this perception; however, possible improvements to the current testing protocol (raised by the drivers themselves) included the incorporation of an extended and more realistic range of experiences.
- 6.10 A small scale exploratory study involving semi-structured interviews with 16 novice drivers investigated how learner drivers decide when to take their first driving test (Baughan et al, 2005a). One possibility of interest to the researchers was that learners might report coming for test before they really felt ready, in an attempt to minimise the total cost of learning to drive. In fact, participants tended to say that they did not come for test until they felt ready, but this readiness was not seen as giving them a particularly high probability of passing. Instead, chance events during the test, perceived idiosyncrasies of the examiners and other factors were thought to intervene, such that learners felt that they had relatively little control over whether they passed. As the authors pointed out, if this finding is a general one, it suggests that it may be rather difficult to persuade learners to increase the amount of training and practice they accumulate pre-test (since they do not think this will greatly affect their chances of passing).

7 Summary

- 7.1 Novice (especially young novice) drivers have high accident rates. Research has shown that newly qualified drivers have difficulty coping concurrently with vehicle handling and higher order skills, both of which are crucial parts of safe vehicle operation. Increased training in basic driving skills has not been found to reduce novice driver accident rates; this suggests that a shift in the direction of driver training is needed. Several EU-funded projects have investigated developing the higher order skills content in driver training and concluded that the proportion of training spent covering these skills should be increased. In addition, a sample of newly qualified drivers suggested that 'real life' driving situations would have been a useful part of their pre-test training because they felt unprepared for certain situations they faced as solo drivers. Findings from the Cohort II study support this, showing gaps in the self reported experience and skills of novice drivers. A further EC funded project and two follow-up CIECA projects have considered how 'higher order' skills could be covered in driving tests, and several countries are now working to introduce such elements into training and testing.
- 7.2 The transition to solo driving poses new (external) challenges to the novice driver, including:
- overcoming limited experience of situations such as night-time driving, driving in adverse weather conditions and different road types (e.g. motorways);
 - having to cope alone with road and traffic situations and to navigate independently – which involves the higher order cognitive processes involved in decision making and which may impose a high workload on drivers who are still relatively inexperienced at the basic control skills
 - being free of supervisory control and therefore (a) more susceptible to influences from journey and personal goals and characteristics, and (b) dependent on self-evaluation rather than on feedback from the instructor or supervising driver.
- 7.3 One way to improve pre-test experience is to encourage or require learner drivers to build up specified numbers of hours of driving before coming for test. For example, VicRoads in Australia targets experience factors by specifying that in order to be eligible for testing, learners must have had at least 10 hours of night driving practice. There are recommendations in the research literature that at least 50 hours of pre-test practice should be taken and this has been taken up in a number of licensing systems worldwide. Some countries have extended the pre-test learner period in order to extend the quantity and diversity of 'protected experience' available to learner drivers. Sweden, for example, reduced its novice driver accident rates across the whole novice population by 15% by extending its pre-test training period which increased the number of pre-licence hours to an average of approximately 120
- 7.4 To improve learner drivers' ability to cope with the extra tasks and lack of supervision inherent in solo driving, independent driving has been introduced into the driver training systems in several countries (e.g. Norway, the Netherlands and parts of Australia). Norway's driver training curriculum requires lessons on independent driving, which are typically long drives, with minimal instructor involvement. Since these drives are a relatively recent addition, no scientific evaluations have yet been conducted to assess their effectiveness.
- 7.5 Several countries incorporate independent driving into their practical testing to some degree (e.g. Western Australia, Spain, France, Sweden and Austria). Only the new practical driving test in the Netherlands dedicates a significant proportion

of time to the specific assessment of independent driving skills. Pilot studies of the new Dutch practical driving test have produced encouraging results; on the basis of a practical driving test and instructor, candidate and examiner evaluation forms, independent driving was reported to be of "great value for the driving test as well as for the training of novice drivers" (Vissers, et al., 2007). Larger scale studies would be needed to provide robust scientific evidence of effects on accident liability.

- 7.6 Applying independent driving within the practical driving test forces candidates to demonstrate higher levels of driving performance than they would in a standard driving test. It would also encourage practice of independent driving in preparation for the test as well as giving candidates more opportunities to demonstrate 'productive' driving behaviour by making their own choices in traffic and increasing awareness of other traffic participants and the traffic environment. Independent driving elements can be beneficial for examiners as they provide greater insight into the way candidates handle traffic situations and allow demonstration of how candidates work through the cognitive processes involved in driving, and how they respond to changes in driving situations.

8 Conclusions and recommendations on independent driving

- 8.1 The present review has identified opportunities which have the potential to reduce novice driver accident rates through improvements to the UK training/testing protocols. The ideas are largely fairly new and have not yet been widely implemented. The overall conclusions and recommendations are listed in the box below.

Conclusions and recommendations on independent driving

- Giving more emphasis to independent driving in driver training should help address some of the challenges that novice drivers face in the early period of post test driving.
- Including elements of independent driving in the driving test should encourage instructors and learners to take such training seriously.
- It should also give examiners new opportunities to observe more 'typical' driving behaviour, and thereby to reach a more robust assessment of competence.
- Several countries incorporate independent driving into their practical testing to some degree (e.g. Western Australia, Spain, France, Sweden and Austria).
- The new practical driving test in the Netherlands dedicates a significant proportion of time to the specific assessment of independent driving skills.
- It will be important to monitor closely results from any future studies of improved driver training and testing to provide robust evidence on the benefits of these developments.
- Further consideration of what constitutes an assessment of independent driving is warranted, given that pre-test restrictions mean that learner drivers are not permitted to actually drive on their own until after licensure.
- In terms of the feasibility of introducing an independent driving element into the UK training and testing protocol, based on the evidence found here the next logical step is to pilot the independent driving element, as planned in the DSA prototype drive.
- It will be vital that the prototype drive is fully evaluated to establish the benefit, or otherwise, of independent driving elements.
- Both short- and long-term evaluation measures will need to be used. The short-term impact on driving could be assessed using questionnaires and interviews (completed by learners, driving instructors and examiners).
- It is only in the longer-term, and through wide-scale studies, that any effect on novice driver accident rates will be visible.

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Appendix A Driving components from the 1991 McKenna et al. study

The components to be judged were as follows:

- overtaking
- paying attention to, and being aware of other vehicles on the road
- reversing
- parking
- changing traffic lanes
- three-point turns
- at give way signs, turning right across heavy traffic
- hill starts
- judging stopping distances for appropriate speeds and road conditions
- paying attention to road signs
- moving onto motorways
- leaving motorways
- changing driving to suit wet/icy or foggy conditions
- changing lanes on motorways
- judging the correct speed for bends/corners
- judging the width of vehicles
- giving cyclists/horse riders sufficient clearance
- driving in busy town traffic
- navigating in unfamiliar areas whilst driving
- driving at appropriate speeds for the road conditions present

Appendix B Austrian two-phase training

Austrian two-phase training was made obligatory in January 2003. IT is a modular system comprised of three parts:

- Two on-road feedback drives (one before and one after track training)
- Track training on a closed track
- A psychological group discussion

An evaluation as part of the EU-NovEv project (REF) was based on three levels: a process evaluation for both trainers and participants with regard to the track training and the group discussion, a wide scale survey concerning driving attitudes, beliefs and other self-reported data and statistical data from a file of the Central Licence Register concerning all novice drivers in Austria. The predominant collection method was the usage of questionnaires.

Results showed that novice drivers who completed at least two modules of the multiphase system were generally satisfied with the whole measurement (although it is obligatory). This suggests high acceptance of the multiphase system in Austria. For the track training day, most participants mainly expect to learn to master risky situations better. Also the practical part of the track training day was assessed as most applicable for every day driving. Furthermore, the results show a different view on the importance of several skills between instructors and participants: for example, the ability to correct a skidding car was rated significantly more relevant for real traffic for novice drivers than for instructors, although all skills were considered as very important for safe driving. Nevertheless, it can be concluded that participants may have received a counterproductive message concerning traffic safety during the track training, i.e. that safe driving is based on manoeuvring skills rather than on an anticipatory driving style.

The results of this large scale survey show that the reduction in practical and theoretical hours of standard education did not have a statistical significant influence on the pass-rates (number of attempts) of the driving exam, either for the theoretical test or for the practical test. No big differences were found between standard-educated and multiphase-educated novice drivers concerning self assessment of driving style and driving behaviour, offences or accidents. The only differences occurred regarding females: they described themselves as more careful drivers and reported fewer speeding offences.

Literature review: independent driving in the driver training and on-road assessment protocols – building an evidence base



The excess accident liability of newly qualified drivers is a widely recognised problem. Accident rates are highest in the first few months of (independent) driving after passing the practical driving test, after which they decrease during the remainder of the first 12 months and beyond. Independent driving has previously been defined as “candidates making a responsible choice based on their own abilities and the requirements of the task”. The research literature is reviewed with the aim of providing the Driving Standards Agency (DSA) with an evidence base on which to inform policy decisions regarding the implementation of an independent driving element into the UK training and testing protocol. The literature show that some of the challenges facing solo drivers include poor opportunity for feedback, involvement in a variety of traffic conditions, different driving manoeuvres, unexpected actions of other drivers, different types of roads and distraction. The findings from this review suggest that giving more emphasis to independent driving in driver training and testing may help address some of the challenges that novice drivers face in the early period of post test driving. Including elements of independent driving in the driving test should give examiners new opportunities to observe more “typical” driving behaviour, and thereby to reach a more robust assessment of competence.

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