

Synthesis title:

Older Drivers

Category: Drivers



Other Relevant Topics:

- ▶ Fitness to Drive
- ▶ Mobility Impaired
- ▶ Eyesight and Driving
- ▶ Training
- ▶ Advanced Vehicle Systems

Keywords:

Older drivers,
Legislation,
Assessments, Training,
Self-regulation,
Decline, Cognitive,
Sensory,
Psychomotor

About the Road Safety Observatory

The Road Safety Observatory aims to provide free and easy access to independent road safety research and information for anyone working in road safety and for members of the public. It provides summaries and reviews of research on a wide range of road safety issues, along with links to original road safety research reports.

The Road Safety Observatory was created as consultations with relevant parties uncovered a strong demand for easier access to road safety research and information in a format that can be understood by both the public and professionals. This is important for identifying the casualty reduction benefits of different interventions, covering engineering programmes on infrastructure and vehicles, educational material, enforcement and the development of new policy measures.

The Road Safety Observatory was designed and developed by an Independent Programme Board consisting of key road safety organisations, including:

- ▶ Department for Transport
- ▶ The Royal Society for the Prevention of Accidents (RoSPA)
- ▶ Road Safety GB
- ▶ Parliamentary Advisory Council for Transport Safety (PACTS)
- ▶ RoadSafe
- ▶ RAC Foundation

By bringing together many of the key road safety governmental and non-governmental organisations, the Observatory hopes to provide one coherent view of key road safety evidence.

The Observatory originally existed as a standalone website, but is now an information hub on the RoSPA website which we hope makes it easy for anyone to access comprehensive reviews of road safety topics.

All of the research reviews produced for the original Road Safety Observatory were submitted to an Evidence Review Panel (which was independent of the programme Board), which reviewed and approved all the research material before it was published to ensure that the Key Facts, Summaries and Research Findings truly reflected the messages in underlying research, including where there may have been contradictions. The Panel also ensured that the papers were free from bias and independent of Government policies or the policies of the individual organisations on the Programme Board.

The Programme Board is not liable for the content of these reviews. The reviews are intended to be free from bias and independent of Government policies and the policies of the individual organisations on the Programme Board. Therefore, they may not always represent the views of all the individual organisations that comprise the Programme Board.

Please be aware that the Road Safety Observatory is not currently being updated; the research and information you will read throughout this paper has not been updated since 2017. If you have any enquiries about the Road Safety Observatory or road safety in general, please contact help@rospa.com or call **0121 248 2000**.

How do I use this paper?

This paper consists of an extensive evidence review of key research and information around a key road safety topic. The paper is split into sections to make it easy to find the level of detail you require. The sections are as follows:

Key Facts	A small number of bullet points providing the key facts about the topic, extracted from the findings of the full research review.
Summary	A short discussion of the key aspects of the topic to be aware of, research findings from the review, and how any pertinent issues can be tackled.
Methodology	A description of how the review was put together, including the dates during which the research was compiled, the search terms used to find relevant research papers, and the selection criteria used.
Key Statistics	A range of the most important figures surrounding the topic.
Research Findings	A large number of summaries of key research findings, split into relevant subtopics.
References	A list of all the research reports on which the review has been based. It includes the title, author(s), date, methodology, objectives and key findings of each report, plus a hyperlink to the report itself on its external website.

The programme board would like to extend its warm thanks and appreciation to the many people who contributed to the development of the project, including the individuals and organisations who participated in the initial consultations in 2010.

Key facts

- In Europe, the number of people aged over 65 is projected to double between 2010 and 2050 (Lanzieri, 2011).
- According to National Travel Survey data, the percentage of people aged 70+ holding a full car driving licence has increased from 38% in 1995/97 to 58% in 2012. This increase is particularly notable for women, as the number of female licence holders aged 70+ has doubled, from 21% in 1995/97 to 42% in 2012 (Department for Transport, 2013b).
- Ageing brings a number of sensory, psychomotor and cognitive changes that may impact driving performance and safety.
- In order to increase safety for older drivers, many countries have introduced some form of age-related controls for relicensing procedures. However, to date, there is no conclusive evidence that age-related controls are effective at reducing risk for older drivers.
- Mobility is important for sustained independence and well-being (Whelan, Langford, Oxley, Koppel & Charlton 2006; Box, Gandolfi & Mitchell, 2010) and, unsurprisingly, imposed driving cessation may also lead to negative psychological consequences.
- Of driver casualties in the UK, of drivers aged 70 and over who were involved in a KSI road traffic accident, 13% were killed. The corresponding figures for male and female drivers of this age group were 15% and 12%, respectively. This fatality rate is the highest for all age groups (RRCGB, DfT, 2017).
- Although older drivers are overrepresented in deaths following a car crash, this is mostly due to increased fragility.
- In fact, accident involvement for older drivers is generally low. If the rate of slight injury is used as a proxy for accident involvement it can be suggested that, when compared with young and middle age groups, accident involvement is lowest for drivers aged 60-79, and only increases by 20% for drivers 80 and older (Mitchell, 2013).
- Although being older presents potential risks to driving, research has shown that older drivers are good at compensating for their deficits, and tend to adopt safer attitudes toward driving and reduce their exposure to difficult driving environments.
- Research has identified potential interventions to help minimise the risk to older drivers. These include: cognitive training, in vehicle design and Intelligent Transport Systems.

Summary

- The world population is ageing. Current projections show that in Europe, the ratio of the number of people aged over 65 to the population aged 15-64 is projected to double between 2010 and 2050 (Lanzieri, 2011).
- Not only is the population increasing, but it is also increasingly heterogeneous; diverse lifestyles, health, education, and expectations of retired life mean that people are maintaining high levels of mobility for longer.
- There are a number of key sensory, psychomotor and cognitive functions that decline with age, and research has found relationships between a number of skills considered important for driving safely and functional decline (For example, Janke, 1994 for a review; Horswill, Anstey, Hatherly & Wood, 2010; Selander, Lee, Johansson & Falkmer, 2011).
- Older drivers as a whole are generally safer than younger age groups as they are more experienced and tend to compensate for functional impairment. In fact, accident involvement is at its lowest rate for drivers aged 70-79, and only increases 20% for drivers aged 80 and over (Mitchell, 2013). This, however, may be due to increased risk resulting from the decrease in miles driven for the older old, also known as the 'low mileage bias'.
- The 'low mileage bias' shows that independent of age, drivers who travel more kilometres tend to have lower crash rates (per km) than those driving fewer kilometres. As this effect is apparent for drivers of all ages, some authors have argued that crash rates based only on distance travelled may be invalid (Langford, Methorst, & Hakamies-Blomqvist, 2006).
- Older drivers may be safer on the roads, but increased fragility with age means that they are more likely to die from injuries sustained in an accident than their younger counterparts. According to data from the Department for Transport, drivers aged 60-69 had an average of 18.8 KSI casualties per billion miles driven. This number significantly increases to 56.7 KSI casualties for drivers 70 and older (DfT, 2013a).
- Research has shown that older drivers tend to be overrepresented in intersection or right of way crashes; the proportion accidents that are right of way accidents increases with driver age when compared to other age groups (Clarke, Ward, Truman & Bartle, 2009; Clarke, Ward, Bartle & Truman, 2010). This may be due to higher order problems with hazard perception (Horswill, Anstey, Hatherly & Wood, 2010) or allocation of attention (Lopez-Ramon, Castro, Roca, Ledesma, & Lupiañez, 2011), or may be simply due to reduced neck flexibility and mobility (Reed, Kinnear & Weaver, 2012)

- Technology can be used to increase safety, ease and comfort for older drivers. Intelligent Transport Systems (ITS), including in-vehicle navigation systems (tools that use geographical information to give feedback and support to drivers) can provide older drivers with increased confidence, and potentially deter them from undertaking more risky behaviours such as reading notes while driving (Emmerson, Guo, Blythe, Namdeo & Edwards, 2013).
- Cognitive and physical training have also been explored as measures to improve older people's driving skills. Cognitive training seems to show more promise as studies have attempted to relate the training back to the driving task and have involved large numbers of participants. On the other hand, evaluation of exercise programs tends to be based on other functional measures to show progress; therefore benefits to driving may only be indirect (Ross, Schmidt & Ball, 2012).
- Opinions on the effectiveness of educational interventions are relatively mixed, though this is likely to be due to the large diversity of educational interventions available (Ross et al., 2012). This said, there is some evidence that education, when used in parallel to other forms of intervention such as on-road training, may be effective in reducing risk (Bédard, Porter, Marshall, Isherwood, Riendeau, Weaver, Tuokko, Molnar & Miller-Polgar, 2008).
- As no single intervention is likely to reduce risk for all drivers, to a large extent safety depends on older drivers' own awareness of their visual, motor and cognitive impairments, and on their ability to self-regulate their driving accordingly.
- A number of studies have demonstrated that older drivers tend to be sensitive to the effects of ageing on driving performance, and that they learn to adjust their driving patterns to limit their exposure to difficult or threatening situations (Lang, Parkes & Fernández-Medina, 2013, for a discussion on the topic).
- This short review is necessarily limited in scope, yet aims to identify some of the main issues surrounding older driver safety, including risks, age-related changes, and how this information has been used to develop interventions to help maintain safe mobility.
- Identifying what is an 'older driver', and how growing older affects driving is a complex task and requires further research to further understand the link between ageing and driving.

Methodology

A detailed description of the methodology used to produce this review is provided in the Methodology section of the Observatory website at <http://www.roadsafetyobservatory.com/Introduction/Methods> .

This synthesis was compiled during November-December 2013.

Literature search

Searches were carried out on the pre-defined sources identified in the link above, and included the Transport Research International Documentation (TRID) database, and Pub Med. Together these databases provide access to over 24 million records in transportation and medical research.

Search terms used to identify relevant papers are included in the table below (Table I). Asterisks denominate the use of special characters to include all forms of the word (e.g. evaluate, evaluation, evaluated). Research articles, reviews, statistical reports and policy documents have been included in this review.

The search yielded 655 results. Abstracts were evaluated on a set of pre-established, objective criteria before moving to a full text review.

Table I

Ageing/ older/ senior	Driving Driver	AND Fitness to drive Prolonging driving Cognitive Perceptual Motor Executive function Decision making Attention Awareness Reaction time Decline Change Function/ functional Crash OR Collision OR Accident Road safety Risk Errors Self-regulation Self-regulate Evaluat* Effect* Accident OR collisions Offences Intervention Enforcement Publicity Education Training Campaigns Policy
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Selection criteria

Research articles were scored on their relevance and quality. A rating of 'High', 'Medium' and 'Low' was given to each article under the following criteria.

For relevance:

- 'High' = refers to data on a metric clearly relevant to the topic under investigation and the research questions
- 'Medium' = refers to data on a metric that is probably relevant to the UK (e.g. specific outcome measures that only relate indirectly to crash or accident risk)
- 'Low' = does not refer to data relevant to the topic under investigation

For quality:

- 'High' = from a high-quality peer-reviewed publication, and clearly methodologically appropriate
- 'Medium' = from an academic source (e.g. book chapter, conference) but without peer-review, and/or possessing some methodological weakness (e.g. some possible confounding factors)
- 'Low' = from a more 'general' source (e.g. conference, trade paper) and/or clearly being methodologically weak or inappropriate (e.g. failing to address random variability by use of appropriate statistical techniques)

After these criteria had been applied to all articles from the literature search, 81 were requested for full text evaluation.

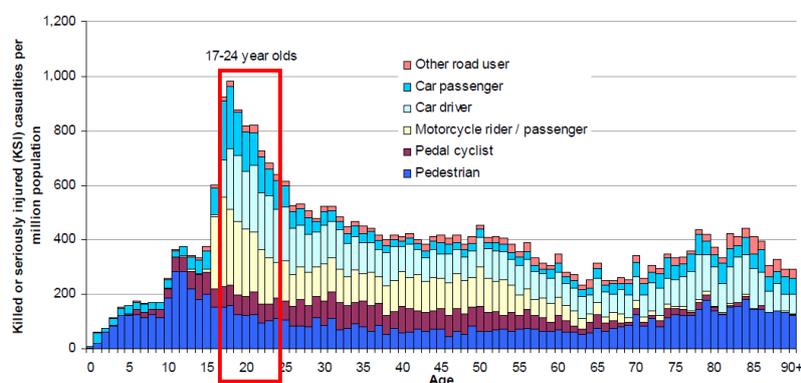
Key statistics

The 'older driver problem' is a common phrase used frequently to quote a number of statistics pointing to an increasing ageing population, who are living and driving for longer. In Europe, the ratio of the number of people aged over 65 to the population aged 15-64 is projected to double between 2010 and 2050 (Lanzieri, 2011). This pattern is replicated in other developed countries such as the United States, Australia and Japan.

Although older drivers are overrepresented in deaths following a car crash, this is mostly due to increased fragility. Research shows that older drivers are not only among the safest groups of drivers (particularly when compared with young drivers 17-24) (DfT, 2013a), but that they are able to compensate for declines in perceptual, physical and cognitive abilities. Thus, the 'older driver problem' is less about how to stop people from driving, but about ensuring that people have the tools necessary to make informed decisions about self-limiting their driving, or driving cessation when appropriate.

Road usage, accidents and casualty rates

- The UK's population is driving for longer. The number of trips made by road users tends to increase with age up to 40-49, however, the reduction in trips does not become apparent until after the age of 70 (DfT, 2013b).
- In the UK, 2% of car occupants injured in traffic accidents aged 70-79, and 4.5% of car occupants injured in traffic accidents aged 80 and over die from their injuries. This compares with 0.6% in occupants aged 30-49 (Mitchell, 2010).
- Accident involvement is at its lowest rate for drivers aged 70-79, and increases by 20% for drivers aged 80 and over (slight injuries per licenced driver) (Mitchell, 2010; Mitchell, 2013)
 - Statistically, the most at-risk group continues to be young drivers between the ages of 17-24, with a gradual decrease in accident involvement into the age of 60-70 (Figure 1).



Source: Dft (2013) Road Casualties Great Britain, 2012

Figure 1 Killed or seriously injured casualties per million population, by age

- In 2012, drivers aged 60-69 had an average of 18.8 KSI casualties per billion miles driven. This number significantly increases to 56.7 KSI casualties for drivers 70 and older.
 - Increased fragility of older drivers is an important factor in accounting for the age-related increase in deaths following a crash. Figure 2 illustrates this change in relation to KSI crashes.

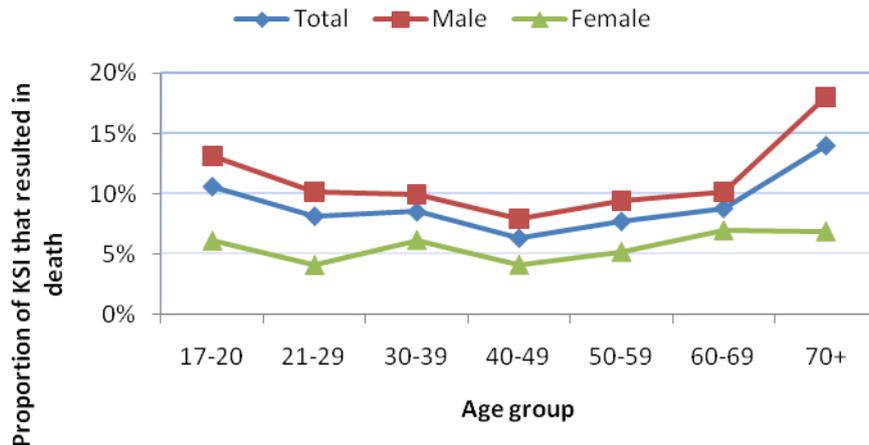


Figure 2 The effect of fragility: The proportion of KSI that were killed, by age

- In 2012, women aged 70+ drove an average of 912 miles while men drove about 3,200 miles (DfT, 2013b). As shown in Figure 3 females aged 70+ have a higher KSI casualty rate per billion miles driven than men aged 70+.
 - As older females tend to drive less than men, this effect is likely due to the 'low mileage bias'.

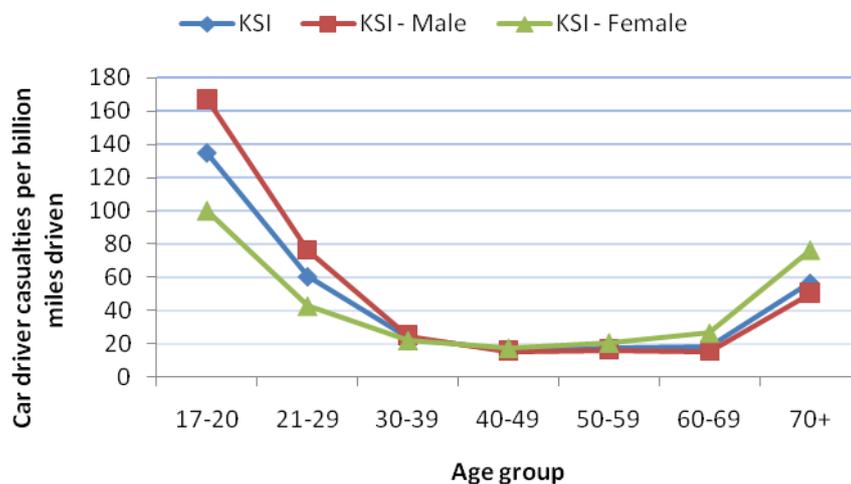


Figure 3 Casualties per billion miles driven, by age

- Looking at casualties per number of trips, older drivers have higher casualty rates than those aged 40-69. However, young drivers aged 17-20 still represent a significantly higher proportion of casualties per billion trips (Figure 4).

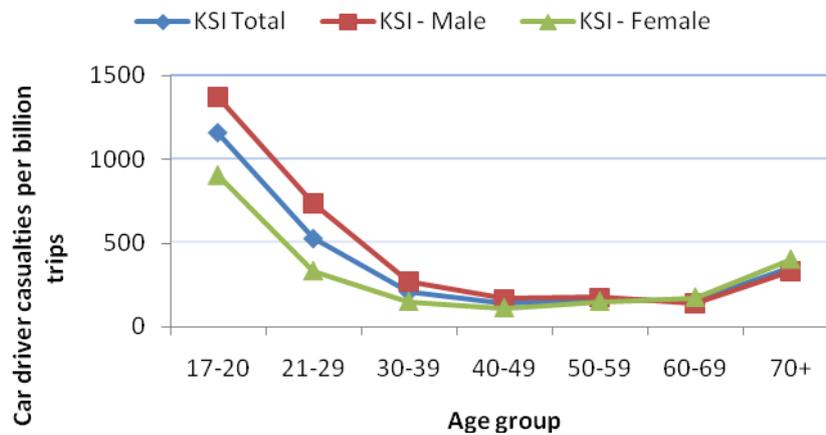


Figure 4 Car driver casualties per billion trips, by age

- If the casualty rate per million drivers holding a full driver licence is considered, males are more likely to be a victim in all age groups when compared with females of the same cohort (Figure 5).
 - This may be because females tend to drive less than males, but it must also be considered that there are lower rates of licence holding in older female age groups. Although female licence holding has increased significantly since 1975 (when it was less than 10%), according to the National Travel Survey, in 2012, only 42% of female drivers 70+ held a full drivers licence, compared with 79% of males of the same age group.

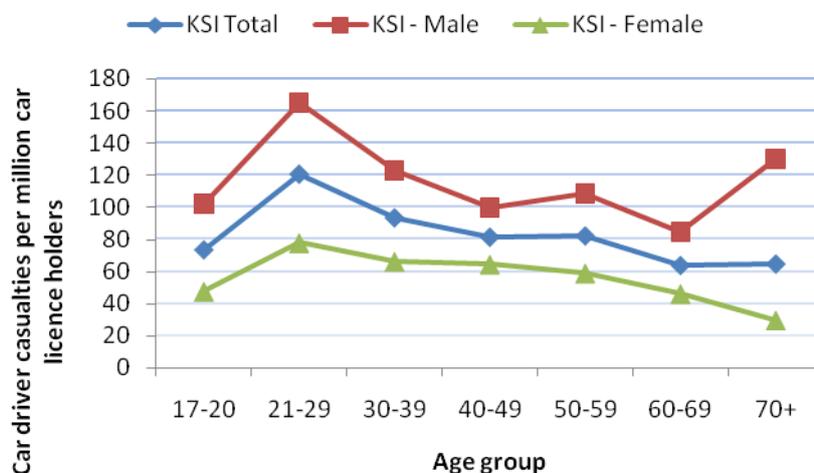


Figure 5 Casualties per million licences by age

Research findings

What is the 'older driver'?

Defining what is considered an 'older driver' has proved to be a complex task. In some EU countries, national legislation has used chronological age as a marker of 'older driver' status. That is, many governments have established a set age where driving limitations (e.g. shorter licence renewal periods, increased medical examinations) begin to take place. However, evidence that age-related limitations are necessary or even effective in reducing risk is inconclusive (Mitchell, 2008; Hakamies-Blomqvist & Peters, 2000). Thus, age alone may be a poor predictor of overall driving ability. In addition, the older population is not only increasing but is also increasingly heterogeneous in terms of lifestyle and health. For this reason, some countries have moved toward a more individualised approach that, although it does not necessarily replace legislation based on age, it takes into account a number of cognitive and physiological factors that may be more relevant to driver safety.

Both of these approaches are discussed below.

- Legislation

UK legislation states that driving licences for non-professional drivers are valid until the age of 70. After this, every three years, drivers must submit a self-declaration of their fitness to drive and that they can meet the minimum eyesight requirement. They must also report to the Driver's Medical Branch of the DVLA any disability which affects, or may be likely to affect, their fitness to drive. However, the latter is applicable to any individual irrespective of age.

More information, forms, and details on professional driver licence renewal are available from the DVLA website <https://www.gov.uk/renew-driving-licence-at-70#before-you-start>.

- Chronological age

Chronological age is widely used to define the 'older driver'. In many European countries some form of age-related controls or limitations for drivers have been introduced by the national government. In the UK, driving licences are valid until the age of 70, thereafter drivers must renew their licence every three years.

In other EU countries, age-related limitations start as early as 45 years of age (Spain), but vary from 50 (e.g. Italy and Luxembourg), to 65 (e.g. Portugal) and 70 (UK). Other countries such as Belgium, Germany and France do not have age-related controls in place and (non-professional) driving licences are granted with unlimited periods of validity.

Research into driving limitations based on chronological age has failed to show a road safety benefit. A case-study by Mitchell (2008) compared the driving licence renewal procedures of seven European countries, including the UK. The countries selected varied in terms of the stringency of their licence renewal procedures and the medical examinations required. The results of his analysis showed that the countries with the least demanding requirement for

medical examinations (France, the Netherlands, the UK, and Sweden) have the highest level of driving licence holding for drivers aged 65 and over. In addition, the UK and the Netherlands had the lowest fatality rate per population. This shows that countries with a more lax approach toward older driver relicensing procedures (such as the UK) do not necessarily have higher fatality rates, thus raising the question of the effectiveness of more stringent age-related controls.

Moreover, these age-related controls may put older people at risk by triggering modal shift to less safe forms of transport. Pedestrians and pedal cyclists, per mile walked and cycled respectively, are approximately eleven times more likely to be killed in a road accident than car occupants (Dft, 2013a).

Research by Hakamies-Blomqvist et al. (1996) (as cited in Mitchell, 2010) compared Swedish and Finnish accident, licencing, and population data and found that fatalities among unprotected road users (e.g. pedestrian and cyclists) increased more sharply with age among the Finish populations than for the Swedish. As Finland has stricter periodic medical examination requirements for drivers over the age of 45 than Sweden (whose only requirement for a medical exam is at the age of 70), authors concluded that there are no safety-related reasons to implement age-related medical screening. In addition, they warn that stricter medical examinations for relicensing could trigger a modal shift to less safe forms of transport, and hence increase fatality rates for older road users more generally.

To date, there is no conclusive evidence that age-related controls are effective at reducing risk for older drivers.

- Psychological/ cognitive factors

There are a number of physiological and cognitive abilities that are known to decline with age. Changes in physical strength and range of movement, as well as decline in visual acuity can impact driving ability. Also, cognitive decline in a number of important areas such as processing speed, hazard perception, and decision-making mean that as we age we are increasingly likely to require more time, space, and attention in order to complete complex tasks such as driving. Salthouse (2010) and Dennis and Cabeza (2008) provide a review of findings on cognitive aging from both the neurological and functional aspect. The interested reader is referred to these articles for more detailed information.

Research has found relationships between crash involvement or driving errors and cognitive, psychomotor and sensory decline (For example, Janke, 1994 for a review; Horswill, et al., 2010; Selander, Lee, Johansson & Falkmer, 2011). However, the onset of such age-related decline is difficult to predict and may vary according to a number of factors, such as health and lifestyle. In addition, older drivers tend to be aware of their limitations, and compensate by driving at slower speeds and avoiding difficult driving scenarios (Lang et al., 2013).

With age also comes the onset of medical conditions which may have an impact on physical and cognitive abilities. This tends to link with use of medications, and may also have repercussions on safe driving, though again, this is not limited solely to the older population. Details on particular medical conditions affecting driving are beyond the scope of this review, however, the interested reader can find more detailed information on the 'Fitness to drive' review on the Road Safety Observatory website, or from the 'Older Drivers, illness and medication' report (DfT, 2003).

The ageing population is heterogeneous. The onset and severity of age-related impairments is different for each individual. Therefore, a one-size fits all solution is unlikely to match the needs of the increasingly mobile older population.

How does being older affect driving?

- Risk

When considering the risk posed by older drivers, it is commonly believed that age-related decline in physical, sensory, or cognitive factors necessarily means an increased risk to other road users. However, if the rate of slight injury is used as a proxy for accident involvement it can be suggested that, when compared with young and middle age groups, accident involvement is lowest for drivers aged 60-79, and only increases by 20% for drivers 80 and older (Mitchell, 2013). In fact, the greatest risk posed by older drivers is the risk of injury or mortality to themselves as a result of increased fragility. To illustrate this, a recent review of UK national statistics by Mitchell (2013) showed that if the number of pedestrians killed is used as a measure of risk posed by drivers of different ages, the highest risk to pedestrians comes from young or middle-aged male drivers.

In the UK, 2% of car occupants injured in traffic accidents aged 70-79, and 4.5% of car occupants aged 80 and over die from their injuries. This can be compared with 0.6% of occupants aged 30-49 (Mitchell, 2010). Koppel, Bohensky, Langford & Taranto (2011) cite analysis by Evans (2004) which points to the increased fragility of older age groups. For example, according to Evans' work, in crashes of equal severity a 79-year-old man is 3.2 times more likely to die than a 32-year-old man. Similarly, a 79-year-old woman is 2.7 times more likely to die than a 32-year-old woman.

The same authors used data from the Australian Transport Accident Commission Insurance claims database to identify the main features of older driver casualty crashes. They compared two groups of drivers (ages 45-64 and 65 and over) and found significant differences in terms of the types of injuries sustained from accidents. While middle-aged drivers were more likely to sustain neck injuries (30.6% compared with 12.1% of older drivers), older drivers were more likely to suffer an injury to the thorax region (30.9% vs 18.5% of middle aged drivers). The authors note that this is of particular concern as older people may not have the lung capacity to recover from such injuries, or that they may be more likely to die from chest injuries than their younger counterparts (Koppel et al., 2011).

Types of collision

A closer look at the types of accidents in which older drivers tend to be involved provides a better idea of the main risks for this age group. Research has shown that older drivers tend to be overrepresented in intersection or right of way crashes (Clarke, Ward, Truman & Bartle, 2009; Clarke, Ward, Bartle & Truman, 2010).

A study conducted by the University of Nottingham in the UK (Clarke, et al., 2010) undertook an analysis of over two thousand police reports of injury crashes involving drivers aged 60 and over in order to gain a better understanding of accident causation. Crashes were classified according to blameworthiness, severity, time of day, and type. Their results showed that older drivers were more likely to be involved in right of way violation crashes (over 38% of the sample). The results also showed that 64% of accidents where the driver was considered to be partly at blame were cross-flow right turns onto and right turns off a road. This is consistent with the literature which indicates that older drivers tend to be overrepresented in intersection collisions where the ability to assess oncoming traffic is crucial.

Narrowing down the specific types of accidents in which older drivers tend to be overrepresented can help to underpin specific processes or failures and therefore improve safety for all road users. It will also help to make important links to specific motor, visual, and cognitive deficits that can have an effect on risk (and those that are common but have little impact on risk).

- Exposure

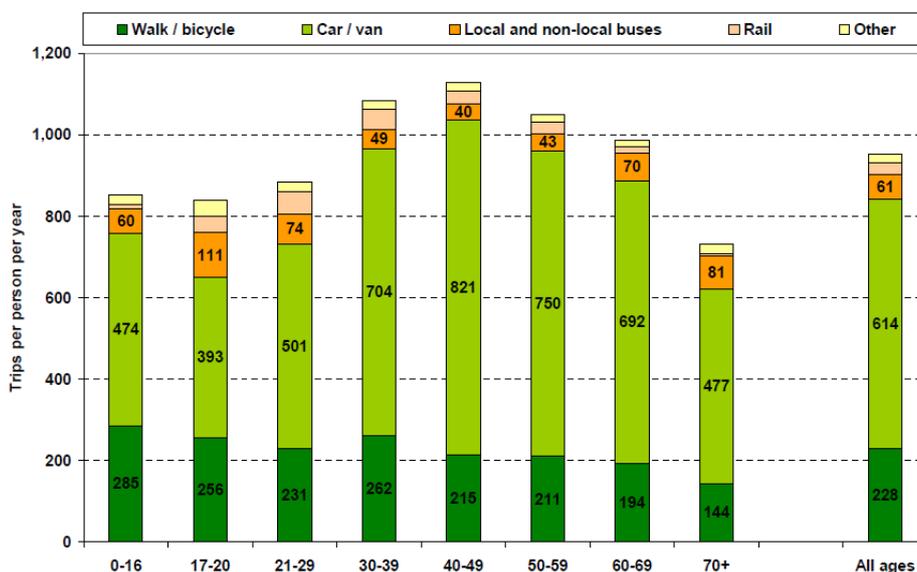
Not only are people living longer, but healthier and more diverse lifestyles mean that people are retaining their independence and driving for longer.

Licence holding has steadily increased since the mid-eighties, with 90% of males aged 60-69 still holding a full drivers licence. Similarly, 79% of males aged 70+ still held a full drivers licence in 2012 (DfT, 2013b). For women, numbers are significantly smaller with 70% of females aged 60-69 and only 42% of females aged 70 and over holding a full drivers licence in 2012 (DfT, 2013b). This is likely to be due to women giving up driving earlier than males (Stutts, Wilkins, Reinfurt, Rodgman and Van Heusen-Causey, 2001).

As licence holding increases for older age groups, so does the number of trips made by older drivers. National Travel Survey data shows that in 2013, drivers aged 60-69 only showed a small decrease in average number of trips made by car. Those aged 70+ show a larger decrease when compared with drivers aged 50-59 (See Figure 6), but still retain a relatively high number of trips. The shift to shorter, more local trips by those in the 'older old' age group has historically provided support for the notion that older drivers are at increased risk due to the 'low mileage bias'.

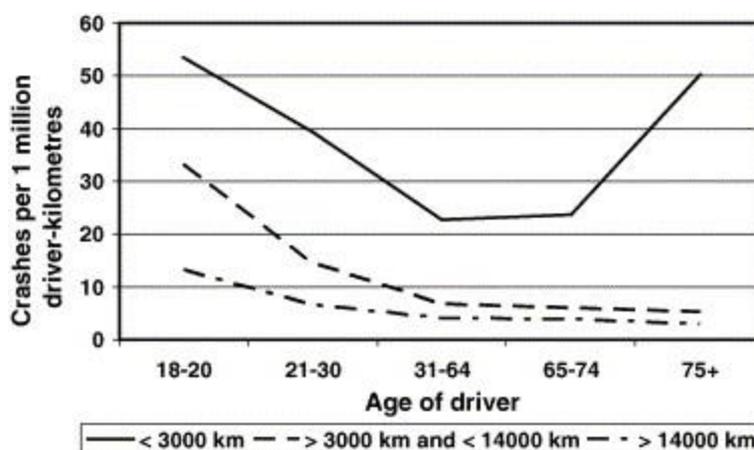
The 'low mileage bias' shows that, independent of age, drivers who travel more kilometres tend to have lower crash rates (per km) than those driving fewer kilometres. However, researchers such as Langford and colleagues and Janke have noted that different age groups drive different average annual distances, and that comparisons of crash involvement for different age groups are not valid if this is not accounted for (Langford, Methorst & Hakamies-Blomqvist, 2006; Janke, 1991, as cited in Langford et al, 2006).

Using this as its framework, a study using Dutch survey data from over 47,000 drivers of different ages showed that after being matched for yearly driving distance, most drivers aged 75 and above were safer than younger age groups (Langford et al., 2006). This supports accident statistics in the UK which show that in terms of accident risk, it is still younger age groups that present the largest road safety risk.



Source: Dft (2013) National Travel Survey 2012

Figure 6 Average number of trips per person per year, by age



Source: Langford et al. (2006); based on data from the 2003 Dutch travel survey

Figure 7 Annual crash involvement per age, controlling for annual mileage.

Concessionary travel

UK National statistics show that at the age of 60-69, there is also an increase in use of local and non-local buses as means for transport (Figure 6). This may reflect recent changes to Concessionary travel in the UK.

The government has introduced Concessionary travel for older adults in order to account for changes in travel patterns of the increasingly aging population. From April 2010 the eligibility in England for men and women is equivalent to the pensionable age for women; this is at the age of 60, but will gradually increase to 65 between now and 2018. In Scotland and Wales the eligibility remained at aged 60 for men and women (Dft, 2013b).

This government measure may help to supplement the need for a private vehicle in older age groups; however, it does not come without its potential problems. Firstly, bus use is likely to require a certain amount of walking to get to a nearby bus stop. As mentioned previously, some research has shown that a modal shift to other forms of transport may increase risk to older road users (Mitchell, 2010). In addition, buses may not be available in certain locations. This coupled with the potential negative psychological consequences of giving up driving, such as increased depressive symptoms (Marottoli, Mendes de Leon, Glass, Williams, Cooney, Berkman, & Tinetti, 1997) or loss of independence mean that the car remains the primary mode of transport for older road users.

What problems/ deficits are encountered by older drivers?

- Motor decline

Motor abilities, particularly range of movement, speed of execution and strength are necessary for the safe operation of a vehicle. Lower and upper limb mobility and head and neck range of motion, for example, have been correlated with driving ability as measured by on-road driving tests, simulator driving, or self-reported driving behaviour (Janke, 1994, for a review; Reed, Kinnear & Weaver, 2012). However, many of these abilities are known to decline with age. This presents a potential risk to road safety, especially as the driving task requires the successful integration of a number of functions.

For example, a study by Reed et al (2012) aimed to explore age-related differences in visual behaviour while driving on a simulator. They compared four different age categories, ranging in ages from 17 years (Young group) to 75+ years old (Old-old group) on a number of visual and response tests between completing driving tasks. Their results showed that participants in the older-old were unable to detect targets presented more than 180° around from their head position to the left and right (poor neck flexibility). In terms of the driving task, they found that at crossroads, older drivers (64+ years old) spent less time looking left and right when waiting at a crossroads when traffic was present. Authors suggested that this may be habitual, or due to slower movement in turning left and right to view the scene (Reed et al., 2012). This is an important finding, especially as older drivers tend to be overrepresented in crashes at intersections (Clarke et al., 2009).

Declines in psychomotor function can also affect older drivers even before they start their journey. In a short review by Eby and Molnar (2012) which considered the need for more advanced vehicle designs, the authors discuss a number of vehicle design issues that may affect older drivers. For example, a study reported in the review found that declines in psychomotor abilities, such as strength and balance, were responsible for problems getting in and out of the car (Shaw, Polgar, Vrkljan & Jacobson, 2010, as cited in Eby & Molnar, 2012). Seating comfort was also a problem reported, with older drivers having difficulty in adjusting the seat to a comfortable and safe position.

Regardless of the knowledge of age-related declines in motor abilities, however, it is important to recognise that the older population is increasingly heterogeneous and that the onset of significant decline will vary from person to person. As Janke states in her review, 'Perhaps no age-related change (except the transition from life to death) is necessarily universal; certainly it is known that changes begin at different chronological ages, and progress at different rates in different individuals' (Janke, 1994). This is applicable to other areas subject to age-related decline, including vision and cognition. Therefore, age alone cannot be seen as the sole causal factor of the changes experienced by older drivers.

- Sensory decline (vision)

Vision is central to performing the driving task, as this function mediates higher-order processes such as attention allocation, hazard perception, and decision-making. Most countries have some form of legislation in place that sets standards of vision required for driving. Many countries also require a re-assessment of vision for licence renewals whether it is at set intervals (i.e. every ten years) or once the pre-determined 'older driver' age is reached (i.e. at the age of 70). Estonia, Italy, Spain, and Latvia are all examples of countries that carry out vision reassessments. However, in these countries reassessments are not limited to older age groups as they are carried out every ten years for drivers.

Studies on ageing have shown an age-related decrease in occipital lobe activity (the area of the brain related to visual processing) which is believed to relate to deficits in visual perception (Dennis & Cabeza, 2008). Earlier, Janke (1994) stated that a high proportion of older drivers will show serious limitations in their visual performance under typical driving conditions. Visual acuity, both static and dynamic, have been implicated in driving, although poor dynamic acuity (the ability to perceive a moving target) has shown a stronger relationship to driving errors than a decline in static acuity. Visual acuity follows an inverted U-shaped curve over the course of life, with adults over 50 starting to show decline. However, Janke (1994) is careful to assert that there is great variability in acuity at older ages, and that age alone cannot determine deteriorations in functioning.

A recent study by the Transport Research Laboratory tested 32 drivers of different ages (including drivers over 64) on a driving simulator. The aim was to gain a better understanding of why older drivers have a propensity to crash at intersections (particularly 'failed to look' accidents) (Reed, et al., 2012). Participants completed a number of vision, motor ability and cognition test in between driving six different test scenarios. Results support the literature showing that visual acuity, useful field of view, and contrast sensitivity decline with age. It also showed that neck flexibility (and hence, the range of horizontal vision) also reduces with age. However, upon closer inspection of the results, researchers found that older drivers positioned their vehicles at the crossroad in a way that made it harder to view other traffic, and that they also spent less time looking left and right before deciding to cross the junction. Although researchers concluded that this is likely related to physical deficits, the study highlights that the issues behind older driver accident risk are not clear cut and that it is a combination of deficits that lead to lowered driving performance.

Recently, The Federation of (Ophthalmic and Dispensing) Opticians (FODO) and similar organisations have lobbied to improve vision tests for older drivers at a national and EU level. They argue that visual performance is central to the driving task and increasing testing for drivers will result in an increased safety benefit for all road users. It is important to note that such organisations are not necessarily lobbying more restrictions to stop older people driving, but they are also keen to identify vision problems in order to be able to rectify them and avoid potential loss. This said, as mentioned previously, case studies assessing the effect of different medical examination requirements for driving licence renewal have failed to show a strong effect of such tests on driver safety. Therefore, the effect of increased vision screening may be of most benefit if it were to apply to all age groups.

○ Cognitive

Another natural consequence of ageing is the onset of cognitive decline. As much as physical movement and visual capabilities are central to performing complex tasks such as driving, so too are the psychological processes that mediate movement, attention allocation (visual or otherwise), and decision-making. Some of the processes that have been found to be affected by age include:

- Attention (Lopez-Ramon, et al., 2011; Dawson, Ergun, Anderson, Johnson, & Rizzo, 2010);
- Working memory (MacPherson, Phillips, & Della Sala, 2002; Grady & Craik, 2000);
- Executive function (Salthouse, 2010; Dawson et al., 2010; Mathias & Lucas, 2009; Selander et al., 2011);
- Task-switching (MacPherson et al., 2002);
- Hazard perception (Horswill et al., 2010);
- Perceptual speed (Salthouse, 2010);
- Visual perception (Dennis & Cabeza, 2008).

Given the considerable body of research that exists on cognitive ageing, it is no surprise that significant research has emerged regarding specific cognitive processes that are considered key to driving safely. Of these capabilities, the ones that have most often been at the centre of research are attention, working memory, and executive function. However, more recently, hazard perception has begun to take importance in emerging literature. One example is the research carried out by Horswill and colleagues in 2010 looking to show a relationship between hazard perception and crash involvement in drivers aged over 65. With a sample of over 200 drivers, authors found a significant association between self-reported crash involvement and hazard perception ability.

They also found that a measure of processing speed and attention (as measured by the Useful Field of View test – widely used in mobility research, as well as for driver training in countries such as the United States and the UK) was also associated to crash involvement, independently of hazard perception (Horswill et al, 2010). Similar findings were obtained in a meta-analysis by Mathias and Lucas in 2009; these authors systematically analysed existing research into cognitive predictors of driving. Studies using on-road driving, simulator driving assessments, and studies using driving problems as a measure of performance were included. The UFOV test was the only test that served as a good predictor of performance on all three types of driving assessment. Similarly, a meta-analysis by Clay, Wadley, Edwards, Roth, Roenker and Ball (2005) examined the relationship between UFOV and objective measures of driving performance (including on-road driving and state recorded accidents). They found that across studies, poorer UFOV performance was associated with negative driving outcomes; a relationship that was considered robust. This said, the individual studies identified by Clay et al. (2005) tended to have only moderate correlations between UFOV and the different driving performance indexes. On the whole, this supports previous research, adding strength to the notion that hazard perception, speed of processing and attention are all important for driving safety.

Another study by Dawson et al. (2010) in the United States sought to identify the neuropsychological factors associated with driving errors in older adults. They tested 111 older adult drivers ranging in age from 65-89 on a number of neuropsychological tests (including motor ability and vision) and an on-road test. A certified driving instructor reviewed video tapes of the on-road tests and classified the frequency at types of driver errors based on the Iowa Drive Test Scoring standards. They found that older drivers committed significantly more safety errors than middle aged drivers did. They also found that specific cognitive abilities that increased risk for older drivers included visuospatial and visuomotor abilities.

Detailed discussion of the research on cognitive decline and driving performance, crash risk, or accident involvement is beyond the scope of this short review. There is an extensive body of literature available on the topic and interested readers are referred to the above mentioned research for more information.

What support and interventions are effective at reducing casualties associated with older drivers?

Mobility is important for sustained independence and well-being (Whelan, Langford, Oxley, Koppel & Charlton 2006; Box, et al., 2010) and, unsurprisingly, imposed driving cessation may also lead to negative psychological consequences. This is emphasised by findings of associations between driving cessation and an increase in depressive symptoms and satisfaction (Marottoli, 1997; Stutts et al., 2001). The ability to connect with friends and family, and to access services, especially in areas with little public transport, remains central to the health and well-being of older people. Moreover, the use of the private car remains at the centre of mobility for this age group. For this reason, developing interventions that improve older driver comfort, confidence and safety is a key task going forward.

Below are a number of key areas believed to show the promise for older drivers.

- New technology

New technology that can influence older driver safety takes the form of vehicle technology and design, but also considers possible changes to the driving environment.

Eby and Molnar also reviewed available technology to help improve older driver safety, though their focus was on vehicle design. They report that many older drivers face difficulties with simple tasks such as getting in and out of the vehicle, seating comfort, and using and adjusting vehicle mirrors (Eby & Molnar, 2012). They also discuss the use of Intelligent Transport Systems (ITS) (systems designed to provide drivers with information and assist with the driving task) to help drivers compensate for any functional impairments such as night vision and object distance.

One form of ITS that is particularly accessible and that has been evaluated in the literature is the in-vehicle navigation system (IVNS). These use Geographical Information Systems (GIS) and Global Positioning Systems (GPS) to give feedback and support to drivers navigating the road systems. Recently, a study using focus groups was carried out to assess older drivers' perception and use of IVNS with both current users and non-users of the technology. Their findings showed that IVNS provide older drivers with increased confidence, and potentially deters them from undertaking more risky behaviours. For example, some drivers who did not have experience with IVNS reported that they used strategies such as writing instructions in large letters on a paper and placing it on the passenger seat or their lap (Emmerson et al., 2013).

However ITS may increase distractions and driving workload for older road users, thus it is important that future ITS is designed to ensure safety is enhanced (Eby & Molnar 2012).

IVNS is only one of many technologies that can be used to enhance older driver safety. Other tools include park assistance, blind spot warning systems, and vehicle stability control. The latter helps to automatically bring the vehicle back in the intended direction of travel, particularly useful for driving on curves or through bad weather. Again, these are only a few examples of the available technologies to help assist older people with the driving task. These tools will not only increase safety by assisting with driving skills that may have deteriorated, but they also help to provide comfort and confidence that can help keep drivers driving safer for longer.

- Changes to the driving environment

Boot and colleagues' (2013) mini review mentions several possible changes to the driving environment that may improve safety for older drivers. Some examples include the use of offset turn lanes, internally lit street signs, and advanced street name signs (signs placed at a certain distance before the road – this allows drivers to start making decisions earlier) (Boot, Stothart & Charness, 2013). However, changes to the road design, and infrastructure are beyond the scope of this review and should be considered separately. The interested reader is redirected to Boot et al. (2013) and Box et al., 2010.

- Training

According to Boot et al. (2013), there is evidence to suggest that changes to the roadway and driver training strategies can bring the abilities of older drivers back into alignment with the demands of the driving task. This said, the evidence available seems to be somewhat mixed with regards to the effectiveness and transferability of driver training interventions.

A recent review of literature on available mobility interventions identified five randomised controlled trials for evaluating cognitive training. These varied in terms of total training time (from 4.5 to 24 hours total training time), length of training period (2-8 weeks of training), administration format (computerised and paper-and-pencil training exercises), and cognitive functions covered (e.g. speed of processing, memory, reasoning, attention and executive function) (Ross et al., 2012). The interventions included training speed of processing, memory, reasoning, and attention; speed of processing was the most common training used. The authors concluded that the results of the cognitive training demonstrated transfer of training to driving safety, using measures such as at-fault crashes and simulator driving. The authors conclude that as many of these were large, multisite clinical trials, cognitive training shows good promise for extending mobility for older populations.

Physical exercise programs have also been evaluated as potential interventions to improve driver's control of the automobile and physical movements necessary for completing the driving task. This form of intervention seems to have received the most attention, and Ross et al.'s review alone identified 65 randomised control trial studies evaluating exercise-based interventions. The interventions were incredibly varied in terms of content and application, and included walking, dancing, yoga and tai chi (among others). However, most functional measures used to evaluate the interventions were physical fitness measures with only one study relating the intervention directly back to the driving task. This was the study by Marottoli and colleagues in 2007 (as cited in Ross et al., 2012) who evaluated a twelve week exercise program guided by a physical therapist with older drivers over the age of 70. The routine included a daily 15-minute session, seven days a week and targeted driving-related physical abilities such as trunk and axial rotation. A post intervention follow up at three months showed that the group receiving the specialised program had a significantly greater road test scores and made 37% fewer critical errors on an on-road test. The errors considered included inattention, turning or changing lanes without looking, and ignoring signs or signals; these were evaluated by a specially trained driving evaluator. However, Boot's mini review warns that more evidence of the effectiveness of these interventions in reducing crash risk is needed.

Although cognitive training interventions have been evaluated to a lesser extent than exercise training programs, these have shown more promise as most studies have been with large sample sizes and have shown good transferability to driving. On the other hand, exercise programs are very varied and have rarely been linked back to on-road or simulator driving. Because of this it is difficult to establish what interventions work best as well as which may lead to the desired outcome: lowered crash risk.

In addition, some research shows that take-up of existing training interventions may be low. For example, a large study conducted by Stutts and colleagues in the United States showed that 26%, of current older drivers, and only 11% of former drivers reported they had attended a driving class or refresher course (Stutts et al., 2001). As many of these courses require a degree of self-motivation by the driver and varying degrees of time commitment, the low uptake may be a hindrance to this type of intervention. Low uptake of interventions may also affect the results of this type of study as people taking part in the research may not be an accurate representation of the population as a whole. However, as this research was over ten years ago, it is difficult to draw any conclusions of current uptake based on this survey. Therefore, more research is needed to better understand the current situation of training acceptance and uptake by older drivers.

- Community services

No literature was identified that met the inclusion criteria for full-text follow up on this topic. This said, there are a number of community services available for older drivers, especially at a local council level where older drivers may be of particular concern. For example, councils such as Devon County Council and Suffolk County Council both have training courses available for older drivers. Suffolk host a driver workshop called 'Grand Driver' which focuses on three main areas: health and mobility, refreshing knowledge of the Highway Code and improving hazard perception skills for drivers over the age of 60.

Devon County Council also has a number of interventions available for older drivers including the 'Driving Safer for Longer' program, which is hosted in partnership with the Devon and Cornwall Constabulary. It is intended to help drivers stay safer for longer and also to help them make choices about their driving future.

The main issue with many of the interventions used at a local level is that there are few (if any) evaluation programs looking at the effectiveness of these with the older driver population. In the future, work should be done to understand which interventions are most accepted by drivers, but that also show the greatest promise in terms of reducing risk.

- Education

The same literature review by Ross et al. (2012) identified 10 studies evaluating the effectiveness of different educational interventions on self-report and on-road driving tests. The findings of all studies are somewhat mixed. Some interventions used in the United States and Canada (such as classroom-based driving retraining intervention by Bédard et al., 2004, as cited in Ross et al. 2012) had no impact on objectively measured driving performance; however, a similar classroom program combined with on-road driving education showed improvement in some (but not all) of the on-road driving measures (Bédard et al., 2008).

A number of other evaluations identified through the review did not directly target driving, but focused on more general mobility outcomes, such as walking difficulty (Mänty, Heinonen, Leinonen, Törmäkangas, Hirvensalo, Kallinen, Sakari, von Bonsdorff, Heikkinen & Rantanen, 2009).

The authors of the review are careful to note that the interventions found varied greatly in terms of content and length of the interventions, and the time frame in which they were evaluated. The interventions also varied in terms of the outcome measure, with those relating back to the driving task being the least successful. It is possible that educational interventions, when used appropriately to target general areas of functioning (such as general mobility) could have a very positive effect. However, driving is a complex task that requires the successful performance and integration of a number of tasks, therefore educational interventions may only be effective when combined with other forms of training such as on-road re-training.

- GPs

Increased engagement with healthcare professionals has been considered as an important step toward increasing safety for older drivers. There is good evidence to support that older people trust healthcare professionals. A survey with over 4,000 drivers in the United States (Coughlin, Mohyde, D'Ambrosio & Gilbert, 2004) found that 31% of married older drivers, and 41% of those living alone would choose to talk to their GP about driving concerns. For married older drivers, this came second only to speaking to a spouse. GPs may therefore play an important part given the role they play in advising their patients.

However, GPs are limited in terms of the knowledge of the subject area and are faced with the ethical conundrum of recommending that a patient should cease to drive. The French government have taken steps toward improving GP knowledge so as to mobilise this valuable resource to improve older driver safety. In order to support GPs, the French ministry of Health edited a booklet in 2012 entitled 'Driving According to one's health, physicians what is your task?' This booklet was distributed to all physicians in France, and includes clear and concise guidelines and frequently asked questions that can help guide physicians advising older drivers. Although this does not represent a definite solution to the problem, it can help GPs to take a more active role in their patients' road safety.

There are some risks in GPs taking on the responsibility of older driver regulation. Not only could it undermine the doctor/ patient relationship, but as Berry mentions in a review, the 'medicalisation' of driving regulations may encourage older people to stop taking responsibility for their own driving (Berry, 2011). In addition, there is little evidence that stringent medical examinations for relicensing necessarily result in increased safety. Mitchell (2010) uses the example of Finland where medical examinations are required at 45, 60, 70 and every five years thereafter. Not only is licence holding for older age groups lower than other EU countries such as Sweden and the UK, but fatality rates per population are generally the same than countries with less stringent medical examinations. There is also evidence that this modal shift may increase risk for older people as they become pedestrians (Mitchell, 2010).

- Self-regulation

Self-regulation, in this context, is the practice of adjusting one's own driving patterns to compensate for functional limitations due to changes in cognitive, sensory and motor capacities. It relies on drivers' motivations to self-assess their driving ability, and to make the decision to self-regulate where they see fit. A number of studies have demonstrated that older drivers tend to be sensitive to the effects of ageing on driving performance, and that they learn to adjust their driving patterns to limit their exposure to difficult or threatening situations (Lang et al., 2013, for a discussion on the topic).

However, the nature of self-regulatory practices is not straight forward, and authors, such as Berry (2011), mention that the process of self-regulation does not seem to be working as effectively as it could be. It is, therefore, necessary to understand the process of self-regulation and how it is used by different groups of people.

A study by Molnar and colleagues examined some of the factors that may mediate self-regulation and posed the question: 'Is driving avoidance always self-regulation?' The authors identified that some of the motivators to limit driving are not always based on self-regulation (and therefore, on awareness of one's own driving abilities). For example, they found that driving avoidance may be due to changes in lifestyle or preferences, though this was only for certain situations such as in-vehicle distractions (Molnar, Eby, Charlton, Langford, Koppel, Marshall & Mann-Son-Hing, 2013). Another study by Gwyther and Holland (2012) found that although self-regulation increases with age, anxious driving style and negative affective attitudes (defined as confidence in difficult driving situations) were independent predictors of self-regulation behaviour. This suggests that self-regulation behaviours are not unique to older drivers. Similarly, Kulikov (2011) found that state driver's licence renewal requirements (in the United States) also made a significant difference in the driving mobility of older Americans. They also found that living alone, education and, interestingly, restricted licencing policies, were significantly related to prolonged driving. The latter is somewhat different to the case of the United Kingdom as, when compared with other EU countries, it has one of the highest rates of licence holding by people aged 65 and older, which, according to Mitchell (2008), is due to the relatively lax relicensing process and may have a positive effect on the wellbeing and safety of older drivers.

Other research shows that self-regulatory practices may not always be timely. Research by Stutts et al. (2001) used focus group data to show that there is a subset of the older driver population who tend to stop driving too early. These are mostly women who have family member available to drive them, or who have been deterred from driving because of crash involvement or discomfort. Given the negative consequences that have been linked to driving cessation, further research by the same authors used survey data to gain a better understanding of the premature reduction and cessation of driving with a sample of 2,510 adults aged 65 and over. This said, numbers for the 'older old' age group (particularly those 85+) were particularly low (n=118). Results showed that former drivers were more likely to be female, older, and less satisfied with their ability to go places. Women were also likely to cite comfort-related reasons for stopping driving, while men were more likely to quote health reasons.

Studies have also found relationships between cognitive ability and self-regulation. A recent study by Wong, Smith & Sullivan (2012) explored the relationship between older drivers' cognitive ability and self-regulation with a sample of 70 Australian drivers aged 65 years and over. Drivers completed a questionnaire about their driving and a measure of cognitive function believed to rely on visual-spatial and executive function the (Clock Drawing Test (CDT)). Results showed that those who failed the CDT were significantly less likely to report self-regulation, and showed less interest in taking part in driving programs. They did, however, report driving significantly fewer hours.

The process of self-regulation is complex and requires better understanding, especially given that it is currently viewed as the most effective 'intervention' to increase older driver safety. However, this process is not well understood and more research is needed to further understand how and when older people use self-regulation as a tool for safety. In Stutts et al.'s study authors also highlighted the fact that nearly a third of all survey respondents who were former drivers felt that they stopped driving too early. Given the negative psychological consequences linked to driving cessation and the gender differences reported in studies (such as Stutts et al., 2001), it is important to ensure drivers do not stop driving too early in order to ensure prolonged safety and mobility for all.

- Self-assessment tools

As mentioned previously, self-regulation involves adjusting one's own driving patterns to compensate for functional limitations. Although it is widely known that ageing increases the potential for decline in particular skills and abilities, it may not always be straight forward to identify what constitutes a 'significant' change. It may also be difficult to understand what specific skills and abilities may have an effect on driving performance. With this in mind, research has turned to the development of self-assessment tools to help older drivers to self-regulate, and to make important decisions about driving cessation.

Currently, both interactive and non-interactive self-assessment tools are available through universities, local councils (UK), and the internet. Although many of the tools available have been developed in the United States, one example of a UK-based tool is the adapted Devon Driving Decisions Work book. This is part of a wider initiative called 'Driving safer for longer' developed by Devon and Cornwall Constabulary, and is based on an American tool (The Driving Decisions Work Book, Eby et al, 2000, as cited in Lang et al., 2013) that was developed over the course of many years and an extensive research program. It is a paper and pencil questionnaire that can be completed by the driver alone or with a family member. It includes questions about on-road behaviours and preferences, including questions on memory, speed of decision making, and reaction time. It also includes a subdomain for health. The results of the questionnaire provide drivers with feedback and information about their driving.

Another UK tool is the 'Older driver risk index' developed for Suffolk County Council, and that is part of the 'Grand Driver' Scheme mentioned previously. The Driver risk index is a web-based profiling tool that uses self-report items to assess four areas: situational risk, behavioural risk, coping risk, and socially desirable responding. The aim of the tool is to establish the attitudinal and behavioural risk of older drivers as compared to their peer group. This is provided by the council as part of the Grand Driver scheme and is part of the overall program aimed at maintaining safe mobility.

Although the development of self-assessment tools for older drivers has gained importance in recent years, more work is needed to validate the effectiveness of these tools. In addition, the main issue of self-assessment tools (and self-regulation as a whole) is the fact that it relies on older driver's self-motivation and self-awareness of their own driving behaviours in order to uptake such interventions. This means that although self-assessment tools will attract a segment of the population, this will likely be the same segment that is likely to take up other types of training, or in fact, self-regulate independently of any tools or training. Nonetheless, these tools can help older drivers to make more timely decisions about when to stop driving, but can also facilitate the conversation with family members or a GP.

For more detailed information of other available self-assessment tools and a discussion on issues surrounding existing self-assessments, the interested reader is referred to the work by Lang et al. (2013), 'Driving Choices for the older motorist: The role of self-assessment tools'.

- Publicity, Campaigns, Policy and Enforcement

No literature was identified that met the inclusion criteria for full-text follow up on these topics.

Conclusion

There are a number of issues surrounding the classification, assessment, and licencing practices for older drivers in the UK, Europe and worldwide. Defining what constitutes an older driver, or more so, what part of ageing constitutes increased risk, has been a complex task. So far, research has shown that there are several motor, visual, and cognitive changes that we experience as a result of age, but that the onset of such changes varies from one person to another. This alone makes it difficult to 'classify' drivers who may be at heightened risk.

This review has highlighted a number of myths that have been associated with ageing and the effects on driving safety. It has been shown that older drivers as a whole are among the safest drivers, and that increased mobility does not necessarily mean increased risk. In fact, many of the safety issues faced by older drivers are related to the modal shift to less safe modes of transport (both in terms of the risk of injury by becoming a pedestrian, and the negative emotional consequences due to loss of independence and access to social activities), as well as the inherent effect of increased fragility as a result of age. This is not to say that age-related declines do not have an effect on driving performance; decline in motor abilities (such as range of neck movement), vision problems (such as changes in visual processing) and cognitive decline (such as processing speed, and attention) may put older drivers at risk of collisions, particularly in complex road environments such as intersections.

In light of this, research has also focused on finding ways to narrow the gap between decline in driving-specific skills and optimal driving performance. These include changes to the road environment, in-vehicle technologies to assist drivers, and driver training. However, driving is a complex task that requires the successful integration of a number of processes and it is unlikely that any individual tool will result in increased safety. Moreover, research into driver training has been incredibly varied, and as such, it has been difficult to pin point what specific parts of training interventions are most successful at showing transfer to the driving task. Training and new technologies may also suffer low uptake, whether because of time requirements, lack of self-awareness, or the expense of taking part in training or fitting a car with new technology. In this case, education and self-evaluation (through self-assessment tools) are likely to become powerful tools in helping older drivers develop a healthier awareness of changes to their own driving abilities. This can help empower drivers and their families to make decisions about driving limitations and, ultimately, driving cessation.

References

Title:	The combination of two training approaches to improve older adults' driving safety
Published:	Bédard, M., Porter, M.M., Marshall, S., Isherwood, I., Riendeau, J., Weaver, B., Tuokko, H., Molnar, F., & Miller-Polgar, J. (2008). The combination of two training approaches to improve older adults' driving safety. <i>Traffic Inj Prev.</i> ; 9(1): 70-6.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/18338298
Free/priced:	Priced
Objectives:	To examine if the combination of an in-class education program with on-road education would lead to improvements in older drivers' knowledge of safe driving practices and on-road driving evaluations.
Methodology:	Randomised controlled trial with older drivers aged 65 and over. Participants in the intervention group (n=38) received the in-class and on-road education; participants in the control group (n=37) were offered the training after the study.
Key Findings:	<ul style="list-style-type: none"> • Participants' knowledge improved by 20% before and after the in-class education component (though baseline of correct answers was 61%) • The on-road evaluation results suggested improvements on some aspects of safe driving (though not all aspects)
Keywords:	Older drivers; Training; Interventions; RCT
Comments:	

Title:	Can older drivers be nudged? How the public and private sectors can influence older drivers' self-regulation
Published:	Berry, C. (2011) RAC Foundation
Link:	http://www.ilcuk.org.uk/files/pdf_pdf_158.pdf
Free/priced:	Free
Objectives:	This reports considers how interventions, or 'nudges', based around insights from behavioural economics and psychology can be used to assist older drivers in coping with the ageing process.
Methodology:	Discussion and evaluation of current literature and expert knowledge.
Key Findings:	<ul style="list-style-type: none"> • There is plenty of evidence to show that older people do self-regulate. • Older drivers reduce, restrict or cease their driving at some point in life, due to concerns about their declining driving ability and increasing vulnerability. • However, the 'medicalisation' of driving regulations may encourage older people to stop taking responsibility for their own driving.
Keywords:	Public policy; Older drivers; 'Nudge'; Self-regulation
Comments:	

Title:	Improving the safety of aging road users: A mini-review
Published:	Boot, W., Stothart, C. & Charness, N. (2013). Improving the safety of aging road users: A mini-review. <i>Gerontology</i> , p. 1-5.
Link:	http://www.cary-stothart.net/files/papers/Improving%20the%20Safety%20of%20Aging%20Road%20Users.pdf
Free/priced:	Free
Objectives:	Authors discuss how the roadway environment can be modified to better match the capabilities of older drivers and review evidence for the efficacy of training interventions that aim to change the abilities and strategies used by older drivers.
Methodology:	Review of literature, though not a comprehensive review.
Key Findings:	There are a number of countermeasures and training available for older drivers that can help reduce crash risk. Although some interventions may require further research and investigation into direct links with accident involvement, measures that seem to show promise include: physical and perceptual training, and education plus on-road training. In terms of the driving environment, changes to improve night time visibility, offset turn lanes, and advanced street name signs may all be helpful in reducing risk for older drivers.
Keywords:	Transportation; Safety; Countermeasures; Driver training
Comments:	

Title:	Maintaining safe mobility for the ageing population: The role of the private car
Published:	Box, E. Gandolfi, J. and Mitchell, K. (2010) RAC Foundation
Link:	http://www.racfoundation.org/assets/rac_foundation/content/downloadables/maintaining%20safe%20mobility%20-%20rac%20foundation%20-%20140410%20-%20report.pdf
Free/priced:	Free
Objectives:	This RAC Foundation collection of reports has been developed to inform and encourage debate on the topic of safe mobility in old age in general and the role of the motor car in particular. It is hoped that practitioners and policy makers from a number of disciplines, not only the field of transport, will find the papers useful in both current and future debates on the subject.
Methodology:	Review of existing literature, government crash statistics, and expert knowledge
Key Findings:	<p>Each review in this collection touches upon a number of important factors relevant to the mobility of the ageing population in the UK and Europe.</p> <p>In general, the main report finds:</p> <ul style="list-style-type: none"> • Mobility is important for sustained independence and well-being • The evidence suggests that a different approach is needed as self-declared licence renewal at age 70 on its own does not deliver all that is required in today's ageing society. • However, driving re-licence re-testing at 70 should not be supported as it has not shown improved road safety in countries where it has been introduced • The RAC also believes there should be a more formal and accessible system of education, training and publicity to help older drivers improve their skills, develop self-awareness and self-regulate their driving behaviour. • The RAC also believe that changes in road infrastructure can play a role in improving older driver safety
Keywords:	Older drivers; Review; Sustained mobility; Licencing; Older driver considerations

Title:	Collisions involving older drivers: An in-depth study
Published:	Clarke, D. D., Ward, P., Truman, W., & Bartle, C. (2009) Department for Transport: London
Link:	http://webarchive.nationalarchives.gov.uk/20090417002224/http://www.dft.gov.uk/pgr/roadsafety/research/rsrr/theme5/rsrrno109.pdf
Free/priced:	Free
Objectives:	The purpose of the study was to conduct an in-depth analysis of police reports in order to understand older driver accident causation.
Methodology:	The data were entered into a FileMaker Pro database customised to handle the information and search parameters required for this project. Data were entered describing the objective facts of each case: time of day, speed limit, class of road, etc. A 'prose account' was also entered for each case. All cases were assessed by coders as to the blameworthiness of any participants in the crash. A minimum set of possible explanations for each crash was recorded from a standard checklist.
Key Findings:	<ul style="list-style-type: none"> • there were wide differences in the type of crash and blameworthiness of the driver in different age groups of older driver. • after 70 years, blameworthiness ratios appeared to rise with age • drivers aged 85 years or more appeared to be over four times as likely to have contributed to a crash than they were to have been innocently involved. • Of all the types of crash they became involved in, older drivers seemed to have the greatest proportion of right of way violation (ROWV) crashes • Over 38% of the sample as a whole consisted of such crashes, and approximately 45% of all crashes where the older driver was considered at least partly to blame were ROWV collisions
Keywords:	Older driver; Crashes; Behaviour
Comments:	

Title:	Killer crashes: Fatal road traffic accidents in the UK
Published:	Clarke, D.D., Ward, P., Bartle, C., & Truman, W. (2010). Killer crashes: fatal road traffic accidents in the UK. <i>Accid Anal Prev</i> ; 42(2): 764-70.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/20159105
Free/priced:	Priced
Objectives:	The aims of the study were to examine and analyse a sample of police reports of older driver crashes in order to gain insight into the causation and underlying factors of these crashes.
Methodology:	<p>Similarly to the previous study by the same authors, crash data from UK police reports were interpreted and coded by researchers. Data were entered onto FileMaker Pro database which was customised to handle the information and search parameters required for this project. The data entered included objective facts of each case: time of day, speed limit, class of road, etc. A 'prose account' was also entered for each case.</p> <p>All cases were assessed by coders as to the blameworthiness of any participants in the crash.</p>
Key Findings:	<ul style="list-style-type: none"> • Older drivers had fewer accidents, but those fatalities they were involved in tended to involve misjudgement and perceptual errors in 'right of way' collisions, typically in the daytime on rural rather than urban roads. • Over 65% of the accidents examined involved driving at excessive speed, a driver in excess of the legal alcohol limit, or the failure to wear a seat, or some combination of these. • Young drivers have the great majority of their accidents by losing control on bends or curves, typically at night in rural areas and/or while driving for 'leisure' purposes. These accidents show high levels of speeding, alcohol involvement and recklessness.
Keywords:	Fatalities; Accidents; Driver; Behaviour
Comments:	This study presents a more general overview of the population as a whole, as opposed to the previous study by Clarke et al., 2009 which focuses on older drivers.

Title:	Cumulative Meta-analysis of the Relationship Between Useful Field of View and Driving Performance in Older Adults: Current and Future Implications
Published:	Clay, O. J., Wadley, V. G., Edwards, J. D., Roth, D. L., Roenker, D. L., & Ball, K. K. (2005). Cumulative meta-analysis of the relationship between useful field of view and driving performance in older adults: Current and future implications. <i>Optometry & Vision Science</i> , 82(8), 724-731
Link:	http://journals.lww.com/optvissci/Abstract/2005/08000/Cumulative_Meta_analysis_of_the_Relationship.15.aspx
Free/priced:	Free
Objectives:	To assess the relationship between the Useful Field of View (UFOV) assessment and objective measures of driving performance, such as state-recorded accidents, on-road driving, and simulator driving performance.
Methodology:	<ul style="list-style-type: none"> • Meta-analysis • PubMed and PsychINFO databases searched using a systematic approach.
Key Findings:	<ul style="list-style-type: none"> • A large effect (Cohen's $d = 0.945$) was found across studies, with poorer UFOV performance associated with negative driving outcomes.
Keywords:	UFOV; Driving performance; Vision; Visual function; Older drivers; Meta-analysis
Comments:	

Title:	Who Drives Older Driver Decisions?
Published:	Coughlin, J. F., Mohyde, M., D'Ambrosio, L. A. & Gilbert, J. (2004) MIT AgeLab
Link:	http://stuff.mit.edu/afs/athena/dept/agelab/news_events/pdfs/Agelab_driver_decision.pdf
Free/priced:	Free
Objectives:	To explore questions around the role others play in older adults' decisions around driving, and when such involvement is more likely to be welcome.
Methodology:	Twelve focus groups were conducted with older adults ages 58-89 who were either current or former drivers.. One focus group was carried out with physicians in order to examine their views of older drivers. A survey with over 4,000 drivers was also conducted.
Key Findings:	<ul style="list-style-type: none"> • 31% of married older drivers and 41% of those living alone would choose to talk to their GP about driving concerns. • Survey respondents also indicated that they engaged in voluntary self-regulation around their driving in order to continue to drive safely. • Approximately 66% of our sample reported that they engaged in some degree of self-regulation.
Keywords:	Self-regulation; Ageing; Older drivers
Comments:	

Title:	Neuropsychological predictors of driving errors in older adults
Published:	Dawson, J. D., Uc, E. Y., Anderson, S. W., Johnson, A. M. & Rizzo, M. (2010). Neuropsychological predictors of driving errors in older adults. <i>Journal of the American Geriatrics Society</i> , 58(6): 1090–1096.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/20487082
Free/priced:	Priced
Objectives:	The objectives of this study were to identify neuropsychological factors associated with driving errors in older adults.
Methodology:	One hundred eleven older adult drivers (mean age 72.3) and 80 middle-aged drivers (mean age 57.2) were administered a number of neuropsychological measures (cognitive, visual, and motor), and a composite cognitive score (COGSTAT). The outcome variable was the number of safety errors, as analysed (video data) by certified driving instructor using a standardized error scoring procedure.
Key Findings:	<ul style="list-style-type: none"> • Driving errors in older adults tend to increase, even in the absence of neurological diagnoses. • Older drivers committed an average of 35.8 safety errors per drive, compared with an average of 27.8 errors for middle-aged drivers ($P < .001$). • Age-related decline in cognitive abilities, vision, and motor skills can explain some of this increase. • After adjustment for age, education, and sex, COGSTAT was a significant predictor of safety errors in older drivers ($P = .005$), with an approximately 10% increase in safety errors observed for a 10% decrease in cognitive function. • Changes in visuospatial and visuomotor abilities appear to be particularly associated with unsafe driving in old age.
Keywords:	Neuropsychological tests; Cognitive decline; Safety errors; Instrumented vehicle
Comments:	

Title:	Neuroimaging of healthy cognitive aging
Published:	Dennis, N. A. & Cabeza, R. (2008) Neuroimaging of healthy cognitive aging. In Craik, F. I. M, Salthouse T. A. (eds.), The handbook of aging and cognition, 3rd ed. (pp. 1–54). New York: Psychology Press.
Link:	http://canlab.psych.psu.edu/Dennis08_HandbookofCognitiveAging.pdf
Free/priced:	Free
Objectives:	To provide a brief overview of resting neuroimaging studies of aging, and review functional neuroimaging studies of aging in various cognitive domains. The review ends by discussing the link between consistent neuroimaging findings to major theories of cognitive aging.
Methodology:	Review of literature and expert knowledge.
Key Findings:	<ul style="list-style-type: none"> • There are changes in the brain structure and function that come with age • Results of different studies indicate that while the brain undergoes significant structural change with age, age-related atrophy differs across and within regions. • Studies on ageing have shown an age-related decrease in occipital lobe activity (the area of the brain related to visual processing) which is believed to relate to deficits in visual perception.
Keywords:	Neuroimaging; Ageing; Cognitive decline; Brain regions
Comments:	

Title:	Reported Road Casualties Great Britain: 2012
Published:	Department for Transport (DfT) (2013)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/245387/rrcgb-2012-complete.pdf
Free/priced:	Free
Objectives:	To report on the yearly situation of personal injury accidents, the resulting casualties and contributing factors in Great Britain.
Methodology:	Statistics in the report are mostly based on accidents reported to the police through the STATS19 system.
Key Findings:	<p>The main findings of the report include:</p> <ul style="list-style-type: none"> • In 2012, there were a total of 195,723 casualties of all severities in road accidents reported to the police. <ul style="list-style-type: none"> ○ This represents a 4% decrease from 2011. • The number of fatalities fell for all road user types, with the exception of pedal cyclists and bus and coach occupants • The total value of prevention of reported road accidents in 2012 was estimated to be £15.1 billion
Keywords:	Road casualties; Statistics
Comments:	<p>As the data is based on police reports, damage-only accidents with no human casualties are not included in the report.</p> <p>Mortality, survey and hospital data are also used to compliment police reports and provide a wider context.</p>

Title:	Reported Road Casualties Great Britain: 2013
Published:	Department for Transport (DfT) (2014)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/359311/rrcgb-2013.pdf
Free/priced:	Free
Objectives:	To report on the yearly situation of personal injury accidents, the resulting casualties and contributing factors in Great Britain.
Methodology:	Statistics in the report are mostly based on accidents reported to the police through the STATS19 system.
Key Findings:	<p>The main findings of the report include:</p> <ul style="list-style-type: none"> • In 2013, there were a total of 183,670 casualties of all severities in road accidents reported to the police. <ul style="list-style-type: none"> ○ This represents a 6% decrease from 2012. • The number of fatalities fell for all road user types, with the exception of motorcyclists • The total value of prevention of reported road accidents in 2013 was estimated to be £14.7 billion
Keywords:	Road casualties; Statistics
Comments:	<p>As the data is based on police reports, damage-only accidents with no human casualties are not included in the report. Mortality, survey and hospital data are also used to compliment police reports and provide a wider context.</p>

Title:	Reported Road Casualties Great Britain: 2014
Published:	Department for Transport (DfT) (2015)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/463797/rrcgb-2014.pdf
Free/priced:	Free
Objectives:	To report on the yearly situation of personal injury accidents, the resulting casualties and contributing factors in Great Britain.
Methodology:	Statistics in the report are mostly based on accidents reported to the police through the STATS19 system.
Key Findings:	<p>The main findings of the report include:</p> <ul style="list-style-type: none"> • In 2014, there were a total of 194,477 casualties of all severities in road accidents reported to the police. <ul style="list-style-type: none"> ○ This represents a 6% increase from 2013. • The number of fatalities fell for all road user types, with the exception of bus, coach and lorry users. • Nearly three quarters of the increase in road deaths in 2014 were older (aged 60 or over) pedestrians. • Over all the user groups combined, the number of older people killed on the roads increased from 459 in 2013 to 535 in 2014, an increase of 16.6%. • As well as an increase of 45 older pedestrian fatalities, there were more older fatalities in every road user group except bus occupants and goods vehicle occupants. • The number of older car occupant deaths increased by 7.6% (18 fatalities) and older pedal cyclist fatalities increased by 7 people to 32 deaths. • There were 4,026 seriously injured casualties aged 60 or over in 2014, up 11% from 2013. This is the highest number since 2003. • Most of the increases in seriously injured casualties were of car occupants. • The total value of prevention of reported road accidents in 2014 was estimated to be over £16 billion.
Keywords:	Road casualties; Statistics
Comments:	<p>As the data is based on police reports, damage-only accidents with no human casualties are not included in the report.</p> <p>Mortality, survey and hospital data are also used to compliment police reports and provide a wider context.</p>

Title:	National Travel Survey 2012
Published:	DfT (2013)
Link:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/243957/nts2012-01.pdf
Free/priced:	Free
Objectives:	To present information on personal travel by residents of Great Britain during 2012.
Methodology:	Data is collected via interviews with people in their homes, and a diary that they keep for a week to record their travel.
Key findings:	<ul style="list-style-type: none"> • The number of trips made by road users tends to increase with age up to 40-49, however, the reduction in trips does not become apparent until after the age of 70. • In 2012, women aged 70+ drove an average of 912 miles while men drove about 3,200 miles. • Licence holding has steadily increased since the mid-eighties, with 90% of males aged 60-69 still holding a full drivers licence.
Keywords:	Travel patterns; UK data; Statistics
Comments:	

Title:	Has the time come for an older driver vehicle?
Published:	Eby, D.W. & Molnar, L.J. (2012, February) University of Michigan, Transportation Research Institute
Link:	http://deepblue.lib.umich.edu/bitstream/handle/2027.42/89960/102821.pdf
Free/priced:	Free
Objectives:	To discuss how automobile designs can increase safety and comfort for older drivers.
Methodology:	Discussion of available research and expert knowledge.
Key Findings:	<ul style="list-style-type: none"> • Declines in psychomotor abilities, such as strength and balance, can be responsible for problems getting in and out of the car. • Many older drivers face difficulties with simple tasks such as getting in and out of the vehicle, seating comfort, and using and adjusting vehicle mirrors • ITS systems help can help drivers compensate for any functional impairments such as night vision and object distance • ITS may increase distractions and driving workload for older road users, thus it is important that future ITS is designed to ensure safety is enhanced
Keywords:	Vehicle design; ITS; Older drivers

Title:	Fork in the road: In-vehicle navigation systems and older drivers
Published:	Emmerson, C., Guo, W., Blythe, P., Namdeo, A., & Edwards, S. (2013). Fork in the road: In-vehicle navigation systems and older drivers. <i>Transportation Research</i> : 21; 173–180.
Link:	http://www.sciencedirect.com/science/article/pii/S1369847813000880
Free/priced:	Priced
Objectives:	<p>There were three aims to this study:</p> <ul style="list-style-type: none"> • To explore how older drivers plan and then navigate on the roads • To develop an understanding of current use and opinions of In-vehicle navigation systems (IVNS) • To investigate potential improvements to IVNS for the specific needs of older adults.
Methodology:	Focus groups were carried out with 30 older adults. These investigated their navigational behaviour and use of in-vehicle navigation systems.
Key Findings:	<ul style="list-style-type: none"> • Older drivers are willing to use technology to overcome the challenges they face with driving, whether this is before or during a journey • Participants suggested a level of pleasure and freedom of travelling with an IVNS, and increased confidence in driving on unfamiliar routes, long and short, as the anxiety with reaching the required destination was reduced. • Participants who did not use an IVNS explained how they take this planning a step further by printing out the directions provided from the online route planners and then travelling with them the majority of the time in potentially unsafe ways. • The focus groups have shown that older drivers have a navigation need that is not being met with the current generation of IVNS. • The research provides a strong foundation to understanding older adults' driving and navigation behaviour, and their route guidance requirements.
Keywords:	In-vehicle navigation systems; Older drivers; Ageing population; Mobility

Title:	Changes in memory processing with age
Published:	Grady, C.L., & Craik, F.I.M. (2000). Changes in memory processing with age. <i>Current Opinion in Neurobiology</i> , 10: 224–231.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/10753795
Free/priced:	Priced
Objectives:	
Methodology:	Some review of literature and discussion.
Key Findings:	<ul style="list-style-type: none"> • Changes to the processes and function underlying memory are complex and relatively little is understood about them • Brain imaging has been an important tool in furthering the knowledge in this area. • The brain sometimes compensates for functional impairment in other areas
Keywords:	Neuroscience
Comments:	This is a short review of knowledge in the area of memory and age decline.

Title:	The effect of age, gender and attitudes on self-regulation in driving
Published:	Gwyther, H., & Holland, C. (2012). The effect of age, gender and attitudes on self-regulation in driving. <i>Accident Analysis & Prevention</i> , 45, 19-28.
Link:	http://www.sciencedirect.com/science/article/pii/S0001457511003277
Free/priced:	Priced.
Objectives:	To understand if self-regulation behaviours are adopted by different demographic groups of drivers.
Methodology:	<ul style="list-style-type: none"> • A sample of 395 drivers (267 women and 128 men) aged between 18 and 78 years completed a questionnaire. • Questions included demographics, crash history, driving style, instrumental and affective attitudes, and self-regulation behaviours.
Key Findings:	<ul style="list-style-type: none"> • When experience was controlled for, self-regulation increased with age • Self-regulation behaviours are present across the driving lifespan and may occur as a result of driving anxiety or low confidence rather than as an effect of ageing
Keywords:	Driving; Self-regulation; Older adults; Coping strategies

Title:	Recent European research on older drivers
Published:	Hakamies-Blomqvist, L. & Peters, B. (2000). Recent European research on older drivers. <i>Accid Anal Prev.</i> ; 32(4): 601-7.
Link: Free/priced:	http://www.ncbi.nlm.nih.gov/pubmed/10868763 Priced
Objectives:	To discuss European research on older drivers published since 1985 in order to touch upon some of the issues that have been most important during the past fifteen years.
Methodology:	Review and discussion. No systematic review was carried out.
Key Findings:	<ul style="list-style-type: none"> • Literature on a number of aspects of driving/ transport behaviour was discussed. These include: accident and risk of injury, travel behaviour, driving cessation, and differences in licencing practices of EU countries. • (To date) The only systematic attempt to evaluate safety effects of age-related screening (licencing policies) has been done in Finland.
Keywords:	European research; Older drivers; Transport policy design
Comments:	This is not a comprehensive review.

Title:	The crash involvement of older drivers is associated with their hazard perception latencies
Published:	Horswill, M.S., Anstey, K.J., Hatherly, C.G. & Wood, J.M. (2010). The crash involvement of older drivers is associated with their hazard perception latencies. <i>J Int Neuropsychol Soc</i> ; 16(5): 939-44.
Link: Free/priced:	http://www.ncbi.nlm.nih.gov/pubmed/20509983 Priced
Objectives:	To study the association between hazard perception and self-reported crash involvement in drivers aged 65 and over.
Methodology:	271 drivers aged 65-96 completed a measure of hazard perception. It required participants to identify road users who could be involved in a traffic conflict from video footage of real traffic situations. Participants provided self-reported crash involvement. The response measure used was response time on the hazard perception task.
Key Findings:	<ul style="list-style-type: none"> • A significant association was found between the hazard perception test and self-reported crash involvement • The mean hazard perception response time for crash-involved drivers was higher than for crash-free drivers • When the hazard perception test was converted into a dichotomous 'pass/fail' score, Individuals who failed the test were 2.32 times more likely to self-report a crash during the previous five years compared with those who passed
Keywords:	Automobile driver examinations; Aged; Aging; Automobile driving standards; Traffic accidents; Motor vehicles

Title:	Age-related disabilities that may impair driving and their assessment: Literature review
Published:	Janke, M. (1994) Department of Motor Vehicles, Sacramento, United States
Link:	https://www.dmv.ca.gov/about/profile/rd/r_d_report/Section%206/156-Age-Related%20Disability.pdf
Free/priced:	Free
Objectives:	The objectives of this review are to define the current state of knowledge concerning the relationship between age-related cognitive or physical disabilities and driving, and to describe the "state of the art" methods available of testing for driving ability those with age-related cognitive and physical impairments. One of the outcomes of this research will be a suggested assessment system for older drivers.
Methodology:	The literature review is divided into six parts, each concerned with the discussion of individual topics such as conditions that may impact driving, assessment instruments and licencing provisions.
Key Findings:	<ul style="list-style-type: none"> • The most important sensory declines with “normal” aging in terms of driving ability are visual, including narrowing of the sensory visual field, impaired detection of angular motion and declining contrast sensitivity • The most important perceptual/cognitive defects that tend to come in the course of normal aging appear to be narrowing of the attentional visual field and declines in speed of information processing. • Motor abilities also decline, but of these oculomotor functioning is probably the most important for driving.
Keywords:	Older drivers; Age-related disabilities; Medically impaired drivers; Dementia; Frailty; Licensing programs for older drivers; Assessment methods
Comments:	This work is part of a wider program of research conducted by the Department of Motor Vehicles in the USA. There is no information on how the literature review was carried out, but the author mentions that the review is a limited overview of the existing literature.

Title:	Older drivers, crashes and injuries
Published:	Koppel, S., Bohensky, M., Langford, J., & Taranto, D. (2011). Older drivers, crashes and injuries. <i>Traffic Inj Prev.</i> ;12(5): 459-67.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/21972856
Free/priced:	Priced
Objectives:	This article aimed to identify the main features of older driver casualty crashes, including detailed descriptions of injury outcomes.
Methodology:	Data were obtained from the Transport Accident Commission insurance claims database for drivers aged 41 to 55 years and aged 65 years and older. These were used for comparison.
Key Findings:	<ul style="list-style-type: none"> • When two groups of drivers (ages 45-64 and 65 and over) were compared, significant differences were found in terms of the types of injuries sustained from accidents. • Middle-aged drivers were more likely to sustain neck injuries (30.6% compared with 12.1% of older drivers), • Older drivers were more likely to suffer an injury to the thorax region (30.9% vs 18.5% of middle aged drivers).
Keywords:	Older drivers; Crash risk; Crash scenarios; Injury patterns; Safety
Comments:	

Title:	The social and policy predictors of driving mobility among older adults
Published:	Kulikov, E. (2011). The social and policy predictors of driving mobility among older adults. J Aging Soc Policy.; 23(1): 1-18.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/21207303
Free/priced:	Priced
Objectives:	The aim of this research is to identify the impact of state driver's license renewal requirements on the driving mobility (i.e., the reduction or cessation of driving) of older (70 years or older) drivers in the United States.
Methodology:	Nationally representative data from four waves (1993-2000) of the Asset and Health Dynamics of the Oldest Old study were linked to state policies on relicensing and used in a longitudinal logistic regression analysis. Data for 9,638 men and women was included in the study.
Key Findings:	<ul style="list-style-type: none"> • State driver's licence renewal requirements in the United States made a significant difference in the driving mobility of older Americans. • self-regulation (by reducing driving) is not the only explanation for a reduction in driving mobility among older drivers. • Living alone, education and, interestingly, restricted licencing policies, were significantly related to prolonged driving.
Keywords:	Longitudinal; Mobility; Restricted licensing; States' Policies; Transportation
Comments:	

Title:	Driving choices for the older motorist: The role of self-assessment tools
Published:	Lang, B., Parkes, A. & Fernández-Medina, K. (2013) RAC Foundation
Link:	http://www.racfoundation.org/assets/rac_foundation/content/downloadables/driving_choices_for_the_older_motorist_lang_parkes_and_fernandez_medina_0213.pdf
Free/priced:	Free
Objectives:	To gain an understanding of the potential role of self-assessment tools in supporting older driver safety through a review of existing literature.
Methodology:	Literature review and consultation with experts and practitioners in the field of older driver safety.
Key Findings:	<p>There are a number of self-assessment tools available to the public; however, they are mostly one element in a more extensive resource provision for older drivers.</p> <p>Self-assessment tools cannot replace more formal evaluations methods, but can help drivers self-refer for further assessment, or may help to promote conversations with GP or family members.</p> <p>To date, there is little evidence of the validity or transferability of self-assessment tools, and more effort is needed in this area.</p>
Keywords:	Older drivers; Self-assessment; self-evaluation; Tools; Cognitive; Motor; Sensory; Decline
Comments:	Review of literature and consultation with experts

Title:	Older drivers do not have a high crash risk - a replication of low mileage bias
Published:	Langford, J., Methorst, R., & Hakamies-Blomqvist, L. (2006). Older drivers do not have a high crash risk--a replication of low mileage bias. <i>Accid Anal Prev</i> ; 38(3): 574-8.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/16426560
Free/priced:	Priced
Objectives:	<p>the aims are of this study are as follows:</p> <ul style="list-style-type: none"> • To demonstrate the association between annual distance driven and crash involvement; • To determine whether there is an association between age of driver and crash involvement, controlling for annual distance driven.
Methodology:	<p>Survey participants were selected from the Dutch Periodical Regional Traffic Safety Survey. 8569 respondents received a questionnaire in 2004 with questions about traffic issues and behaviour for the year 2003.</p> <p>Data from the 1990–1995 and 1997, 1999, 2001 and 2003 travel surveys was also obtained and combined to determine the crash rates for different age groups.</p>
Key Findings:	<ul style="list-style-type: none"> • Different driver age groups cannot be validly compared for crash involvement, if crash rates have been calculated solely on the basis of distance travelled. • The present study has shown that after being matched for yearly driving distance, most drivers aged 75 years and above were safer than younger age groups. • Only low mileage older drivers (just over 10% of older drivers in the survey) indicated a relatively high self-reported crash rate.
Keywords:	Older drivers; Low mileage bias; Crash risk
Comments:	

Title:	The greying of the baby boomers: A century-long view of ageing in European populations
Published:	Lanzieri, G. (2011) Eurostat
Link:	http://ec.europa.eu/eurostat/documents/3433488/5578868/KS-SF-11-023-EN.PDF/882b8b1e-998b-454e-a574-bb15cc64b653
Free/priced:	Free
Objectives:	This article provides population projections and assesses the population ageing trend of European countries. The author uses Eurostat data (using 1960 as the base year) to create comparisons and tables, as well as projections as to what the population composition is likely to be toward 2060.
Methodology:	Data analysis of Eurostat data stored in online demographic databases.
Key Findings:	<ul style="list-style-type: none"> • By 2060, the median age for people will increase by 50% • Family structure may also see a change from a 'horizontal' composition (more siblings) to a more 'vertical' composition (more generations), as great-grand parents become more common • This shift toward increasingly older populations is happening at different rates for different countries
Keywords:	Eurostat; Ageing; Statistics; Population trends

Title:	Attentional networks functioning, age, and attentional lapses while driving
Published:	Lopez-Ramon, M. F., Castro, C., Roca, J., Ledesma, R. & Lupiañez, J. (2011). Attentional networks functioning, age, and attentional lapses while driving. <i>Traffic Injury Prevention</i> , 12(5): 518–528.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/21972863
Free/priced:	Priced
Objectives:	To explore the relationship between age and personal proneness to attention-related errors while driving.
Methodology:	The functioning of attentional networks were explored by means of attentional behavioural measures and self-report data in a sample of 55 Argentinian drivers.
Key Findings:	<ul style="list-style-type: none"> • Older participants showed a slowdown in performance and worse cognitive control when solving conflict in comparison with younger drivers. • Drivers reporting the greatest propensity to experience attention-related errors showed an overall slowdown in performance • It can be inferred that older drivers might show a reduction of the general state of alertness to signs that indicate the presence of a dangerous driving situation and in solving conflict in traffic circumstances.
Keywords:	Driving distraction; Age; Attentional networks; ANTI; ARDES

Title:	Age, executive function, and social decision making: A dorsolateral prefrontal theory of cognitive aging
Published:	MacPherson, S. E., Phillips, L. H. & Della Sala, S. (2002). Age, executive function, and social decision making: A dorsolateral prefrontal theory of cognitive aging. <i>Psychology and Aging</i> , 17(4): 598–609.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/12507357
Free/priced:	Priced
Objectives:	This study assessed the age effects on three tasks of executive function and working memory; and three tasks of emotion and social decision making.
Methodology:	Three age groups involving 30 healthy participants in each (15 men, 15women) performed eight tasks which were the counterbalanced. Measures included related to functions shown to activate different brain regions.
Key Findings:	<ul style="list-style-type: none"> • Age-related differences in performance were found on all tasks dependent on dorsolateral prefrontal dysfunction. • In contrast, age-related differences were not found on the majority of the tasks dependent on ventromedial prefrontal dysfunction. The results support a specific dorsolateral prefrontal theory of cognitive changes with age, rather than a global decline in frontal-lobe function.
Keywords:	Adult; Aged; 80 and over; Aging/psychology; Cognition; Decision Making; Memory; Middle Aged; Prefrontal Cortex/physiology; Social Behavior; Task Performance and Analysis

Title:	Long-term Effect of Physical Activity Counseling on Mobility Limitation Among Older People: A Randomized Controlled Study
Published:	Mänty, M., Heinonen, A., Leinonen, R., Törmäkangas, T., Hirvensalo, M., Kallinen, M., Sakari, R., von Bonsdorff, Eino Heikkinen, M.B., & Rantanen, T. (2009). Long-term effect of physical activity counseling on mobility limitation among older people: a randomized controlled study. <i>J Gerontol A Biol Sci Med Sci.</i> ; 64(1):83–89.
Link: Free/priced:	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2691194/ Priced
Objectives:	To study the effect of physical activity counseling on mobility among older people and evaluated whether counseling-induced benefits persist after cessation of the intervention.
Methodology:	A two year randomised controlled trial with 632 participants aged 75-81.
Key Findings:	<ul style="list-style-type: none"> • The treatment effect was significant at the 2-year follow-up and remained significant 1.5 years post intervention • Their results showed that there was a significant treatment effect (when compared with a non-contact control group) of the outcome measure: perceived difficulty walking
Keywords:	Aging; Disability; Mobility limitation; Physical activity; Promotion
Comments:	

Title:	Driving cessation and increased depressive symptoms: prospective evidence from the New Haven EPESE (Established Populations for Epidemiologic Studies of the Elderly)
Published:	Marottoli, R., Mendes de Leon, C., Glass, T., Williams, C., Cooney, L. J., Berkman, L. F. & Tinetti, M. (1997). Driving cessation and increased depressive symptoms: prospective evidence from the New Haven EPESE (Established Populations for Epidemiologic Studies of the Elderly). <i>Journal of the American Geriatrics Society</i> , 45(2): 202–206.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/9033520
Free/priced:	Priced
Objectives:	The purpose of this study was to determine the association between driving cessation and depressive symptoms among older drivers.
Methodology:	<ul style="list-style-type: none"> • A driving survey was administered in 1989 to surviving members of the New Haven Established Populations for Epidemiologic Studies of the Ageing (EPESE) cohort. • Information about independent and dependent variables other than driving status came from the in person EPESE interviews in 1982, 1985, and 1988, except for medical conditions, which were updated yearly. • Depressive symptoms were assessed by the Centers for Epidemiologic Studies-Depression (CES-D) scale.
Key Findings:	<ul style="list-style-type: none"> • Individuals who stopped driving exhibited substantial increases in depressive symptoms during the 6-year interval. • Driving cessation was among the strongest predictors of increased depressive symptoms
Keywords:	Aged/psychology; Automobile Driving; Connecticut Depression/etiology; Health Status; Longitudinal Studies
Comments:	

Title:	Cognitive predictors of unsafe driving in older drivers: a meta-analysis
Published:	Mathias, J. L. & Lucas, L. K. (2009). Cognitive predictors of unsafe driving in older drivers: a meta-analysis. <i>International Psychogeriatrics</i> , 21(4): 637–653.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/19470197
Free/priced:	Priced
Objectives:	The objectives of the study were to provide an evidence-based method for screening drivers by undertaking a meta-analysis of research examining the cognitive predictors of driving ability in older drivers.
Methodology:	A search of literature published between 1980 and 2007 was undertaken of the PubMed, PsycINFO, CINAHL, and Health-Source Nursing electronic databases in order to identify studies that examined cognitive differences between drivers aged over 55 years who either passed or failed a driving assessment. Studies using on-road driving, simulator driving assessments, and studies using driving problems as a measure of performance were included.
Key Findings:	A measure of processing speed and attention (as measured by the Useful Field of View test) was the only test that served as a good predictor of performance on all three types of driving assessment.
Keywords:	Cognition; Driving; Older drivers; meta-analysis
Comments:	

Title:	The licensing of older drivers in Europe- a case study.
Published:	Mitchell, C.G. (2008). The licensing of older drivers in Europe- a case study. <i>Traffic Inj Prev.</i> ; 9(4): 360-6.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/18696393
Free/priced:	Priced
Objectives:	This paper presents a case study of the different older driver licensing procedures in seven European countries and addresses the association between these procedures and older driver safety.
Methodology:	The seven countries studied consist of France, The Netherlands, the United Kingdom, Denmark, Finland, Norway, and Sweden. The first-mentioned three countries have the most relaxed license renewal procedures and least demanding medical examination requirements; this provides the opportunity to observe the effects of licence renewal procedures on older drivers.
Key Findings:	<ul style="list-style-type: none"> • There is no evidence that any license renewal procedure or requirement for a medical examination has an effect on the overall road safety of drivers aged 65+ • the countries with the least demanding requirement for medical examinations (France, the Netherlands, the UK, and Sweden) have the highest level of driving licence holding for drivers aged 65 and over. • The UK and the Netherlands (more lax re-licencing procedures) had the lowest fatality rate per population.
Keywords:	Older drivers; Licence renewal; European practices; Safety
Comments:	

Title:	Older drivers: A review
Published:	Mitchell, K. (2010). Older drivers: a review. In E. Box, J. Gandolfi and K. Mitchell: Maintaining Safe Mobility for the Ageing Population, London: RAC Foundation.
Link:	http://www.racfoundation.org/assets/rac_foundation/content/downloadables/maintaining%20safe%20mobility%20-%20rac%20foundation%20-%20140410%20-%20report.pdf
Free/priced:	Free
Objectives:	This review is part of a collection of papers entitled 'Maintaining safe mobility for the ageing population: The role of the private car' commissioned as a follow-up to the 2009 RAC foundation report 'The car in British society'. It covers the mobility and safety of older drivers, comparisons between male and female drivers, licensing procedures, road design and education and refresher training.
Methodology:	Review of national statistics and existing research on older drivers.
Key Findings:	The UK has an ageing population and increasing numbers of older people are remaining independently mobile later in life. This trend needs to be fully recognised by government and appropriate policies developed.
Keywords:	Older drivers, crash involvement, licencing procedures, road design, education
Comments:	This is not meant as a comprehensive, systematic review of all existing literature on the topic.

Title:	The licencing and safety of older drivers in Britain
Published:	Mitchell, C.G.B. (2013) The licensing and safety of older drivers in Britain. Accident Analysis and Prevention, 50, p. 732-741.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/22831499
Free/priced:	Priced
Objectives:	To provide an analysis of the number of fatalities for drivers of different ages in Britain using demographic projections, forecast licence holding and the trends in fatality rates. The focus is on older road users.
Methodology:	The author uses data from Great Britain, including data from the DfT and the National Travel Survey, to create graphs and current statistics.
Key Findings:	Key findings include: <ul style="list-style-type: none"> • The number of car driver fatalities aged 70 and over was highest between 1990 and 2004, and has subsequently reduced by almost 40% • For drivers aged 80 and over, fatalities peaked in 2004 and the number has subsequently reduced by almost 50% • Fatality rates for older road users are increased by the fragility of older persons. • The safety of older drivers is improving faster than that of younger age groups.
Keywords:	Driver licence forecast; Car driver fatality forecast; Safety older drivers; Risk to other road users; Fragility of older persons
Comments:	

Title:	Driving avoidance by older adults: Is it always self-regulation?
Published:	Molnar, L.J., Eby, D.W., Charlton, J.L., Langford, J., Koppel, S., Marshall, S. & Man-Son-Hing, M. (2013). Driving avoidance by older adults: is it always self-regulation? <i>Accid Anal Prev.</i> 57: p. 96-104.
Link:	http://www.ncbi.nlm.nih.gov/pubmed/23659865
Free/priced:	Priced
Objectives:	The purpose of this study was to examine self-regulatory practices among older adults at multiple levels of driver performance and decision making, taking into account the specific motivations for avoiding particular driving situations or engaging in other driving practices.
Methodology:	Study participants completed a computer-based questionnaire on driving self-regulation.
Key Findings:	<ul style="list-style-type: none"> • This study examined self-regulation of driving among older adults. • Results suggest that self-regulation cannot be defined simply by avoiding driving situations. • Reasons for driving avoidance were often more closely related to lifestyle or preferences.
Keywords:	Self-regulatory practices; Mobility; Older drivers
Comments:	

Title:	Why do older drivers have more 'failed to look' crashes? A simulator based study
Published:	Reed, N., Kinnear, N. & Weaver, L. (2012) Transport Research Laboratory
Link:	https://trl.co.uk/reports/PPR635
Free/priced:	Free
Objectives:	Many studies have shown that older drivers are over-represented in intersection or right of way accidents. 'Failure to look' has been identified as the most prevalent contributory factor in these types of crashes. In light of this, the present study aimed to further understand this problem by mapping the correlation between 'failed to look' errors and vision deficits in older drivers.
Methodology:	32 participants ranging in ages from 17 years to 75+ years old were divided into four age groups and tested on a number of visual and response tests. These were completed between six different driving scenarios presented on a driving simulator.
Key Findings:	Results showed that participants in the older-old group (75+) were unable to detect targets presented more than 180° around from their head position to the left and right (poor neck flexibility). In terms of the driving task, they found that at crossroads, older drivers (64+ years old) spent less time looking left and right when waiting at a crossroads when traffic was present.
Keywords:	'Failed to look' crashes; Older drivers; Simulator; Vision; Motor; Cognitive
Comments:	

Title:	Interventions to maintain mobility: What works?
Published:	Ross, L.A., E.L. Schmidt, and K. Ball. (2012). Interventions to maintain mobility: What works? <i>Accid Anal Prev. In press.</i>
Link:	http://ac.els-cdn.com/S0001457512003442/1-s2.0-S0001457512003442-main.pdf?_tid=fe7e6ca2-55e8-11e3-a9a0-00000aacb35e&acdnat=1385394674_56c5eb55e78daee3fb85a11e60f0ff8b
Free/priced:	Priced
Objectives:	The purpose of the study was to review the literature available on interventions for maintaining mobility.
Methodology:	An electronic search of PubMed was carried out using a systematic combination of three qualifiers: targeted intervention approaches, dependent variable of interest, and a sample qualifier (i.e. 'older adult'). Only research in English between 1990 and 2012 that met pre-established criteria was considered for review.
Key Findings:	<p>81 articles met the criteria set out by the authors. The interventions could be classified under three types: cognitive training, educational interventions and exercise.</p> <p>Most studies identified were evaluating exercise-based interventions, though these were diverse in terms of content, presentation, and duration. In addition, only one study used driving performance as the outcome measure.</p> <p>Authors conclude that cognitive training and exercise-based interventions hold the most promise, though more research is needed to develop personalised interventions for drivers with different levels of difficulty.</p>
Keywords:	Mobility; Intervention; Training; Older adults; Driving; Lifespan
Comments:	

Title:	Selective review of cognitive aging
Published:	Salthouse, T. A. (2010). Selective review of cognitive aging. <i>Journal of International Neuropsychological Society</i> , 16: 754–760.
Link:	http://faculty.virginia.edu/cogage/publications2/Salthouse%20(2010)%20Selective%20review%20of%20cognitive%20aging.pdf
Free/priced:	Free
Objectives:	To describe some of the major questions and findings in the field of cognitive aging.
Methodology:	Review of literature and expert knowledge.
Key Findings:	<ul style="list-style-type: none"> • There is consensus on the general pattern of age-cognition relations. • There is nearly linear decline from early adulthood on measures representing efficiency or effectiveness of processing. • There is good evidence to show this decline is replicated when measures such as neuropsychological tests are used
Keywords:	Cognitive aging; Cross-sectional; Longitudinal; Variability; Moderators; Mediators
Comments:	

Title:	Older drivers: On-road and off-road test results
Published:	Selander, H., Lee, H.C., Johansson, K., & Falkmer, T. (2011)
Link:	http://hj.se/download/18.1590596b1327cba6d1580003151/1317038523082/OlderDrivers-Selander+et+al_2.pdf
Free/priced:	Priced
Objectives:	To investigate what types of driving errors are characteristic for older drivers without cognitive impairments affecting their fitness to drive, and to identify any relationships between off-road and on-road tests results.
Methodology:	85 participants were draw from the Vehicle Registration Office in Sweden. Participants completed a number of tests, including an on-road assessment, and self-report measures.
Key Findings:	<ul style="list-style-type: none"> • 21% of the participants failed the on-road assessment • Some of the older drivers, without cognitive impairments impacting on their driving, displayed questionable driving behaviour. • Authors believe that these findings indicate that we should be aware of the fact that some specific problems or errors can actually be “normal driving behaviours” • The current identified two cognitive subtests, which correlated to the result of the on-road assessment
Keywords:	Fitness to drive; Off-road assessment; Older driver; On-road assessment
Comments:	

Title:	The premature reduction and cessation of driving by older men and women
Published:	Stutts, J.C., Wilkins, J.W., Reinfurt, D.W., Rodgman, E.A. & Van Heusen-Causey, S. (2001, April) Highway Safety Research Center, University of North Carolina
Link: Free/priced:	https://www.researchgate.net/profile/Eric_Rodgman/publication/228483526_The_premature_reduction_and_cessation_of_driving_by_older_men_and_women/links/551bcb3e0cf2909047b9661c.pdf Free
Objectives:	To understand factors associated with premature driving reduction or cessation that might be remediated by interventions such as education, training and vehicle design. The study also looked to better understand older drivers attitudes toward driving and the impact of driving cessation on their lives.
Methodology:	The project was carried out in different phases and included focus groups and survey data.
Key Findings:	Older females tend to stop driving more prematurely than males. These are usually women who never enjoyed driving, felt uncomfortable with current traffic conditions, or had someone available to drive them. Females also tend to quote discomfort with driving situations as a reason for driving cessation more often than males, while males tend to link it to medical reasons. Women tended to be less happy with their current mobility situation and recognised that they may need to drive in the future.
Keywords:	Older drivers; Driving cessation; Driving reduction; Premature
Comments:	

Title:	The relationship between cognitive ability, insight and self-regulatory behaviours: Findings from the older driver population
Published:	Wong, I.Y., Smith, S.S., & Sullivan, K.A., (2012). The relationship between cognitive ability, insight and self-regulatory behaviors: Findings from the older driver population. <i>Accident Analysis & Prevention</i> . 49: p. 316-321.
Link:	http://www.sciencedirect.com/science/article/pii/S0001457512002163
Free/priced:	Priced
Objectives:	To explore the relationship between older drivers' cognitive ability, their driving confidence, and their use of self-regulatory practices.
Methodology:	A convenience sample of seventy Australian drivers completed a questionnaire about their driving and a brief screening measure of cognitive performance (the Clock Drawing Test - CDT).
Key Findings:	A number of drivers performed poorly on the CDT, and were used as a comparison group to those who performed within normal levels. Drivers who failed the cognitive test were significantly less likely to report driving self-regulation, showed less interest in taking part in driving programs, and were no different to the other group in terms of their expectation to continue driving in the foreseeable future.
Keywords:	Driving; Older adults; Driving self-regulation; Insight; Cognitive ability
Comments:	

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