

Holding back the gears:

The ageing process and driver safety



Holding back the gears: The ageing process and road safety

As the UK's leading road safety charity, the IAM supports the raising of driving and riding standards and campaigns for increased skills.

Our 'Skill for Life' programmes help people to become more skilled, controlled and confident on the road - helping to make every trip more relaxing, more enjoyable and safer.

IAM – dedicated to raising driving standards and helping save lives on our roads.

For more information visit
www.iam.org.uk

Introduction

As life expectancy rises, the number of older people in the UK is set to rapidly increase. In twenty years, one in ten people will be over 80 years old¹ and the number of people over 100 will have increased by 475 per cent².

Responding to an older population will become a significant policy issue for transport; a much larger number of people are now requiring help with their mobility and more older people are driving than ever before.

This change has created a road safety debate, with some claiming that older drivers can no longer be safe after a certain age. However, accident statistics show that older drivers tend to be much safer than younger ones, although they are overrepresented in certain types of crashes.

We commissioned the Transport Research Laboratory (TRL) to look at how the ageing process affects driver behaviour. They carried out a wide range of tests that go beyond

simply looking at accident rates. This report summarises their findings and considers how we can respond; it covers:

- Future trends in driver numbers
- Accident trends for older drivers
- TRL's research findings
- The ageing process and driver behaviour

The policy implications for responding to an ageing population are urgent and the IAM want to see;

A government action plan for older drivers

More car manufacturers considering older drivers in vehicle design

Better information for older drivers and their families

Online self-assessment tools for older drivers

Wider availability of voluntary on-road driving assessments

Better partnership working at a local level

Greater publicity to encourage health professionals to discuss driving

¹ Based on ONS population projections - currently one in twenty people are over 80.
² From 14,500 in 2012 to 83,800 in 2032.

Holding back the gears: The ageing process and road safety

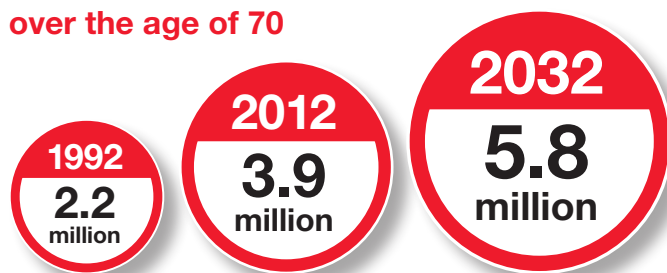
The ageing population and driving

Over the last twenty years there has been a 72 per cent increase in the number of licence holders over the age of 70. It is clear that a significant change has already taken place, however, a much more dramatic increase in older drivers is imminent as the 'baby boomer' generation reach retirement age and beyond.

Conservative calculations using current licence figures from the DVLA and ONS population projections predict how many older drivers there will be in the future.

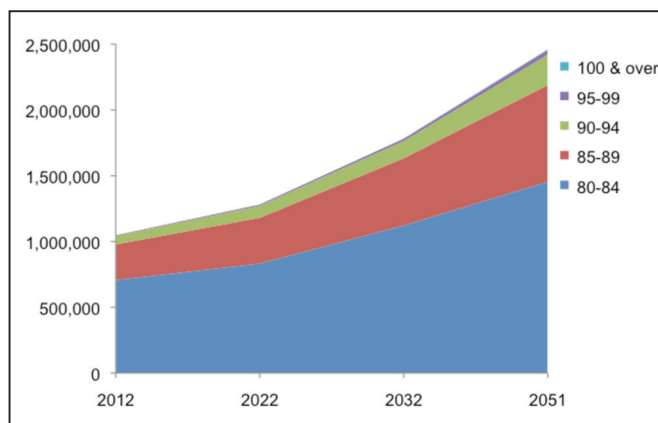
It shows that the number of older drivers will continue to grow dramatically over the next thirty years; we believe the number of licence holders over 70 will increase by at least 49 per cent by 2032.

Number of licence holders over the age of 70



The number of much older drivers is likely to rise even more than this, as people will stay healthier for longer. Even based on conservative estimates there will be almost two million drivers over the age of 80 by 2032, twice the current population of Birmingham.

Licence holders over 80



As well as demographic changes, there are social factors behind the rise in older drivers. Levels of vehicle ownership rose dramatically over the last fifty years and a generation committed to their cars are now reaching retirement age. In 1975/76 only 15 per cent of people over 70 years old had a driving licence, now almost 60 per cent do.

Older people and safe driving

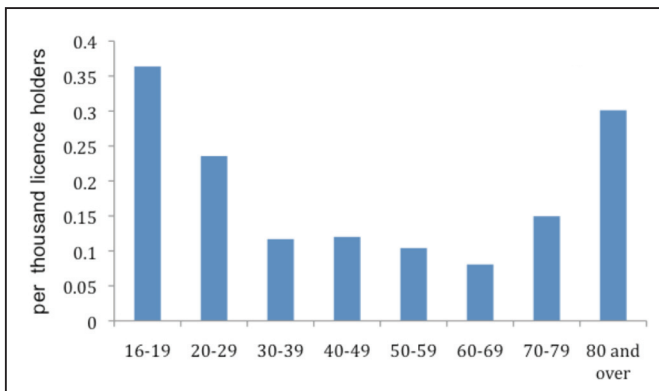
This change in population and a small number of cases where older drivers have killed or seriously injured other people have raised concerns and has created a debate around safe driving. There is currently no age limit for holding a driving licence and drivers over 70 self-certify their fitness. This has led to calls for an age limit or compulsory retesting.

However, previous analysis by the IAM found that older drivers are involved in a smaller number of injury accidents than drivers under the age of 60³.

³ IAM, 2010 'Older Drivers – Safe or unsafe?'

In 2011, people over 70 made up nine per cent of drivers but six per cent of driver casualties, while drivers under 30 made up 20 per cent of drivers but 35 per cent of casualties⁴. Studies show that the accident rate per mile is similar for older drivers and younger adults.

Number of killed and seriously injured drivers per thousand licence holder



Age	Number of drivers killed or seriously injured	Rate per thousand licence holder
16-19	557	0.36
20-29	1671	0.24
30-39	919	0.12
40-49	996	0.12
50-59	739	0.10
60-69	539	0.08
70-79	422	0.15
80 and over	316	0.30

Although older drivers tend to be safer, their age-related frailty makes them more vulnerable to suffering an injury. This means that over the age of 80 people become overrepresented in casualty figures. Previous

research found that older drivers are more likely to die due to health complications after their accident and that frailty or a pre-existing health condition was involved in a higher proportion of their deaths⁵.

Causes of older driver's accidents

Contributory factors for accidents are recorded by the police and show clear differences between age groups. They indicate that older drivers have a more cautious driving style and they are less likely to be involved in accidents caused by:

- Being careless, reckless or in a hurry
- Travelling too fast for the conditions
- Sudden braking
- Exceeding the speed limit
- Being impaired by alcohol

Although 'failed to look properly' is the most common factor for all age groups it is particularly high among drivers over 70 (30 per cent compared to 19 per cent of those aged 25 – 69). Factors that can be associated with deteriorating physical and cognitive functioning are also more likely to feature in the accident reports for drivers over the age of 70.

These include:

- Failed to judge other person's path or speed
- Poor turn or manoeuvre
- Loss of control
- Illness or disability
- Dazzling sun
- Nervous, uncertain or panic

⁴ Department for Transport 'Reported road casualties Great Britain 2011'
⁵ Kent, R et al, 2005 'On the fatal crash experience of older drivers'

Holding back the gears: The ageing process and road safety

The last three factors are rarely recorded in accidents involving drivers aged 25-69, and suggest that the ageing process could have an effect on driver safety.

The research

With a particular focus on why older drivers have more 'failed to look' crashes, we commissioned the Transport Research Laboratory (TRL) to investigate how the ageing process affects driver behaviour.

The research team conducted a series of tests to compare the driving behaviour of different ages. The study looked at the differences between these groups:

- 17-26 year olds
- 34-55 year olds
- 64-74 year olds
- 75+ year olds

Thirty-two participants took part in the study, eight from each age group. The small sample size reflects the in-depth nature of the research, with participants completing a series of driving simulator tasks, exercises and questionnaires over a number of hours.

Research tasks

The study aimed to cover all aspects of driver behaviour. TRL used a review of existing research on driving and the ageing process to carefully design and select the tasks. They looked at six main areas.

Driving behaviour

Participants completed six drives in TRL's driving simulator, replicating common real life driving situations.

Reaction times

Reaction times were measured in the driving simulator and through a test requiring a response to an LED light.

Visual ability

Participants completed

- A simple distance sight test
- A test to identify objects
- A test on peripheral vision and field of view

Visual behaviour

Researchers also tested visual behaviour, looking at the number and length of glances in the driving simulator.

Driver attitudes

Participants were asked to complete two questionnaires, one on driver behaviour and one on their attitudes.

Physical ability

Researchers tested participants' neck flexibility while driving, measuring the maximum angle for detecting and recognising pictures over their shoulder.

The following sections look at some of the key results from TRL's research. The full report 'Why do older drivers have more 'failed to look' crashes? A simulator based study' is available at iam.org.uk



Driving simulator tasks

A driving simulator is an ideal tool for understanding how the ageing process affects driver behaviour. A simulator allows participants to experience exactly the same scenarios as each other, for example a pedestrian walking into the road at exactly the same moment.

A driving simulator allows researchers to create hazards in a completely safe environment. It enables scientific analysis of driving habits such as speed, brake force, and travelling distances. Researchers can also measure reaction times and participant's attention, e.g. the amount of time spent looking at junctions.

The state of the art TRL driving simulator uses a medium sized family hatchback (Honda Civic), surrounded by video projection screens. It has all the attributes of a normal car, including the use of the vehicle's driving and wing mirrors.

Driving simulator tasks

Participants completed these six driving simulator tasks replicating different real life situations.

Pedestrian hazard

A person walks out from behind a parked vehicle

Braking is required but not an emergency response

Participants are asked the colour of the person's top

Crossroads no vehicles

Participants are required to continue straight ahead at a crossroads

No other traffic is present during the crossing

Braking vehicle

Participants travel behind a vehicle which brakes suddenly without warning.

A reaction is required but not an emergency response

Emerging hazard

Participants drive on a country lane

The roads become hedge-lined with several obscured entrances

A vehicle emerges from one of the entrances on the left

Crossroads with vehicles

Participants are required to continue straight ahead at a crossroads

Traffic passing from the right

Participant is asked to recall the colour of the last vehicle that passed before they proceeded

Motorway driving

Participants drive on a motorway

No hazards are presented but there is traffic

Researchers measured participants' speed, their distance between vehicles and their lane choice

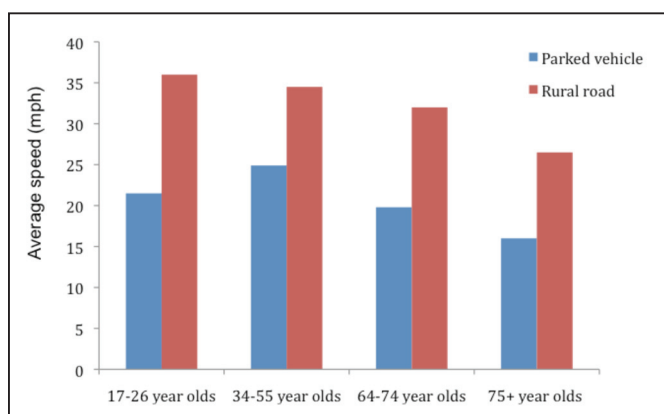
Holding back the gears: The ageing process and road safety

Speed when approaching hazards

The results show some key differences between ages, some of these suggest that older drivers are more cautious. For example, older participants tended to drive at slower speeds on all of the tasks.

The older groups had the slowest average speed when approaching a potential hazard. This chart shows average speeds for negotiating a parked vehicle, and driving down a rural road with an obscured view.

Speed when approaching potential hazards



Drivers over 75 drove at around 16 mph when negotiating a parked vehicle, while drivers in the 34-55 year old group drove an average of 24 mph with some going over 30mph.

Older drivers also tended to stay a longer distance behind the vehicle in front. On the motorway task drivers in the 75+ age group kept around 120 metres distance, while the other age groups were more likely to keep around 60 to 80 metres.

Drivers over 64 years old maintained their chosen distance just as consistently as the younger age groups.

Although drivers over 75 years old kept a safer distance on the motorway task, they did show a greater tendency to use the middle lane.

Behaviour at crossroads

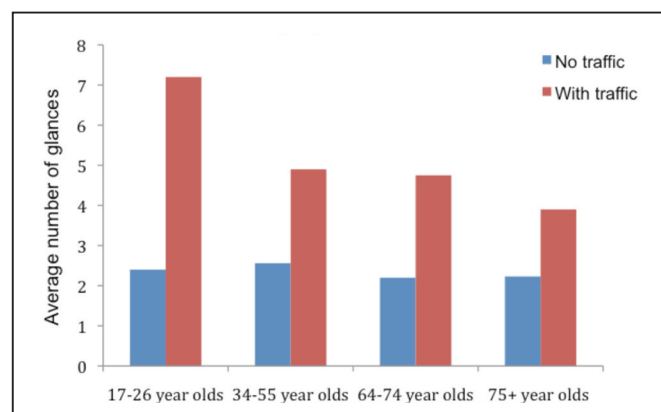
There were two simulator tasks involving crossroads, one with and one without traffic. On both tasks there were no visible age differences for:

- Driving speeds on the approach
- Braking on the approach
- Accelerating away

The researchers measured participants' visual activity. The different age groups had broadly similar visual behaviour when there was no other traffic; looking left and right a similar number of times. However, clear age differences emerge when there is traffic, with older drivers failing to look as many times as the younger age groups.

Although all age groups significantly increase the number of glances they make to the right into oncoming traffic, older drivers do not increase the number of glances as dramatically.

Looking right at crossroads



Participants in the 17-26 year old age group make three times⁶ as many glances right when they can see that traffic is present, while participants in the 75 year plus age group only made twice as many glances right. Although the two middle age groups appear to look a similar number of times, drivers between 64-74 spent much less time looking than drivers between 34-55 years old.

This potentially increases the risk of older drivers being involved in accidents where they ‘fail to look’. There are ways of preventing this issue from occurring, for example a simple driver coaching session could help older drivers recognise when they are failing to look.

Interestingly, there were no major age differences in how many times the drivers checked their rear view mirror on the approach to the crossroads. In all age groups a number of participants failed to do so. However, older drivers were less likely to check their rear view mirror on the motorway. This again suggests that older drivers could benefit from coaching on how often to look.

Older drivers also tended to stop further from the stop line at the crossroads, particularly when traffic was present putting them at a greater distance from the traffic and potentially adding to the time taken to negotiate the hazard.

Reaction times

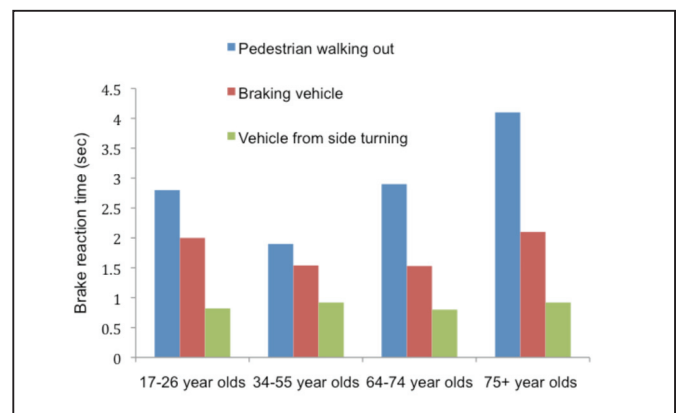
The researchers looked at reaction times using a test requiring a response to an LED light. The test required participants’ to recognise that a response was required and then move their hand to make the response.

Reaction times appeared to decrease with age, although the ability to make rapid coordinated movements tended to decline before the mental processing requiring the response. However, this test was measured in milliseconds and there was less than a second apart between participants’ reaction times, suggesting that age differences in reactions are small.

The driving simulator also measured reaction times by calculating the time between a hazard appearing and the driver pressing the brake pedal. It found that there are no significant age differences in reaction times for:

- Needing to brake when a vehicle suddenly emerges from a side turning
- Needing to brake when a vehicle in front brakes unexpectedly on a motorway

Brake reaction times



Older drivers were slower to react to a pedestrian walking out from behind a parked vehicle; participants aged 75 plus took around one second longer to brake after the pedestrian walked out creating a visible difference in reaction time.

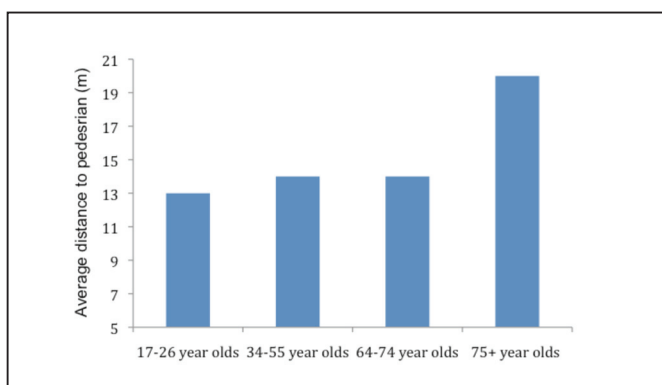
⁶ On average

Holding back the gears: The ageing process and road safety

Although older drivers took around a second longer to react, their lower speeds meant they actually stopped further from the pedestrian than drivers in the younger age groups.

This chart shows that drivers over 75 stopped an average of 20 metres away from the pedestrian while 17-26 year olds stopped an average of 13 metres away. These results suggest slightly slower reaction times are mitigated by driving at lower speeds.

Average safety margin to pedestrian



Driver behaviour questionnaire

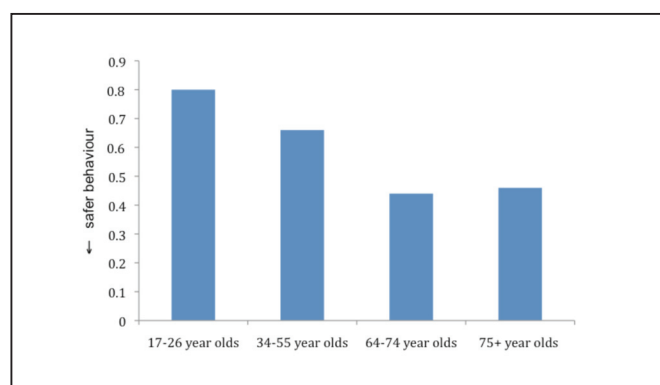
A driving behaviour questionnaire asked participants how often they find themselves in particular driving situations, they answered on a five point scale ranging from 0 for never to five for nearly all the time.

The researchers measured the results for four areas: violations, errors, lapses and positive behaviour. Interestingly, there were no significant differences between age groups for errors, lapses and positive behaviour.

However, the results show that younger drivers produce a higher than average score for driving violations, indicating that they are

much more likely to commit violations than the older age groups.

Driver behaviour questionnaire violation scores (mean score)



Driver attitude questionnaire

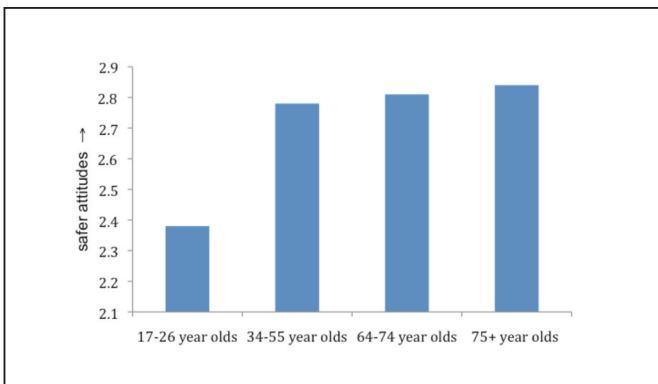
Participants also completed a questionnaire on driving attitudes. This looked at drink driving, close following of other vehicles, risky overtaking and speeding. The questionnaire asked for the level of agreement on a range of statements, such as 'close following is not really a serious road safety problem'; again participants gave responses on a five-point scale.

There were no significant differences between ages in the results for speeding and drink driving. For close following, older drivers gave scores indicating safer attitudes, they also gave more consistent responses⁷.

The 17-26 year old group had the lowest average score, indicating the least safe attitudes, while the 34-55 year old group were the most inconsistent in their responses.

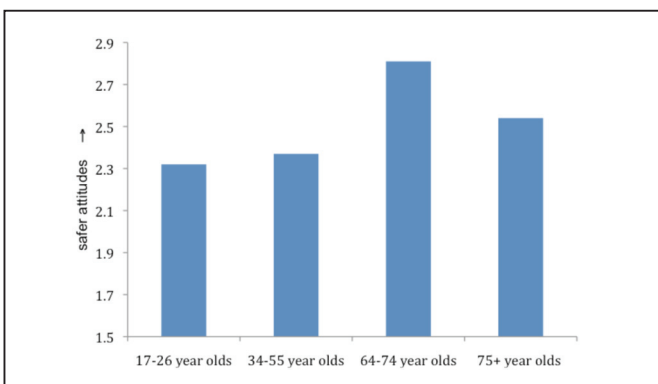
⁷ Illustrated in the full report

Driver attitudes to close following



Both of the older age groups also produced higher average scores on dangerous overtaking, again indicating safer attitudes. The 64-74 year old group had the safest average score.

Driver attitudes to risky overtaking



Physical ability

Researchers measured participants' neck flexibility while they sat in a driving position by asking them to look at a picture behind them and say what was on the picture.

They found that neck flexibility tended to decrease with age. Drivers in the 75+ age

group could turn their head an average of 170 degrees in total (from left to right), while the 17-26 year olds could turn their head 200 degrees on average.

However, all of the participants had neck flexibility suitable for safe driving and some older drivers could turn their heads around 190 degrees, giving them better scores than some of the participants in the youngest age group. The change in neck flexibility varies for individuals and its relationship with ageing is not always clear cut.

The decrease in neck flexibility with age is important for safety as it impacts on a driver's range of vision. Older drivers who experience a significant decline in neck flexibility may want to consider their suitability to drive, while car manufacturers may want to consider how they design for people who experience changes in how far they can turn.

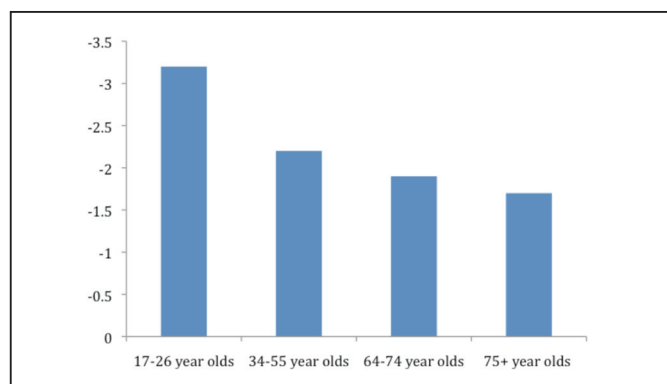
Visual tests

The researchers tested participants' vision by asking them to read out letters on a chart almost 2 metres away. Participants wore glasses or contact lenses as they would for driving.

All of the participants' had eyesight that more than met the requirements in the UK practical driving test. However, there is a clear age related trend with the younger drivers having much better scores than the other age groups.

Holding back the gears: The ageing process and road safety

Eyesight - distance test



Unsurprisingly the results show that vision deteriorates with age. However, the 75-year plus age group had a slightly bigger range of scores, which suggests that the deterioration in eyesight is different for individuals.

Useful field of view

Researchers looked at participants' peripheral vision, this is known as 'useful field of view'. Participants looked at a block picture of a car or truck on a screen; they were asked if they could see an additional vehicle on the screen that was at an angle to the central image.

The results show that people's useful field of view appears to decline with age. However, there were much larger differences within the 75 plus age group suggesting once again that age related deterioration varies.

The results for the contrast sensitivity test are also similar. The ability to spot objects against a similar background declines with age. Again drivers over 75 showed a much wider range of scores, confirming that age related visual decline varies.

Conclusions

Age related decline and driving performance

The rising number of older drivers has created a road safety debate, with some calling for restrictions and mandatory health checks for older drivers. Much of the debate has focused on eyesight, however, there are many more elements which contribute to safe driving and this research has attempted to look at some of the main areas including;

- Driving behaviour
- Reaction times
- Visual ability
- Visual behaviour
- Driver attitudes
- Physical ability

The research found a relationship between deteriorating vision and age. However, this does not translate into less safe driving behind the wheel as older drivers appear to compensate for reductions in visual acuity and reaction time through safer speed and distance from lead vehicle choices. The eyesight of all the participants in this study more than met the requirements to pass the UK driving test.

The affect ageing has on visual ability is not clear cut and some people will experience a much greater decline in their sight than others indicating a need for greater awareness on this issue. Opticians, doctors, friends and family all have a role to play in discussing how changes in sight may affect driving.

The ability to turn the neck to look at junctions may be impaired among some older drivers as their physical health changes over time. TRL's research found a relationship between ageing and neck flexibility, although some older drivers were just as flexible as some of the participants in the 17-26 age group.

Some car manufacturers are starting to respond to the growing number of older drivers by designing cars that help them to remain mobile. The ability to see easily out of new cars has been reduced by recent safety regulations and car makers must do more to help drivers with reduced flexibility. If they do not recognise the specific consumer needs of the growing number of older drivers they risk losing sales in a key market sector.

Although physical health has an impact on driving, it is only one factor. We believe that attitudes, awareness and skills play a much bigger role in being safe behind the wheel.

Drivers constantly make decisions on how fast to drive, when to pull out in front of other traffic and how close to travel behind other vehicles. Risk taking behaviour leads to crashes, and the over representation of young (particularly male) drivers in road accidents is directly related to their attitudes and lack of experience.

TRL's independent research found that older drivers are less likely to commit driving violations, and that they have safer attitudes on risky overtaking and close following. This is confirmed by their safer results in most of the driving simulator tasks.

Older drivers drove at slower speeds particularly when they were negotiating a

potential hazard. They drove at a greater distance behind the car in front and stopped a greater distance away from traffic at a crossroads.

There were many areas where there were no significant age differences in driver behaviour, for example reaction times to a vehicle suddenly emerging from a side turning, and to a vehicle in front braking unexpectedly on a motorway.

On average the oldest drivers took around a second longer to press the brake pedal when a person walked out into the road. However, their lower speeds more than mitigated this and they stopped at a much safer distance from the pedestrian.

A driver's reaction times may decrease with age but their knowledge about how to respond to the road environment and plan their journey ahead clearly increases with experience.

The key area the study identified for improvement was the amount of time older drivers spent looking right at crossroads. There were no results in the physical or sight tests which suggest that the older drivers were unable to increase the number and length of glances right when negotiating traffic. Older drivers need to be made aware of this finding and they would clearly benefit from coaching or assessment that focuses on when and how often to observe and where they place their vehicle to maximise the information available to them.

Policy implications

The relationship between growing old and driving safely is not straightforward.

Holding back the gears: The ageing process and road safety

This is because how we drive is based on a combination of experience, attitudes, physical health and brain functions (e.g. reaction times). One area can simultaneously improve while another deteriorates, how and when we age is unique.

The number of older drivers is increasing dramatically and will continue to rise for the next thirty years. The government must plan now for how it will respond rather than wait for the numbers to rise.

There should be more publicly available information on how the ageing process can affect driving and the NHS should invest more to train and encourage health professionals, opticians and doctors, to discuss driving habits with older people. There is also a key role for family and friends but they need the information and the tools to help make informed choices. The IAM is working to develop online self-assessment tools as the default first step in helping older drivers to recognise and deal with changes in their driving.

The most practical finding of this study is that older drivers appear to demonstrate a 'skills gap' when dealing with junctions. Voluntary driving assessment and coaching provides a clear solution to this problem and in the future could help prevent older drivers being overrepresented in 'fail to look' crashes.

However, access to driving assessments at a local level is very inconsistent. The government, public health bodies, local councils and the voluntary sector must work together to ensure every older driver has the

opportunity to have their driving checked out. Although the key role of observation at junctions has been highlighted no two older drivers will ever be the same in their physical ability or their transport requirements. This is why tailored driving assessments must be more widely available to give positive personalised advice to older people.

In summary, the IAM want to see:

A government action plan for older drivers

More car manufacturers considering older drivers in vehicle design

Greater publicity to encourage health professionals to discuss driving

Better information for older drivers and their families

Online self-assessment tools for older drivers

Wider availability of voluntary on-road driving assessments

Better partnership working at a local level

Through partnership, research and sharing of information the IAM believe that mobility can be enhanced without expensive and unwieldy restrictions that cannot be justified by the crash statistics. Demographic change is imminent but coordinated action now can ensure that we harness the abilities of our most experienced drivers to deliver even safer roads in the future.

We would like to thank the FIA for part funding this project and TRL for their independent research. We believe these findings will inform policy development for older drivers and that they have implications beyond the UK.

About the IAM

The IAM (Institute of Advanced Motorists) is the UK's largest independent road safety charity. We are dedicated to improving standards and safety in driving, motorcycling and cycling. The IAM has more than 200 local volunteer groups and over 100,000 members in the UK and Ireland; we are best known for the advanced driving test and the advanced driving, motorcycling and cycling courses. We also offer driver training to businesses through our commercial arm IAM Drive & Survive. The IAM's policy and research division offers advice and expertise on road safety, and publishes original research on road safety issues.

