SWOV Fact sheet

The elderly in traffic

Summary
The elderly have a higher than average fatality rate in traffic. The most important cause of this high fatality rate among the 75 year olds and older is their greater physical vulnerability. In addition, functional limitations can lead to the elderly more frequently being involved in certain types of crashes. The crash type that is characteristic for the elderly occurs while turning left at an intersection. Measures that can reduce the crash involvement of the elderly are infrastructural adaptations, technical systems in the vehicle, and education and information for the elderly as well as for the other road users. Measures aimed at reducing injury severity are also important to lower the fatality rate of the elderly road user.

Who are considered to be elderly road users?
It is not possible to indicate precisely who belong to the category 'elderly'. Often the retirement age of 65 is used and sometimes the category ‘elderly’ even starts at the age of 50 (as in the ‘over-50s fair’). As the elderly stay healthy and fit longer, the lower age limit for the group of elderly road users is nowadays increasingly put at 75 years old. However, using rigid age boundaries does not take into consideration the fact that ageing is a process that does not begin at the same age for each and every individual, nor progresses at the same pace. There can be large differences in driving skills between people of the same age, as well as in their physical and mental abilities. It is very well possible that some 85 year-olds are in better shape than some 40 year-olds.

What is the influence of an ageing population?
In the past decades, the share of over-65s in the Dutch population has gradually increased from 11% in 1980 to 16% in 2011. According to a prognosis of Statistics Netherlands, the share of over-65s will continue to increase to 26% in 2040 and will then begin to show a small decline. In absolute numbers this will amount to 4.6 million people. Not only will there be rapid aging in the next few decades, but there will also be double aging; from 2025 onward the proportion of over-80s within the group of over-65s will show a large increase from a quarter to more than 40 per cent in 2050 (Van Duin & Garssen, 2011).

The percentage of people having difficulties in traffic due to functional limitations is clearly higher among the older elderly than among the younger elderly road users. This is not only the case for elderly pedestrians and cyclists, but also for elderly drivers as more of the elderly possess a driving licence. In the Netherlands, in 1985, only 53% of the male and 13% of the Dutch female over-65s had a driving licence. In 2010 these percentages had already increased to 86% and 49% respectively. Because the group of elderly continues to grow, it goes without saying that road safety policy should pay more attention to the possibilities and limitations of this group of road users.

Which factors determine the safety level of elderly road users?
The road safety of elderly road users is to a large extent determined by two factors: functional limitations and physical vulnerability. Both factors contribute to the relatively high fatality rate among elderly road users in crashes. Taking the distances travelled into account, the fatality rate of the over-75s is about seven times higher per kilometre travelled than the average fatality rate for all ages. The fatality rate of the 60-74 year olds is much lower (see *Table 1*).
The fatality rate is particularly high for elderly cyclists: it is approximately 12 times higher for the over-75s than for 'the average cyclist'. Compared with the fit group of 30-49 year olds, the difference is even greater (see *Table 1*).

According to some researchers their low annual mileage is part of the explanation for the high fatality rate for elderly drivers. It may be argued that drivers wit a high annual mileage generally have a lower crash rate than drivers with a low annual mileage. These researchers therefore argue that if risk

groups were not only determined based on age but also on annual mileage, the crash rate of elderly drivers with a low annual mileage would not be higher than that of younger drivers with an equally low annual mileage. Furthermore, the crash rate of elderly drivers may be overestimated because they travel a larger share of their kilometres on roads with a lower safety level. The elderly tend to avoid motorways and therefore mainly use the secondary road network which has a higher crash rate (Davidse, 2007; ERSO, 2009).

Age group	Walking	Cycling	Car driving	All transport modes
30-49 years	12	6	2	2
65-74 years	15	25	2	5
≥ 75 years	101	165	13	35
All ages	18	13	2	4

Table1. *Death rate by age group and transport mode: real number of road deaths per billion kilometres travelled, 2006-2010.*
(Source: SWOV/Centre for Transport and Navigation, Statistics Netherlands).

Functional limitations
As people age, functional limitations and disorders occur, such as reduced visual or auditory abilities, increased reaction times, difficulties with dividing attention, and dementia. The decline of motor functions in particular can increase the crash rate. In general terms, this decline consists of a slowing down of movements, a decline in muscle strength, a decline in the finely tuned coordination, and a particularly strong decline in the ability to adapt to sudden changes in bodily position. This last aspect is especially important for cyclists and pedestrians, but also for those who use public transport (walking and standing in moving buses and trains).

There are few indications that a decline in visual, auditory and cognitive functions, as part of normal ageing, also has road safety consequences. Only in the case of severe sensory, perceptual, and cognitive limitations does the relation between functional limitations and crash involvement become visible (Brouwer & Davidse, 2002; Davidse, 2007).

Physical vulnerability
The elderly are physically more vulnerable than younger adults: their injuries will be severer given an identical collision impact. To illustrate this: with the same impact force, the fatality rate is approximately three times higher for a 75 year-old motor vehicle occupant than for an 18 year-old. The physical vulnerability has the severest consequences during travel by 'unprotected' modes of transport such as walking and cycling. This physical vulnerability is a less important factor for drivers, but it still has an influence on injury severity. Protection devices such as helmets for cyclists and (light-)moped riders, and seat-belts and (side) airbags for drivers, can limit injury severity.

Which crashes are the most common among the elderly?
Various crash studies and surveys have shown that the elderly particularly have problems with turning left at intersections. In general, intersections are complicated traffic situations which involve time pressure and the necessity of dividing attention between various subtasks. These are task demands that the elderly relatively often experience as being difficult. Various sensory, perceptual, cognitive, and motor functional limitations which are part of the normal aging process and age related disorders could lie at the root of this.

Should the elderly continue to drive?
Functional limitations and age-related disorders do not automatically lead to unsafe traffic behaviour. Other characteristics of elderly road users can prevent safety problems. Among these are the insight into one's own limitations, driving experience, and compensation behaviour such as driving when the roads are less busy or when it is daytime and dry. One can think of various reasons for the elderly being well able to compensate for their limitations. In the first place they often have more freedom in choosing the moment to travel. Various studies have shown that the elderly more often choose to drive during daytime and in dry weather conditions. In the second place, the elderly on average have much driving experience. The traffic insight they have acquired may give them the ability to anticipate

on possible problem situations. In the third place, the diminishing desire for excitement and sensation when getting older possibly plays a role. In conformity with this the elderly, on average, drink-drive less often than younger adults and generally obey the traffic rules more (Brouwer & Davidse, 2002). However, the ability to compensate is limited for drivers suffering of dementia, a cognitive functional limitation that often comes with ageing. For example, they tend not to avoid hazardous traffic situations. This is due to the fact that they fail to have an accurate insight in their own disorder, which often stands in the way of assessing what they can or cannot do. Therefore, they cannot adjust their behaviour to the situation (Davidse et al., 2010).

A good fitness to drive test makes it possible to select those people whose physical and/or mental functioning prevents them from driving a car safely. The problem is that we do not very well know yet which functional limitations lead to an increased crash rate, and the extent to which these limitations can be compensated by (technical) aids. Presently, fitness to drive research specifically focuses on the relation between functional limitations and crash involvement (i.e. which functional limitations increase the crash involvement rate), on continued developing of tests to assess the fitness to drive, and on developing of compensation strategies that make it possible to safely participate in traffic in spite of functional limitations (e.g. extra head and eye movements to compensate for a limited field of vision). Furthermore, there is discussion in the Netherlands about whether the age-related medical test which is compulsory at present, cannot be done faster and cheaper, or maybe even be abandoned altogether. In all cases it remains important that there is a good procedure which determines when an individual can no longer drive a car safely, irrespective of his or her age. This requires further professionalization of the testing process. SWOV's opinion can be found in Vlakveld & Davidse (2011).

A test procedure that results in people losing their driving licence when they can still drive a car safely is undesirable for a variety of reasons. As *Table 1* shows, the fatality rate for elderly cyclists and pedestrians is many times higher than for elderly drivers. Consequently, elderly road users are safer in a car. In addition, the elderly often have already stopped cycling, partly because of loss of balance. Therefore, a farewell to their car often is also a farewell to part of their social lives. This can have negative consequences for the well-being of the individual, but also for society as a whole (e.g. the extra costs of door-to-door community transport). And all this while the elderly who still drive are no disproportional danger to other road users. They are more often severely injured themselves (killed or hospitalized) in a collision with another car than that they, as a driver, cause severe injury to another road user (drivers or other types of road user). For the younger adult it is the other way round: as a driver they more frequently cause severe injury than that they are severely injured in a crash with another road user, be it as a driver or other road user (Davidse, 2007).

Which measures can improve the elderly's road safety?

Infrastructural measures

Assuming that the functional limitations become more frequent as one ages, it is important that for each task the road user has sufficient opportunity to detect, decide, and act. Furthermore, it is important to design the infrastructure in such a way that it conforms to the road users' expectations based on their experience. These preconditions are largely in line with the principles of a sustainably safe traffic system. That is why realising Sustainably Safe also benefits the safety of the elderly road user. Specific implementations, however, sometimes require a better tuning to the elderly road user. This means, for example, that:

- new designs must match existing principles so that the elderly can use their experience and existing automatisms;
- complex tasks can be performed in parts (e.g. crossing the road in phases), in which the elderly can repeatedly assess the situation from a safe place and can themselves determine the time pressure;
- important infrastructural features stand out, e.g. by good lighting and clear road markings.

Concrete examples of infrastructural adaptations while keeping the elderly in mind can be found in Staplin et al., (2001) and Davidse (2002). A summary of the information in these publications can be found in the SWOV Fact sheet *The elderly and infrastructure*. Furthermore, a CROW publication has recently appeared which asks attention for a 'senior proof' road design (CROW, 2011).

Technical adaptations

The driving task can also be tuned to the road user's individual possibilities. For a long time now technical adaptations have been available such as power steering, an automatic gearbox, and

adjustments of the power needed to press down the brake and/or acceleration pedal. These are systems that offer specific support for motor functional limitations, such as the decline in muscular strength. Also, more and more Intelligent Transport Systems (ITS) are becoming available which can assist the elderly motorist with functional limitations of vision, attention, and information processing. Examples are systems that warn about other vehicles simultaneously approaching an intersection, systems that help when merging or changing lane, and systems that project the relevant traffic signs and warnings along the roadside inside the vehicle. See also SWOV Fact sheet *The elderly and Intelligent Transport Systems (ITS)*).

Protection devices
If, in spite of the above-mentioned measures, crashes still occur, protection devices such as bicycle helmets or technical vehicle measures can minimize the consequences. The application of airbag-like systems such as SIPS (Side Impact Protection Systems) can offer extra protection in side collisions, such as crashes when turning left in which the elderly are overrepresented.

Information, education, and testing
With a progressive decline in functions, adaptations to the road and vehicle surroundings cannot always prevent individuals becoming unfit to drive a vehicle. Therefore, a procedure that leads to a timely withdrawal from traffic is necessary. The problem is determining the threshold: when is someone still fit to drive and under which preconditions (vehicle adaptations, aids, training, limited driving licence)?

In addition, information meetings are important to inform the elderly about the functional limitations that come with aging, and the aids available to continue driving a car safely for as long as possible. In these meetings they should also learn about changes in traffic situations and rules, and about problem situations that they could come across and how to deal with them best (Davidse & Hoekstra, 2010). Such information meetings are best accompanied by a practical driving course such as the Dutch 'BROEM' drive for the elderly to test the driving skills, the mobility scooter course, or the course 'Safely mobile' for cyclists. The greatest challenge is to reach people who themselves have great doubts about their driving skills, and those who overestimate their driving skills. Both of these groups will be less inclined to participate in these courses, the first group because of the fear of losing their driving licence and the other because they are convinced that they do not need such a course.

Alternative transport possibilities
If, from a safety point of view, driving is no longer justified, the elderly must be supported in switching from the car to other modes of transport; for each target group the most suitable transport mode must be found. The availability of public transport is very important. As more of the elderly continue to live on their own, and public transport is not always available nearby, it is important that door-to-door community transport is also available, particularly in rural areas. The co-operative 'Remain Mobile Safely' has developed a guide for advisors of the elderly which they can use for individual mobility advise. Based on what causes the reduced mobility, physical limitations, unfamiliarity with the vehicle, finances, these advisors can tell the elderly how they can re-establish their mobility. This can for instance be achieved by following a course, or by turning to the council to apply for a grant.

Which legislation is relevant to the elderly?
In the Netherlands, drivers of 70 years old and older have to submit a *Declaration of Fitness to Drive* when applying for a new driving licence; from 1July 2013 the age will be 75. This declaration can be obtained from the Dutch Driving Test Organisation CBR) by filling in and sending a *Personal Declaration* with answers to ten questions about physical and mental disorders that are relevant for road safety, such as epilepsy, loss of balance, eye diseases, and use of medicines that can influence driving skills. A *Medical Report*, filled in by a doctor, must accompany the *Personal Declaration*. In the *Medical Report*, the doctor reports his/her findings concerning blood pressure, visual acuity with and without correction (glasses), the field of vision, hearing, limitations in the use of the neck, back, and limbs, and the general physical and mental condition of the applicant. If no impediments are found in the medical examination, the applicant receives a *Declaration of Fitness to Drive* that is valid for 5 years. If there are doubts about future fitness, a limited validity of 1 to 3 years can be decided upon. In addition, limitations to the conditions under which a motor vehicle may be driven can be imposed. These can refer to requirements of the vehicle (e.g. an automatic gearbox), the driver (e.g. wearing glasses), or use of the vehicle (e.g. only during daytime). A code which is put on the driving licence indicates which restrictions apply.

Conclusions

The number of elderly road users will increase strongly during the coming decennia. This group has a greater risk of being killed in a road crash than the average road user. However, there are various measures that could reduce the fatality rate of elderly road users. Possible measures to be taken include protection devices, technical systems that provide support, and infrastructural adaptations. These measures can compensate for functional limitations that occur with aging, so that the elderly can continue to safely and independently participate in traffic for a longer period of time. Furthermore, traffic education is of importance. This can be in the form of easily accessible courses that provide elderly drivers with the opportunity of testing their driving skills and driving behaviour and, if necessary, of making improvements by driving lessons and by changing their behaviour. Specific types of assessment and training should be made available to the elderly with functional limitations that threaten their fitness to drive.

Publications and sources
(SWOV reports in the Dutch language have an English summary)

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