SWOV Fact sheet

The elderly in traffic

Summary
The elderly have a larger than average death rate in traffic. The most important cause of this high death rate among the 75 year olds and older is their greater physical vulnerability. In addition, functional limitations can lead to the elderly being involved in certain types of crashes more often. 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 providing education and information for the elderly as well as for younger road users. For a reduction of the death rate of the elderly road user, it is also important to take measures aimed at reducing injury severity.

Who are considered to be elderly road users?
It is not possible to indicate precisely who belong to the category of the 'elderly'. Until recently, when talking about elderly people, one referred to people of 65 years and older. Nowadays, the lower age limit for the group of elderly road users is usually 75 years old. This is because older people are becoming more vital. However, using rigid age boundaries does not take into consideration the fact that ageing is a process that does not start at the same age for each and every individual, nor does it progress 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 certain 40 year olds.

What is the influence of an ageing population?
In the last decennia, the share of the 65 years and older in the Dutch population has gradually increased from 11.5% in 1980 to 14.5% in 2007. According to a prognosis of Statistics Netherlands (CBS), the share of the 65 year olds and older will increase more rapidly after 2010 and reach 25.0% in 2040 (CBS, 2006). In absolute numbers this will amount to more than 4 million people of the age of 65 and above. A substantial part will be much older than 65. At this moment in time there are approximately 1.1 million people older than 75. CBS expects that this number will have grown to 1.3 million in 2020, and in 2040 will have reached more than 2.2 million.
The percentage of people having difficulties in traffic due to functional limitations is clearly larger among the older elderly than among the younger elderly road users. This not only applies to elderly pedestrians and cyclists, but also to elderly drivers. Because the group of elderly is getting increasingly larger, 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 death rate among elderly road users as a result of crashes. Taking the distances travelled into account, this rate is about six times higher for the 75 years and older than for the average for all ages. That of the 65-74 year olds is much lower (see *Table 1*).
The death rate is particularly high for elderly cyclists. The rate is about 12 times higher for the 75 years and older than for 'the average cyclist'. Compared with the fit group of 30-49 year olds, the difference is even larger (see *Table 1*).
According to some researchers their low annual mileage is an explanation for the high death rate for elderly drivers. These researchers argue that if risk groups were not only determined based on age but also on annual mileage, the crash rate of elderly drivers would not be higher than that of younger drivers.

Age group	Walking	Cycling	Car driving	All road users
30-49 years	14	5	2	3
65-74 years	27	33	4	8
≥ 75 years	154	147	17	33
All ages	24	12	3	5

Table1. *Death rate by age group and transport mode: road deaths per billion kilometres travelled, 2002-2006.*
(Source: SWOV/Transport Research Centre, CBS).

Functional limitations
As people age, functional limitations and disorders occur (such as reduced visual acuity and perception reaction time, having difficulties with dividing attention, and dementia), which can increase the crash rate of road users. This is particularly the case in the decline of motor functions. 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 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 the following: with the same impact force, the death 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 'unprotected' journeys such as walking and cycling. This physical vulnerability is a less important factor for motorists, but it still has an influence on injury severity. Protection devices such as helmets for cyclists and (light-)moped riders, and seatbelts and (side) airbags for motorists, can limit injury severity.

Which crashes are the most common among the elderly?
Various accident 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 often find difficult. Various sensory, perceptual, cognitive, and motor functional limitations could lie at the root of all this. They belong to both the normal aging process and to age related disorders.

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 having the opportunity to compensate. 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 dry weather. In the second place the elderly on average have a great deal of driving experience. The traffic insight they have acquired may give them the ability to anticipate on possible problematic situations. In the third place the diminishing desire for excitement and sensation when getting older possibly plays a part. In conformity with this the elderly, on average, less often drink-drive than younger adults and generally obey the traffic rules more often (Brouwer & Davidse, 2002).

A good fitness to drive test makes it possible to select those people whose physical and/or mental functioning actually prevents them from driving a car safely. The problem is that we do not very well know yet which functional limitations lead to an increase in crash rate, and the extent to which these limitations can be compensated by (technical) aids. At this moment in time, 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), and on the developing of compensation strategies that make it possible to participate safely in traffic in spite of functional limitations (e.g. extra head and eye movements to compensate for a limited field of vision).

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 death rate for elderly cyclists and pedestrians is many times larger than for elderly motorists. Consequently, they are safer in a car. In addition, the elderly often have already stopped cycling, partly because of loss of balance. Saying 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 do not pose a disproportional danger to other road users. They are more often severely injured themselves (killed or hospitalized) in a collision with another motorist than that they, as motorist, cause severe injury to an other road user (drivers or other types of road user). For the younger adult it is the other way round: as a motorist they more frequently cause severe injury than that they are severely injured in a crash with another road user, be it as a motorist 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 the road user gets sufficient opportunity to observe, decide, and act for carrying out each task. Furthermore, it is important to design the infrastructure in such a way that they conform 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. Some ways of implementation, 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 to be performed in parts (e.g. crossing the road in phases), in which the elderly can repeatedly view the situation from a safe place and themselves can determine how to deal with time pressure;
- the important features of the infrastructure stand out by means of good lighting and markings rich in contrast.

Concrete examples of infrastructural adaptations 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*.

Technical adaptations

The driving task can also be tuned to the road user's individual possibilities. For a long time now there have been technical adaptations available such as servo-assisted 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 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. For example, 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 what the limits are: 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 go with aging, and the aids available to continue driving a car safely for as long as possible. In the 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. Such information meetings can be accompanied by a practical driving course such as the existing Dutch BROEM driving skills drives for the elderly. The greatest challenge is to reach people who themselves have great doubts about their own driving skills, and those who overestimate their own 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 swapping the car for other modes of transport; for each target group the most suitable mode. The availability of public transport is very important. As more of the elderly continue living 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 countryside areas.

Which laws are relevant to the elderly?
In the Netherlands, motorists of 70 years old and older have to produce a *Declaration of Fitness to Drive* when applying for a new driving licence. This declaration can be obtained from the CBR (The Dutch Driving Test Organisation) 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 greatly during the coming decennia. This group has a greater chance of being killed in a road crash than the average road user. However, there are various measures that could reduce the death 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 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 great 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 ways of judging and training should be made available to the elderly with functional limitations that threaten their fitness to drive.

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