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Age-friendly Transport: Traffic Safety for All

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Abstract

The elderly make up an increasing percentage of the European population and, with it, of the Hungarian population. Modern society is built around mobility. These two factors together lead to an increasing proportion of elderly drivers on the roads. Given the high proportion of people with chronic neurological conditions (stroke, Parkinson's disease, dementia), particular care should be taken to regularly check their fitness to drive. At present, there is no standardized, well-established protocol for the objective assessment of fitness to drive in the case of these diseases. Our paper discusses this matter.

Keywords

elderly drivers, vulnerable drivers, neurological diseases in transport

1 Introduction

Road safety has a prominent role in the European Union, both in policy and in enforcement development. The second White Paper set an expected target of a 50% reduction in fatalities by 2020 compared to 2010, and a 2050 target of zero road deaths by 2050. Achieving these goals is made more difficult by the fact that both the EU and our own population is ageing, meaning that the ratio of the elderly in transport is increasing. Given that the number of people of this age who will be driving in the next 50 years will be almost 100%, it will be increasingly difficult to achieve the above targets. As a result, it is particularly important to look at the driving habits of the older age group and to promote their safe transport. The topic has been addressed by several researchers before, including Daniel A. Schlueter, Kim L. Austerschmidt, Philipp Schulz, Thomas Beblo, Martin Driessen, Stefan Kreisel, Max Toepper, who also consider the driving habits of an ageing society to be a significant issue. (Schlueter et al., 2023)

2 The issue of defining the "elderly"

Hungary is typically an ageing society, with a negative demographic balance. Firstly the number of deaths exceeds the number of births, also the migration balance of the currently working-age population is negative (Fig. 1).

The ageing of the population not only causes problems for road safety, but we should also consider the extended retirement age and the economic changes that this entails. This phenomenon is not only true for Hungary, but it is a general phenomenon in our society.

From the point of view of road safety, one of the main issues when looking at a group of drivers is the definition of "old age onset" (Langford et al., 2006). Take the example of an active 80-year-old who is able to run a marathon and whose cognitive functions have deteriorated so little over the years due to this active lifestyle that their reaction time is barely 1 second below the average. The other side of the coin is a 50-year-old person whose physical and cognitive abilities have declined and whose reaction time is significantly below average, up to 2–3 seconds. In terms of road safety, the first person is a low risk, while the younger person is a high risk (Anstey et al., 2005).

As a result it is an important problem to define the onset of elderly age, as we cannot draw a line between who is considered to be elderly and who is not, as the onset and course of ageing is different for everyone. Most often, the year of retirement, age 65, is indicated.

In Hungary, you need to have a driver's license to drive, one of the main conditions of which is passing a medical examination. Decree 13/1992 (VI. 26.) NM on the establishment of the medical fitness of road drivers aims to establish the medical fitness of drivers, Ministry for National Economy (1992).

The regulation states that a general practitioner is obliged to check that the driver has no illness, physical or mental disability or sensory impairment that makes him

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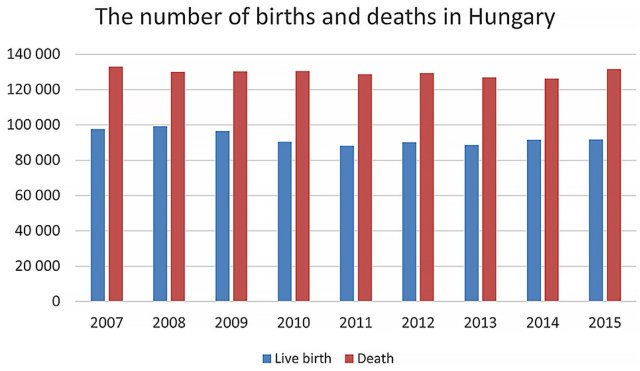

Fig. 1 The number of births and deaths in Hungary

or her unfit to drive a road vehicle and thus to participate safely in public transport.

In addition, a driver has undergo an additional periodic medical examination earlier than the prescribed period if they:

- had an illness or injury where they lost consciousness,
- had a deterioration in their visual acuity which cannot be corrected by glasses, or a loss of hearing which interferes with the perception of the flow of traffic,
- had severe hypoglycemia, or
- have a deterioration in their general health which may render them temporarily or permanently unfit to drive a road vehicle or may affect their ability to drive a road vehicle.

So it is the driver's responsibility to report to their GP for a check-up if they notice any of the symptoms listed above before the exam. However, if the doctor is "aware that the person under their care is in possession of a driver's license and they detect a disease or condition which calls into question the person's fitness to drive, they must immediately arrange for an examination".

In addition, a doctor must initiate an immediate medical fitness test if the person he/she is examining is presenting with:

- a mental disorder or a residual mental disorder;
- mental disorder of any origin;
- epileptic symptoms;
- visual or hearing impairment affecting the ability to drive;
- repetitive or persistent impairment of mobility and coordination;
- treatment involving withdrawal from alcohol;
- drug dependence.

The test is a general check-up: ECG, urine, vision, internal medicine (blood pressure, thyroid, abdomen, musculoskeletal), which is performed by your GP. The driver does not meet a neurologist, psychologist or other specialist. The frequency of the medical fitness test varies according to age as follows:

- under 50 years of age: every 10 years
- between the ages of 50 and 60: every 5 years
- between the ages of 60 and 70: every 3 years
- over 70 years: every 2 years.

3 Assessment of elderly people's own abilities

People of the elderly group tend to make subjective judgements about their own abilities, which are based on factors such as experience, vitality, lifestyle, etc. (Chen et al., 2021). The way in which they judge their abilities can be divided into several categories:

- underestimating their own abilities: driving too carefully,
- estimates their own abilities realistically: appropriate driving,
- overestimating one's own abilities: driving without recognizing the risks.

The first group also poses a risk of accidents, as driving at a speed that is too low, which is a sign of increased caution, can be just as risky as speeding. Think of a car travelling at 60 km/h on a highway or driving out of an intersection with extreme caution.

For the second group, we can talk about driving appropriately or not driving at all, knowing our own health.

The last group is the most dangerous. They overestimate their own abilities (both physical and cognitive) and manage their vehicles accordingly. When choosing speed, starting off, following distance, they do not take into account that their reaction time is slowed down (because they do not even recognize it), thus increasing the risk of an accident. In these cases, they are not only endangering their own safety, but also that of others (Schlueter et al., 2023).

The elderly as a whole are characterized by:

- their movement being slowed down,
- reduced ability to process information,
- decision-making and reaction time is prolonged,
- attention lapses may occur,
- traffic knowledge may be incomplete or incorrect.

On the positive side, they are less likely to be at fault for their own accidents (Lucidi et al., 2014).

However, in terms of mortality rates, it is striking that the 78 deaths per million population aged 65 and over exceed the 58 deaths per million population aged 26–40.

According to a study published by the Dutch Road Safety Research Institute (SWOV), older people are most likely to cause accidents at intersections, when turning left (a complex maneuver requiring a lot of attention, taking into account the right of way rules), and prefer to drive in dry weather and during the day. At the same time, they have more driving experience and the level of "excitement" decreases with age, so they are able to drive more calmly. Accordingly, the proportion of drunk-drivers and repeat offenders is generally lower among older people.

4 Methods that support decision-making

In order to make an objective decision about either approving or withdrawing a license, there are a number of cheap, easy-to-implement methods available that are still not well-known in our country.

In our tests (Fig. 2), we tried several reaction time tests, but the closest to reality was the Harvard University test, in which the simulated subjects were in a monotonous moving vehicle for 5 minutes. During the test, 50 obstacles were randomly placed in front of the screen, which had to be responded to by pressing the "space" button (Division of Sleep Medicine Harvard Medical School, 2023).

Before completing the experiment, participants were asked to provide the following information:

- how much sleep they had the night before,
- how long they had been awake,
- what time it is now,
- how alert they feel.

In addition, the following information was recorded about the participants:

- gender,
- age,
- driving frequency,
- how often they drive on average per year.

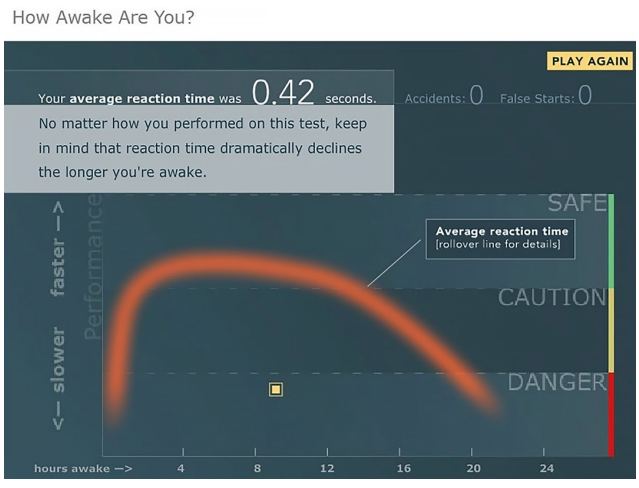

Fig. 2 Result of Harvard University's test

The experiment also took into account that the participants expect obstacles to appear, so their reaction time is significantly better than in real driving (average reaction time in driving is 1 second). There was no tutorial of the method before the test, only a brief explanation. For the test the instructions was the following: push the space bottom as soon as an obstacle comes into the screen. the test will be held for 5 minutes. The test was firstly about the perception, the reaction time and ability of tolerate monotonity.

The obsatcles were different: it could be an object, an animal, or a person.

Fig. 2 shows the attention and reaction time. On the x-axis is the number of hours spent awake and on the y-axis is the reaction time, which can be divided into three categories: safe, average and dangerous. In the final result shown in the figure, the average reaction time is 0.42 seconds, which after 9 hours of wakefulness falls into the "dangerous" category. The red curve shows the "expected" evolution of the average reaction time. Despite the dangerous reaction time, no experiment obstacle was hit.

5 Results and discussion

50 people participated in the test. Those who completed the test were divided into two large groups: under 50 (26 people) and over 50 (24 people). The mean scores of the participants were:

Table 1 shows that the only significant difference between the two groups is the number of obstacles hit. The difference in sleep time and reaction time is probably age specific. Since the two groups had almost the same number of participants (24 and 26) and the participants' characteristics are similar, the large difference in hitting a barrier means a high risk of accidents in real traffic. It can be understood that each person moving into the elderly age group brings 1.88 hits into the system (every 5 minutes!). Looking at the extremes (minimum, maximum) rather than

Table 1 Mean values of participants

	Under 50	Over 50
Median age	34 years	65 years
Annual driven vehicle kms	16712 km	13467 km
Sleep time	7.46 h	6.79 h
Wakefulness	7.07 h	6.75 h
Reaction time	0.35 s	0.38 s
Hits	0.58	2.46

the averages gives a very similar picture. The characteristics for the participants are similar in the two age groups, but the maximum number of hits is strikingly different (even when looking at the second highest, 2 and 5 hit).

Looking at the test results, there is no strong correlation between reaction time/hits and age, sleep time or wakefulness. In addition, reaction time is influenced by other factors which were not considered in this study (stress, hunger, illness, physical condition, mental state, etc.)

There is a significant difference in the total number of hits between the two age groups (Table 2), with 26 people in the under 50 age group having 15 hits, compared to 59 hits in the over 50 age group of only 24 people. Breaking down the over 50s further, it is clear that the 50–60 age group is not much worse than the under 50s, but the over 60s have seen a sharp increase in the number of hits (Fig. 3).

Our hypothesis at the start of the test was that there would be a clear relationship between experience, driving frequency and age as inputs, and reaction time and number of hits as responses. This was not confirmed by the test. What could be the reason for this? Limitation of our study was that interviewing 50 people did not provide a sufficient sample. Another hypothesis is that there is no such correlation, as concentration and alertness are influenced by a number of factors (some of which are not examined here) as described earlier. Of course, this could be a warning sign in the field of road safety that there is no such thing as an absolutely safe driver, and training/education is therefore important to make drivers aware of this. Everyone should know that they are not infallible.

Table 2 Minimum and maximum values of participants

	Under 50		Over 50	
	min.	max.	min.	max.
Minimum and maximum age	13 years	47 years	51 years	77 years
Driven vehicle kms	0 km	150000 km	0 km	125000 km
Sleep time	2 h	12 h	3 h	9 h
Wakefulness	2 h	18 h	2 h	11 h
Reaction time	0.28 s	0.43 s	0.31 s	0.42 s
Hits	0	3	0	11

6 Conclusion

Increasing numbers of elderly drivers are experiencing a higher proportion of consequences associated with increased reaction times. Our test has therefore highlighted the need to pay increasing attention to the cognitive abilities of elderly drivers in order to improve road safety. For this reason, we recommend the use of simple, easy-to-implement test methods to assess driving ability (e.g. reaction time test, monotonity tolarete test).

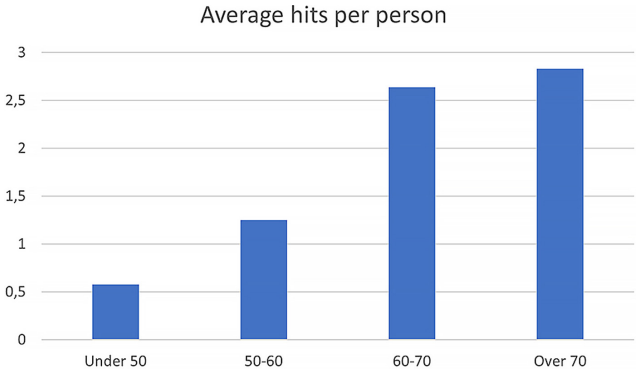

Fig. 3 Average number of hits per person by age group

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