Age-related compensation strategies after registration of driving errors

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Abstract

With increasing age changes of sensory, motor, and cognitive functions take place, that can have an impact on driving and may induce driving problems and errors, that are partly registered in the "Verkehrszentralregister (VZR)". In order to cope with functional deficits and to continue driving, elderly often activate compensation mechanisms. The present study investigated in which respect old drivers which were registered either only once or rather several times in the VZR differ with respect to compensation strategies. To this aim two groups of old active drivers (72+) were interviewed and a subsample additionally underwent psychological tests and a driving test in real traffic. Concerning compensation strategies, psychometric tests or driving in real traffic there was no significant difference between single- and multiple registered seniors. Overall, the results of the present study provide no consistent evidence for the assumption that multiple-registered seniors have larger sensory, motor or cognitive deficits or different personality traits and self-perceptions than single-registered seniors.

Keywords: older drivers; Verkehrszentralregister; compensation; age-related deficits; real traffic.

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1. Introduction

In ageing, especially after retirement, there is an increasing need for social contacts, independence and self-determination. These needs have to be fulfilled, otherwise individual quality of life can be affected seriously (Kocherscheid & Rudinger, 2005; Schlag, 2008). Mobility, and particularly driving a car as the main source of mobility in many cases, is one common factor for quality of life and independence concerning social life. Therefore older people will try to maintain mobility (in car traffic) as long as possible.

To perform tasks like driving several sensory, cognitive and motor processes have to interact in a complex manner. However, with increasing age changes of sensory (e.g. Schneider & Pichora-Fuller, 2000), motor (e.g. Yordanova, Kolev, Hohnsbein & Falkenstein, 2004), and cognitive functions (Nielsen, Langenecker & Garavan, 2002) take place. Diseases and medication intake can induce additional functional deficits or can enhance age-related deficits. All these deficits can have an impact on driving and may induce driving problems, errors, and even accidents. According to Owsley, Ball, Sloane, Roenker & Bruni (1991) the problems of older drivers controlling their cars at complex crossroads and estimating the speed of approaching road users at the same time can be attributed to visual, motor and cognitive processes. Indeed, many older people need more time to detect stimuli in the peripheral field of view (Hartley & McKenzie, 1991) and have more problems to divide their attention on different tasks (Brouwer, Waterink, van Wolffelar & Rothengatter, 1991) than young people.

In 2012 the Federal Statistical Office in Germany registered more than 41,800 crashes with personal injury involving older drivers (Statistisches Bundesamt, 2013). The involved older drivers showed more than 32,700 kinds of misbehaviour, mainly driving errors concerning the right of way (18.1%), turning right or left or backing (16.8%). Other kinds of misbehaviour like driving with poor distance (7.9%) or inappropriate speed (5.0%) were rather unusual. However, in Germany all drivers who are convicted of these kinds of administrative offence were registered in the „Verkehrszentralregister (VZR)“. Schade & Heinzmann (2008) analysed data from 350,000 drivers registered in the VZR and confirmed the rise of certain kinds of administrative offence with increasing age, e.g. errors with the right of way or driving on wrong roads (e.g. side-way or cycle-path). Surprisingly older drivers who show these or similar age-typical misbehaviour were re-registered less often than older drivers who show other kinds of administrative offence. At the same time drivers with age-typical driving errors had a higher crash risk. This assumed contradiction can be explained by a 2-stage-model: According to this, after VZR-registration older drivers try to compensate their driving deficits by avoiding certain situations or adapting the driving behaviour (step 1). With increasing age these efforts become less successful (step 2) and result in higher crash risk (Schade & Heinzmann, 2008), which can be attributed to age-related sensory, motor and cognitive impairments (Anstey, Wood, Lord & Walker, 2005). However, there are many older drivers who were not only registered once, but also re-registered several times. Maybe these drivers do not use appropriate compensation strategies or fail in using them. Other reasons for being registered once or rather several times may be differences in driving-relevant competences, personality traits, attitudes, and self-perceptions.

The present study investigated in which respect older drivers, which were registered either only once or rather several times in the VZR, differ with respect to personality traits, driving-relevant cognitive functions and driving behaviour in real traffic. In addition it is investigated whether and which compensation strategies the different groups adopted currently as opposed to earlier in their life (at about 45 years).

2. Methods

To investigate in which respect old drivers, which were registered either only once or rather several times in the VZR, differ with respect to compensation strategies, personality traits, driving-relevant cognitive functions and driving behaviour in real traffic, two groups of old active drivers were interviewed and tested.

In sum 399 active drivers (almost exclusively men) at the age of 72 or older with at least one (Group 1) or multiple (Group 2) registrations in the VZR were interviewed by phone concerning several driving-relevant issues. The sample consisted of 199 drivers with one VZR-registration (mean age = 76.0 years) and 200 drivers with multiple registrations in the VZR (mean age = 76.7 years). According to their account they did not suffer from any neurological or psychiatric disorders. They were not taking any drugs affecting the central nervous system and had normal or corrected to normal vision and hearing.

The interview included questions about their driving habits, personality traits, driving-related self-perceptions, and compensation mechanisms during driving. Particularly they were asked about their compensation strategies they used currently as opposed to earlier in their life (at about 45 years). For details see Table 1.
Table 1. Interview topics concerning driving-relevant behaviour and attitudes.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Examples</th>
</tr>
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<tbody>
<tr>
<td>Driving biography</td>
<td>Issue date of driving licence; technical equipment of the own car</td>
</tr>
<tr>
<td>Driving habits</td>
<td>Frequency of driving; use of public transport systems</td>
</tr>
<tr>
<td>Crash history</td>
<td>Number of crashes in the last years</td>
</tr>
<tr>
<td>Registrations in the VZR</td>
<td>Number of registrations in the VZR</td>
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<tr>
<td>Compensation strategies</td>
<td>Avoidance of specific situations; modification of driving behaviour (both now and about 30 years ago)</td>
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<tr>
<td>Personality traits</td>
<td>Conscientiousness; agreeableness; openness</td>
</tr>
<tr>
<td>Attitudes toward driving</td>
<td>Speed limit; regulatory offence</td>
</tr>
<tr>
<td>Self-concept</td>
<td>Driving abilities compared to young drivers and to drivers of the same age</td>
</tr>
<tr>
<td>Health status</td>
<td>Diseases; medication</td>
</tr>
<tr>
<td>Other biographical data</td>
<td>Former job; current leisure time activities</td>
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</table>

A subsample (N = 96) additionally underwent psychological tests and a driving test in real traffic. The tests embraced some traffic-relevant psychometric tests as well as questionnaires concerning personality traits, self-perceptions, and attitudes. In detail participants had to complete the Mini-Mental-Status-Test (MMST; Kessler, Markowitsch & Denzler, 2000), Beck-Depressions-Inventar (BDI; Hautzinger, Bailer, Worall & Keller, 1995), Mehrfachwahl-Wortschatz-Intelligenztest, Form B (MWI-B; Lehrl, 2005), Skala zur Erfassung von Handlungskompetenzerwartungen (cf. Holte, 2011, 2012), Action Regulating Emotion Systems Skalen (ARES; Hartig & Moosbrugger, 2003), Inventar verkehrsrelevanter Persönlichkeitseigenschaften (IVPE; Herle, Sommer, Enzl & Litzenberger, 2004), Trail Making Test (TMT-A+B; Reitan, 1992) and some subtests from the Test of Attentional Performance (Mobility Version) (TAP-M; Zimmermann & Fimm, 2005).

The driving test was conducted on a critical test route in Dortmund with more or less complex sections and critical crossroads. Overall older drivers had to drive a challenging, but not too difficult test route. Their driving behaviour was checked by experienced driving instructors using the “Test Ride for Investigating Practical Fitness to Drive” (TRIP) protocol (De Raedt & Pon-Jaert-Kristoffersen, 2001). Here driving instructors evaluated several kinds of driving behaviour in certain situations, e.g. lane changing, speed, perception and anticipatory driving. All these ratings were summed up to one value as an indicator for general driving performance.

3. Results

First of all, subjects showed no signs for dementia or depression, and their intelligence was generally high or in normal range. However, it must be mentioned, that multiple registered drivers had a larger mileage (19,928 km/year vs. 15,288 km/year) and drove more frequently daily (64.5% vs. 46.7%) compared to single-registered drivers. Furthermore, multiple-registered seniors used significantly more technical assistance systems than single-registered drivers.

Concerning compensation strategies almost all participants in both groups (99.2%) stated avoiding critical situations while driving, if possible. Overall, there was no significant difference in the total number of critical situations avoided between single- and multiple registered seniors, who avoid mainly driving fatigued, on clear ice, at the rush-hour, pressed for time or without a fellow passenger. In the single analyses a few group differences emerged: Single-registered seniors avoid driving in darkness more than multiple-registered seniors and prefer to drive with fellow passengers (see Fig. 1 (a)). Overall, single-registered seniors avoid currently – compared to earlier in their life – more critical situations than multiple-registered seniors, which suggests some age-related compensation. However, the numerical differences between the groups were small and only significant in few situations. In particular single- compared to multiple-registered seniors avoid driving in darkness currently more than in the past (see Fig 1 (b)).
I usually avoid driving...

* ...fatigued
* ...on icy roads
* ...at the rush hour
* ...pressud for time
* ...without a fellow passenger
* ...on snowy roads
* ...in darkness
* ...and backing
* ...on unknown roads
* ...in the rain
* ...on complex crossroads

Do you avoid driving in darkness?

Fig. 1 (a) Avoidance of critical situations of single- and multiple-registered seniors, * < p 0.05; (*) p < 0.10

Compared to earlier in their life both groups mentioned as most frequent current strategies more cautious driving and keeping a larger safe distance, but many single- and multiple-registered seniors also stated to drive more slowly, to have more breaks while driving and to prepare car rides more carefully. Some of the drivers also stated to listen to the radio or to talk to fellow passengers currently less frequently than in the past. In both groups approximately one third of the participants stated that currently their concentration decreases faster than in the past. Moreover, slightly more single- than multiple-registered seniors stated to feel more distracted in complex traffic situations (e.g. in a large city) than about 20 years ago.

No group differences were seen concerning personality traits (conscientiousness, agreeableness, openness), health status and attitudes towards driving. However, a clear difference emerged in self-perception: multiple-registered seniors rated their own driving competence as “better than that of younger drivers” more frequently than single-registered seniors.

In the psychometric test differences emerged only in the sub-test distractibility of the TAP-M, in which relevant stimuli were presented together with irrelevant ones. In this task multiple-registered seniors reacted much more slowly to the relevant targets than single-registered seniors.

In the driving test in real traffic no group differences were seen. During the driving test about 18 % of the participants in both groups were rated having doubtful driving skills. Especially the quality of traffic perception and understanding was rated doubtful in 30 % and insufficient in about 7 % of the participants.

4. Discussion

The aim of the study was to investigate, if older drivers who are multiple-registered in the VZR show less compensation strategies or larger sensory, motor or cognitive functions than single-registered drivers of the same age. First of all, it has to be mentioned that the number of registration in the VZR is not necessarily the best representation of driving skills. In fact, people with larger mileage automatically have a larger chance to be registered. Additionally, it should be considered that the degree of separation of the two groups is presumably rather low in the present study.

Concerning compensation strategies nearly all participants avoid critical driving situations if possible. These are situations which are typically avoided by older drivers (Poschadel et al., 2012), because they are supposed to be difficult to manage and easy to avoid (Baldock et al., 2006; Ball et al., 1998). It can be assumed that this avoidance behaviour in both groups partly is due to age-related compensation, as the participants stated to avoid currently more situations than in the past (about 20 years ago). Furthermore, older drivers adapt their driving behaviour and drive more cautiously or keep a larger safe distance today. Analyses of single situations reveal only on significant difference between single- and multiple-registered drivers, namely the avoidance of driving in darkness, which is enhanced in the single-registered group.

But, the self-perception of their own driving skills may be another possible explanation for single- vs. multiple-registration in the VZR: Multiple-registered participants rated their driving skills more frequently as “better than that of younger drivers” than single-registered users. Probably these participants did not recognise possible
deficits and thus saw no reason for changing their driving behaviour. Indeed, many older drivers describe “themselves as safe and highly-skilled drivers with good manners” (Ota & Hagiwara, 1996; Freund et al., 2005).

However, even though there were single meaningful group differences, the results of the present study provide no consistent evidence for the assumption that multiple-registered seniors have larger sensory, motor or cognitive deficits or different personality traits and self-perceptions than single-registered seniors. Also there were no consistent group differences in compensation strategies and driving performance. The results of the present study hence do not justify increased monitoring or constraints for multiple-registered seniors. Therefore, given the results of the driving test in real traffic, it just can be generally recommended to develop training procedures for older drivers to increase their driving competence and thereby traffic security.

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