Does older driver’s psychophysical fitness predicts their driving performance?

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BASt, Bergisch Gladbach, 27.-28.11.2014
Accidents with personal injury – Driver mainly responsible by age (2012)

Source: Destatis, 2012
## Study Design

### Study 1 (Test drive)

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>Min - Max</th>
<th>Km / year (M/SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 – 55</td>
<td>26</td>
<td>27 - 53</td>
<td>18,368 (17,633)</td>
</tr>
<tr>
<td>64 – 69</td>
<td>41</td>
<td>64 - 69</td>
<td>15,962 (11,874)</td>
</tr>
<tr>
<td>70 – 74</td>
<td>29</td>
<td>70 - 74</td>
<td>12,154 (7,512)</td>
</tr>
<tr>
<td>&gt; 75</td>
<td>18</td>
<td>75 – 90</td>
<td>12,632 (7,712)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Study 2 (Driving simulator)

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>Min - Max</th>
<th>Km / year (M/SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 – 55</td>
<td>27</td>
<td>35 - 55</td>
<td>11,519 (10,018)</td>
</tr>
<tr>
<td>64 – 69</td>
<td>29</td>
<td>65 - 69</td>
<td>8,862 (9,404)</td>
</tr>
<tr>
<td>70 – 74</td>
<td>4</td>
<td>70 - 74</td>
<td>10,118 (4,068)</td>
</tr>
<tr>
<td>&gt; 75</td>
<td>28</td>
<td>75 - 86</td>
<td>8,100 (4,733)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>118</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

June – October 2010

April – November 2013
Psychophysical fitness of older drivers

Sensory skills
- Visual acuity*
- Peripheral perception*
- Contrast vision*
- Colour vision
- Age-related macular degeneration

Motor skills
- Physical Fitness
- Hand-Eye-Coordination
- *Responsiveness
- *Motility (Neck)
- *Motility (Walking)

Cognition
- Attention*
- Distraction*
- Visual search*
- Concentration
- Obtaining an overview*

Attitudes
- Risk taking
- Sense of responsibility
- Self-control
- Mental stability

*= statistical significant age group differences
Age-related differences in Cognition

Divided attention

Distraction

![Graphs showing age-related differences in divided attention and distraction.](image)
Driving mistakes of older drivers
Psychophysical fitness does not predict older driver’s overall performance
But: specific prediction for particular driving situations

<table>
<thead>
<tr>
<th>Psychophysical fitness</th>
<th>Driving situation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test drive (Study 1)</strong></td>
<td></td>
</tr>
<tr>
<td>Divided attention, risk taking</td>
<td>Junction: eye movement only to the right</td>
</tr>
<tr>
<td>Age</td>
<td>Junction: shoulder check</td>
</tr>
<tr>
<td>Concentration, responsiveness, <strong>visual search</strong></td>
<td><strong>Interurban:</strong> mean speed (6)</td>
</tr>
<tr>
<td>Divided attention</td>
<td>Interurban: mean speed (8)</td>
</tr>
<tr>
<td>Peripheral perception</td>
<td>Motorway: mean speed</td>
</tr>
<tr>
<td><strong>Driving simulation (Study 2)</strong></td>
<td></td>
</tr>
<tr>
<td>Visual acuity</td>
<td>Crossing Pedestrian with/without distraction: time to collision</td>
</tr>
<tr>
<td>Motility (Neck)</td>
<td>Masked STOP Sign: Brake reaction time</td>
</tr>
<tr>
<td><strong>Visual search</strong></td>
<td><strong>Veering out taxi:</strong> Brake reaction time</td>
</tr>
</tbody>
</table>
Example: visual search

Test drive: Interurban mean speed

Driving simulator: BRT veering out taxi
Summary

• Considerable age-related differences in psychophysical fitness
• Few driving situations with age-related differences in test drive
  -> Driver compensation
• More driving situations with age-related differences in driving simulator
  -> “Testing the limits”
• No consistent prediction of driving performance by psychophysical fitness of senior drivers
What could we do otherwise?

- Age based populations screening? – no safety benefit due to false positive effect
- Voluntary training? – selection effect

➢ We suggest a mandatory feedback of driving performance in real traffic, BUT without consequences for driving licence possession
Thanks for your attention!

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Example: Visual Search

- Visual search detects spatial attention and visual processing speed
- Task: to press a button for upwards green arrow and right-sided red arrow
- Parameter: reaction time, No. of missed targets