Driving fitness in the elderly – validation of visual and driving-aptitude tests

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Introduction

- By 2050, the number of people in the EU aged 65 and above will have increased by 70%, and over 80 by 170%.
- Mobility is key in facing challenges of demographic change, for independent living, and for promoting health and quality of life.
- Safe driving requires visual and cognitive abilities.

The present study aims at a validation of apparatus and methods of testing vision and cognitive aptitude, with driving competence as the criterion of validity.

Methods

From May 2004 to February 2005, cognitive, visual and road driving tests were conducted in elderly drivers in Bad Tölz (Germany). Driving-specific abilities were tested by a standardized test battery (“Standard Plus”) in the “Expert System Traffic” (Schuhfried, Austria). Visual diagnostics included visual acuity, visual field, and contrast sensitivity. Results of psychological and visual tests were used as statistical predictors of variance in subjects’ driving performance.

Psychological Testing

On-Road Driving Test

Traffic Situations and Frequencies

<table>
<thead>
<tr>
<th>Situation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective behaviour</td>
<td>30%</td>
</tr>
<tr>
<td>Attentional behaviour</td>
<td>20%</td>
</tr>
<tr>
<td>Use of instruments</td>
<td>15%</td>
</tr>
<tr>
<td>Behaviour at crossings</td>
<td>10%</td>
</tr>
<tr>
<td>Safety behaviour</td>
<td>5%</td>
</tr>
<tr>
<td>Speed</td>
<td>5%</td>
</tr>
<tr>
<td>Communication</td>
<td>5%</td>
</tr>
<tr>
<td>Lane keeping</td>
<td>5%</td>
</tr>
<tr>
<td>Distance to car ahead</td>
<td>5%</td>
</tr>
</tbody>
</table>

Results

- Dynamic visual field size (PP) = 0.344
- Central contrast sensitivity (R_Contrast) = 0.272
- Visual field size (Octopus) = 0.265
- Tracking deviation (PP) = 0.511
- Total correct reactions (COG) = 0.642
- Length of mistakes (AV/T) = 0.344
- Number of correct reactions (DT) = 0.317
- Overview (TAV/TMB) = 0.32
- Mean motor reaction (RT) = 0.282
- Median detection time (sec) (SIGNAL) = 0.268
- General intelligence (AMT) = 0.25

Subject Sample

- Sample of 92 drivers (60 m, 32 f). Mean age 68.5 y (range 60–91 y; median 67 y; SD 6.6 y).
- Participants were volunteers with valid driving license; normal visual fields only.

Conclusion

- Visual performance indicators have only limited predictive power for driving aptitude (20% explained variance, EV); 80% are person-specific.
- Psychometric tests are more important (35% EV).
- The label “visual field” for PP on the VTS is misleading.
- Acuity (9%) and perimeter (7%) are of little importance.