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%.1
- 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 diagnostics included visual acuity, visual field, and recognition contrast-sensitivity on a standard PC.

Objective tests were used as statistical predictors of variance in contrast sensitivity. Results of psychological and visual diagnostics included visual acuity, visual field, and recognition contrast-sensitivity on an standard PC.

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.
- By 2050, the number of people in the EU aged 65 and above will have increased by 70%, and over 80 by 170%.1

Psychological Testing

- 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.

Visual Diagnostics

- 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.

On-Road Driving Test

- Traffic Situations and Occurrence Rates

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.

Results

- Visual and cognitive performance indicators that correlated significantly with driving competence (Explained Variance, **p<0.01, *p<0.05).

Driving Ability

- Good drivers
- Bad drivers

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>Wald df Sig.</th>
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<tbody>
<tr>
<td>Focused attention (COG)</td>
<td>–1.77</td>
<td>4.553</td>
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<tr>
<td>Divided attention (PP)</td>
<td>.278</td>
<td>7.618</td>
</tr>
<tr>
<td>Recognition time (SIGNAL)</td>
<td>.755</td>
<td>2.69</td>
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<tr>
<td>Dynamic visual field (PP)</td>
<td>.007</td>
<td>2.54</td>
</tr>
<tr>
<td>Visual acuity (Visus)</td>
<td>–.317</td>
<td>1.591</td>
</tr>
<tr>
<td>Central contrast sensitivity (R_C)</td>
<td>.360</td>
<td>.726</td>
</tr>
</tbody>
</table>

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).
- Best predictors were lane tracking (26% EV), Schuhfried’s dynamical peripheral vision PP (12% EV).
- The label “visual field” for PP on the VTS is misleading.
- Acuity (9%) and perimetry (7%) are of little importance.