Deviant driving measures of healthy controls, MCI and AD patients in simulated driving

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CONCLUSION
• Deviant scores are frequent in the patient groups, observed in more than 50% of the AD patients in average speed and headway distance.
• Distraction increased the percentage of deviant scores.
• The clinical significance of deviant scores is being explored in further analyses, in relation with braking during unexpected incidents.

BACKGROUND & AIMS
Both driver characteristics and driving scenarios are shown to affect driving performance in simulated driving. Driver characteristics are participant type, and driving scenarios are traffic load and use of distraction. Despite some findings on the above variables, little is known about the performance of individual drivers, that is, the proportion of drivers who deviate significantly from the mean in different driving measures. The study examines the proportion of healthy controls, MCI and AD patients who deviate significantly from the mean in simulated driving.

METHODS
Participants
• 21 healthy controls over 52 years of age (age of youngest patient)
• 37 Mild Cognitive Impairment (MCI) patients
• 16 mild Alzheimer’s disease (AD) patients
All participants were regular drivers

Driving simulator experiment
• Data from Distract and DriverBrain research projects
• All participants underwent a neurological, neuropsychological and ophthalmological assessment
• Driving simulator assessment: All drivers drove a quarter-cab FOERST driving simulator (3 LCD wide screens 42'’, full HD: 1920x1080 pixels - total field of view 170 degrees, validated against a real world environment) in 4 rural conditions, counterbalanced across participants:
  • moderate traffic with & without distraction
  • high traffic with & without distraction
• A practice drive (10-15 minutes) preceded the driving assessment
• The rural drive took place in a single carriageway route, zero gradient, with mild horizontal curves

Measures
• Average speed (in km)
• Headway average (distance from the vehicle ahead in m)
• Lateral position variability (SD of the distance of the vehicle from the right road border in m)
• The measures were z-transformed based on the performance of all 86 control participants in each of the driving conditions (mean age 46±16.04) and the number of participants deviating by > 1.5 SD from the mean were computed.

RESULTS

<table>
<thead>
<tr>
<th>Condition</th>
<th>χ² (df, N)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1: moderate speed</td>
<td>6.90 (2, 74)</td>
<td>.03</td>
</tr>
<tr>
<td>R2: high speed</td>
<td>7.53 (2, 74)</td>
<td>.02</td>
</tr>
<tr>
<td>R3: moderate speed with distraction</td>
<td>13.98 (2, 74)</td>
<td>.001</td>
</tr>
<tr>
<td>R4: high speed with distraction</td>
<td>12.19 (2, 74)</td>
<td>.002</td>
</tr>
</tbody>
</table>

Distraction condition: conversation with passenger

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