Simulated driving after stroke: toward ecologically valid neuropsychological assessment

Lauriane A. Spreij¹, Antonia F. Ten Brink¹, Johanna M.A. Visser-Meily² and Tanja C.W. Nijboer¹,²

1. Brain Centre Rudolf Magnus, Centre of Excellence for Rehabilitation Medicine, University Medical Centre Utrecht and De Hoogstraat Rehabilitation, Utrecht, The Netherlands
2. Department of Experimental Psychology, Helmholtz Institute, Utrecht University, Utrecht, The Netherlands

Background
Currently visuo-spatial neglect is mainly assessed with paper-and-pencil tasks, which lack the dynamics and complexity to detect mild or well-compensated neglect.

The aim of this study is to investigate whether simulated driving can identify neglect in stroke patients and serve as a diagnostic tool.

- We compared the average position on the road and sway (average standard deviation of the position) between patient with and without neglect.

- We computed correlations between driving performance and neglect severity based on the Star Cancellation (SC), Line Bisection (LB), and the Catherine Bergego Scale (CBS).

- In order to evaluate sensitivity, percentages of patients with and without neglect as measured with the simulated driving task were provided. The threshold for neglect was based on the average position + 2.5 standard deviations of healthy controls (n = 27).

Methods
59 stroke patients with right brain damage completed a simulated driving task and completed several neglect tasks.

Participants were instructed to use the steering wheel to maintain the starting position on the middle of the right lane during 2 minutes. A continuous ‘side wind’ was simulated fluctuating regarding direction. Average position and sway were computed every 15 seconds. In total, there were eight timestamps in time.

Results
Average position on the road and sway: There was a significant difference between the two groups on average position on the road and sway.

<table>
<thead>
<tr>
<th></th>
<th>Neglect-</th>
<th>Neglect+</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>-51.99 (97.36)</td>
<td>-110.80 (159.46)</td>
<td>.019*</td>
</tr>
<tr>
<td>Sway</td>
<td>39.47 (18.69)</td>
<td>62.55 (40.43)</td>
<td>.002*</td>
</tr>
</tbody>
</table>

Relations with neglect severity: There were moderate positive correlations between driving performance and neglect severity (based on SC, LB and CBS).

<table>
<thead>
<tr>
<th></th>
<th>Position</th>
<th>p</th>
<th>Sway</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC asymmetry score</td>
<td>-.28</td>
<td>.013*</td>
<td>.45</td>
<td>&lt;.001**</td>
</tr>
<tr>
<td>LB mean deviation score</td>
<td>-.41</td>
<td>.001**</td>
<td>.55</td>
<td>&lt;.001**</td>
</tr>
<tr>
<td>CBS total score</td>
<td>-.41</td>
<td>.005**</td>
<td>.34</td>
<td>.023*</td>
</tr>
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</table>

Sensitivity: the average position on the road fell outside normal range in 60% of neglect patients and importantly in 16% of non-neglect patients.

Conclusion
Simulated driving might be a useful tool in the assessment of neglect. It can be considered as a more dynamic task enhancing the ecological validity of the assessment of neglect.

There was a significant difference on education, MI arm, MI leg, and MOCA between the two groups.

(SAN) Stichting Afasie Nederland; (MI) Motricity Index; (SAN) Stichting Afasie Nederland; (MOCA) Montreal Cognitive Assessment. *A higher score means a better performance.

l.a.spreij-2@umcutrecht.com