Predicting Speech-in-Noise Recognition from Performance on the Trail Making Test: Results from a Large-Scale Internet Study

Rachel Ellis a,b, Peter Molander a,b, Jerker Rönberg a,b, Björn Lyxell a,b, Gerhard Andersson a,b,c & Thomas Lunner a,b,d

a Linnaeus Centre HEAD, Swedish Institute for Disability Research, Sweden. b Department of Behavioural Sciences and Learning, Linköping University, Sweden. c Department of Clinical Neuroscience, Karolinska Institute, Stockholm, Sweden. d Eriksholm Research Centre, Oticon A/S, Snekkersten, Denmark.

Introduction
- The trail making test (TMT)\(^2\) is a neuropsychological test thought to measure executive control and cognitive flexibility
- Scores on the TMT have been shown in small samples to correlate with speech in noise recognition in young adults with normal hearing\(^2\) and in older adults with hearing loss\(^1\).

Aim
- To investigate whether TMT scores can be used to predict speech-in-noise recognition in a large and varied sample of listeners.

Results
- TMT-A and TMT-B scores correlate with speech recognition but TMT-d does not (see Figure 2).
- TMT-A and TMT-B scores correlate with age but TMT-d does not (see Table 1).
- Partial correlations, with the effect of age removed, indicate that all TMT measures correlate with speech recognition.

Conclusions
- TMT scores can be used to predict speech-in-noise recognition in adult listeners of all age groups, with and without hearing loss.
- The relationship between speech recognition and the TMT seems to relate to basic speed of processing rather than to complex cognitive processes.
- Results are consistent with the speed of processing theory of cognitive ageing\(^5\).
- Type of speech materials used (words rather than sentences) may have influenced these findings.

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Further information about the study may be obtained from: Rachel.Ellis@liu.se

Methods
- Participants: 1509 aged between 18 and 91, 19% of whom had a hearing loss.
- Procedure: All testing was conducted via the internet.
- Speech-in-Noise Recognition Test: The Hearing Bridge test\(^4\) was used. This is an adaptive closed set test in which disyllabic words are presented in a background of speech-shaped noise. The outcome measure was the SNR at which responses, based on the last 10 trials, were correct 50% of the time.

Trail Making Test: A computerised version of the TMT was developed. The participants task was to connect a sequence of points in numerical (TMT-A) or to alternate between alphabetical and numerical order (TMT-B) as shown in Figure 1. The outcome measure was the time taken to complete the task. An additional measure, TMT-d, was calculated by dividing TMT-B scores by TMT-A scores.

Analysis: Correlational analyses (Pearson’s r) were conducted.

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<tr>
<th></th>
<th>TMT-A</th>
<th>TMT-B</th>
<th>TMT-d</th>
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<tbody>
<tr>
<td>Age</td>
<td>0.49</td>
<td>0.37</td>
<td>-0.01</td>
</tr>
<tr>
<td>SNR 50%, age</td>
<td>0.17</td>
<td>0.19</td>
<td>0.07</td>
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<td>removed</td>
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Table 1. Correlation (Pearson’s r) statistics. Red font = statistically significant

Figure 1. Examples of partially completed TMT-A (left) and TMT-B (right)

Figure 2. Scatterplots showing the relationship between SNR 50% correct and TMT-A (left), TMT-B (centre) and TMT-d (right) scores. Regression lines indicate a significant correlation.

References