Immediate recall of short stories depends on educational level

Ricardo Nitrini

Abstract – Memory complaints are frequent in the elderly but the confirmation of memory decline is challenging. Tests employing the recall of paragraphs or short stories have been proposed for the diagnosis of Alzheimer’s disease and amnestic mild cognitive impairment. Objectives: To evaluate the influence of educational level on immediate recall of short stories. Methods: A sample of 363 individuals (214 women; median age of 50; median years of schooling of 6; 23 illiterates) without evident physical or mental illnesses were evaluated with simple neuropsychological tests, including the recall of short stories immediately after listening to them read aloud by the examiner. Results: Age showed an inverse correlation whereas years of schooling showed a direct correlation with the scores on the immediate recall of short stories. As age and years of schooling were inversely correlated, logistic regression was employed, which showed that only years of schooling had an influence on the performance in the test. Conclusions: In populations with heterogeneous educational background, the recall of short stories cannot be recommended for the diagnosis of memory impairment. It is possible that tests with larger encoding phases are more appropriate for these populations. From a broader perspective, information released by radio or TV, as well as information disseminated orally in public settings such as hospitals, stations or airports may be less well retained by low educated individuals, especially when the information is presented only once.

Key words: memory, Alzheimer’s disease, mild cognitive impairment, logical memory, education, neuropsychological tests.

Recordação imediata de estórias curtas depende do nível educacional

Resumo – Queixas de problemas com a memória são frequentes em idosos, mas a confirmação de declínio da memória não é simples. Testes que utilizam a recordação de parágrafos ou estórias curtas têm sido propostos para o diagnóstico de doença de Alzheimer e de comprometimento cognitivo leve amnésico. Objetivos: Avaliar a influência do nível educacional sobre a recordação imediata de estórias curtas. Métodos: 363 indivíduos (214 mulheres; idade mediana de 50; escolaridade mediana de 6; 23 analfabetos) sem doenças físicas ou mentais evidentes foram avaliados com testes neuropsicológicos simples que incluíram a recordação de estórias simples imediatamente depois da leitura em voz alta pelo examinador. Resultados: Idade correlacionou-se inversamente enquanto anos de escolaridade correlacionou-se diretamente com os escores na recordação imediata das estórias. Como idade e anos de escolaridade correlacionaram-se inversamente, foi empregada regressão logística que demonstrou que apenas a escolaridade influenciou o desempenho no teste. Conclusões: Em populações com nível educacional heterogêneo, a recordação de estórias curtas não deve ser recomendada para o diagnóstico de comprometimento da memória. É possível que testes com fases de codificação mais prolongadas ou repetidas sejam mais apropriados para populações deste tipo. A partir de perspectiva mais ampla, informações divulgadas por rádio ou televisão, bem como avisos oralmente apresentados em espaços públicos como hospitais, estações ou aeroportos podem ser menos lembrados por indivíduos de baixa escolaridade, especialmente quando a informação for apresentada uma única vez.

Palavras-chave: memória, doença de Alzheimer, comprometimento cognitivo leve, memória lógica, educação, testes neuropsicológicos.

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Demographic data and information on the level of schooling attained by the participants were gathered. The scores on the M-LMI did not differ for gender, with medians of 8.5 for women and 9.0 for men (p>0.2).

Table 2 shows the mean and median scores of the neuropsychological tests according to educational level, and for the M-LMI also according to gender. Spearman’s correlation test was employed for correlating the scores in the M-LMI with age and education. Logistic regression was applied to investigate the influence of age and education on the performance on the M-LMI. The value of significance accepted was 0.05. The software package SPSS for Windows 14.0 was used for the statistical analysis.

Results

Table 1 shows the average demographic data and scores on the neuropsychological tests of the 363 participants (214 women; 149 men).

The scores on the M-LMI did not differ for gender, with medians of 8.5 for women and 9.0 for men (p>0.2).

Table 2 shows the mean and median scores of the neu-
Immediate recall and education

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There were statistically significant differences between the performances of the two groups on all the neuropsychological tests (p<0.001).

There was an inverse correlation between scores on the M-LMI and age (rho= –0.184; p<0.001) and direct correlation between scores on the M-LMI and years of schooling attained (rho=0.524; p<0.001).

Because there was an inverse correlation between age and years of schooling attained in this sample (rho= –0.368; p<0.001), logistic regression was used with the scores on the M-LMI being divided into below the median, and greater than or equal to the median. Age and gender were not included in the equation while only years of schooling attained was included (B=0.173, standard error=0.27; Exponential (B)=1.189, 95% CI 1.128–1253; p<0.001).

There were 23 (15 women) illiterate subjects (23/363) in this sample, with mean age of 59.4 (±7.4) years and median of 60 years. Illiterates were older than the other (literate) participants, whose mean age was 48.5 years (±14.0) and median was 49 years (p<0.001). The performance of the illiterates on the M-LMI was very low with a mean of 5.7 (±2.2) and median of 5.5, in contrast to the other participants who scored 9.6 (±4.6) with median of 9 (p<0.001).

Discussion

The results showed a major influence of educational level on performance in immediate recall of the stories. The influence of illiteracy was marked.

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Table 1. Demographic data and scores on the neuropsychological tests of the 363 participants.

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Min–Max</th>
<th>25th–75th percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.2 (13.9)</td>
<td>50</td>
<td>16–87</td>
<td>42–58</td>
<td></td>
</tr>
<tr>
<td>Schooling years</td>
<td>6.8 (4.8)</td>
<td>6</td>
<td>0–20</td>
<td>3–10</td>
</tr>
<tr>
<td>28.0 (2.6)</td>
<td>29</td>
<td>17–30</td>
<td>27–30</td>
<td></td>
</tr>
<tr>
<td>19.7 (7.3)</td>
<td>19</td>
<td>6–44</td>
<td>15–23</td>
<td></td>
</tr>
<tr>
<td>82.4 (55.9)</td>
<td>61</td>
<td>15–300*</td>
<td>45–105</td>
<td></td>
</tr>
<tr>
<td>2.1 (1.1)</td>
<td>2</td>
<td>1–5†</td>
<td>1–3</td>
<td></td>
</tr>
<tr>
<td>9.4 (4.6)</td>
<td>8.5</td>
<td>1–23</td>
<td>5.5–12</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Scores on neuropsychological tests according to years of schooling, divided into below the median (N=205) and greater than or equal to the median (N=158).

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Min–Max</th>
<th>25th–75th percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.2 (2.9)</td>
<td>28</td>
<td>17–30</td>
<td>26–30</td>
<td></td>
</tr>
<tr>
<td>29.1 (1.6)</td>
<td>30</td>
<td>20–30</td>
<td>29–30</td>
<td></td>
</tr>
<tr>
<td>17.4 (5.8)</td>
<td>17</td>
<td>6–42</td>
<td>14–20</td>
<td></td>
</tr>
<tr>
<td>22.6 (8.1)</td>
<td>22</td>
<td>9–44</td>
<td>17–28</td>
<td></td>
</tr>
<tr>
<td>102.1 (59.9)</td>
<td>80.0</td>
<td>25–300*</td>
<td>57.5–135</td>
<td></td>
</tr>
<tr>
<td>56.9 (37.1)</td>
<td>48.5</td>
<td>15–240</td>
<td>35–61.2</td>
<td></td>
</tr>
<tr>
<td>2.3 (1.1)</td>
<td>2</td>
<td>1–5†</td>
<td>2–3</td>
<td></td>
</tr>
<tr>
<td>1.8 (1.0)</td>
<td>2</td>
<td>1–5</td>
<td>1–2</td>
<td></td>
</tr>
<tr>
<td>7.6 (3.5)</td>
<td>7.0</td>
<td>1–20.5</td>
<td>5.5–12</td>
<td></td>
</tr>
<tr>
<td>11.6 (4.8)</td>
<td>11.5</td>
<td>2–23</td>
<td>8–15</td>
<td></td>
</tr>
</tbody>
</table>

- Min-Max, minimum and maximum values; MMSE: Mini-Mental State Examination; SD, standard deviation; 'Test was interrupted at 300 s.; 'Score was the number of demonstrations needed to obtain correct performance; †Test was interrupted after five demonstrations.
Other authors have previously reported that education has a greater effect than age on the retention of items in logical memory, both for form I and form II, but other authors have not observed any influence of education. The absence of effect of educational level reported in the cited study was probably related to relatively higher range of years of schooling (6–20 years), with a mean of 13.5 years (SD=2.2), versus this and other studies.

In populations with heterogeneous educational background, a very frequent occurrence in developing countries, the evaluation of memory with the recall of short stories is not recommended. Alternatively, if these tests are to be used, scores adjusted for education should be employed.

Although this study did not compare the performance on the M-LMI with that of other memory tests, it is probable that in tests with larger encoding phases, such as the memory tests of the CERAD battery, and the Brief Cognitive Battery, the Free and Cued Selective Reminding Test and the Double Memory Test, are more appropriate for the evaluation of memory impairment in populations with heterogeneous educational level. In the CERAD battery and the Brief Cognitive Battery, the items to be reminded are presented three times to improve encoding, whereas in the Double Memory Test semantic encoding is stimulated.

The reasons for the poor performance of illiterate and low educated individuals on the immediate recall of short stories is not clear. It is possible that their attention had been focusing on the general meaning of the stories rather than trying to segment the information to encode it. An alternative explanation is that there were difficulties on re-telling the stories, which is mainly an executive function. As we did not evaluate the recognition of the items or the recall of the meaning of the stories it is not possible to ascertain the relative contributions of these factors. The artificial setting of the evaluation may have contributed to the poor performance of the low educated participants, especially when the information is presented only once.

This study was conducted according to the principles established in the Helsinki declaration, but the participants did not sign an informed written consent because this was not a required formal procedure in 1989-1990, when the data were collected.

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