A study of the links between trilingualism, short term memory and attentional control

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Introduction and Aim

While some studies observed a cognitive advantage in bilingual and multilingual speakers (Bialystok, 2015), other studies have recently questioned the existence of such an advantage (Paap & Greenberg, 2013).

The aim of this study was to assess the potential cognitive advantages of trilingualism by focusing on auditory-verbal short-term memory (STM) and attention. Although these cognitive functions are strongly recruited during language learning and processing, they have rarely been explored in the context of multilingualism.

Methods

- Participants (N = 51) aged 18-32 (mean 23.86 years, SD 2.93) were raised in Luxemburg and spoke at least three languages: Luxemburgish, German and French.
- Language comprehension and production for German and French were assessed.
- Auditory-verbal STM was assessed via an immediate serial recall (ISR) task for lists of words and non-words (1-6 items).
- Attention was assessed via auditory-verbal running spans under two attentional control demands: automatic attention (Fig. 1a) and controlled attention (Fig. 1b). As the items are presented at a very fast rate, rehearsal and any other strategies are blocked (Cowan, Frisoe, Elliott, Bruner, & Saults, 2006).

Results

Bayesian correlation analysis

<table>
<thead>
<tr>
<th>Language</th>
<th>ISR</th>
<th>Automatic</th>
<th>Controlled</th>
<th>Raven</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>-</td>
<td>0.55***</td>
<td>0.35 *</td>
<td>0.36 *</td>
</tr>
<tr>
<td>ISR</td>
<td>-</td>
<td>-</td>
<td>0.65***</td>
<td>0.46***</td>
</tr>
<tr>
<td>Automatic</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.22</td>
</tr>
<tr>
<td>Controlled</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

BF₁₀ values for the prediction of ISR, Automatic Attention, and Controlled Attention tasks by trilingual language proficiency and Raven’s matrices scores.

<table>
<thead>
<tr>
<th>ISR</th>
<th>Automatic</th>
<th>Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>689.119</td>
<td>3.890</td>
</tr>
<tr>
<td>Raven</td>
<td>1.365</td>
<td>2.938</td>
</tr>
</tbody>
</table>

Discussion and conclusion

- Moderate to strong association between language proficiency and auditory-verbal STM as well as automatic and controlled attentional abilities, while controlling for general intellectual efficiency.
- This study suggests that:
  1. Auditory-verbal STM and attention are important candidate functions for the exploration of a potential multilingual advantage.
  2. Higher verbal STM capacities in highly proficient trilinguals may stem from higher auditory-verbal attention abilities, more efficient support from linguistic long-term memory, better serial order encoding abilities, or a combination of these.

References


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