The Effect of Simultaneous Interpreting on Age-Related Changes of Executive Functions Across Lifespan

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With advancing age, cognitive functions decline

But different activities can slow the decline of cognitive functions and delay the symptoms of neurodegenerative diseases
Introduction

• Recent studies showed that an experience in a work activity can modify the brain.

  ➔ Modification of the size of hippocampus in taxi drivers (Maguire et al., 2000; 2003; 2006; 2011).

  ➔ Modification of the gray matter volume in professional musicians compared to non musicians (Gaser & Schlaug, 2003).

• Other studies showed that experience in a work activity can preserve cognitive functions from declining

  ➔ Higher mental stimulation at work is associated with improved cognitive functioning and a slowing cognitive decline (Marquié et al., 2010).
Based on this research, we are interested in the influence that a specific work activity can have on executive functions.

Why executive functions?

Simultaneous Interpretation

- Inhibition
- Flexibility
- Updating
- Speed
- Multitasking

Park et al., 2001
Objective and Hypothesis

• **Final objective:**
  
  • To show that a cognitively demanding work activity helps prevent the natural decline of cognitive functions.

• **Hypothesis**
  
  • H1: The functions intensively and frequently involved in a work activity can be preserved from the natural cognitive decline.
  
  • H2: In the case of simultaneous interpreters, the functions and processes related to executive control should show a smaller decline than for non-interpreters.
Participants

225 participants divided into three groups

75 Interpreters
75 Translators
75 Monolinguals

5 age groups of 15 participants each
(25–34 ; 35–44 ; 45–54 ; 55–65 ; 66+)

Statistically comparable for gender, level of education, age and experience.
Methods

• 5 computerized tasks presented randomly

• These tasks were selected to evaluate the cognitive processes and functions essential to the simultaneous interpretation activity.

  • Simple reaction time

  • Dual task (Brown Peterson)

• 3 tasks assessing executive functions (updating, inhibition, flexibility) from the model of Miyake et al. (2000)

  - Letter memory for updating
  - Antissaccade for inhibition
  - Plus-Minus for flexibility
Results

Table 1. Results – Reaction Time

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Interpreters/Translator vs Monolinguals</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-34 (n=45)</td>
<td>NS</td>
</tr>
<tr>
<td>35-44 (n=45)</td>
<td>NS</td>
</tr>
<tr>
<td>45-54 (n=45)</td>
<td>.009*</td>
</tr>
<tr>
<td>55-65 (n=45)</td>
<td>.001*</td>
</tr>
<tr>
<td>66+ (n=45)</td>
<td>NS</td>
</tr>
</tbody>
</table>

**35 years**: Difference between interpreters and monolinguals

**45 years**: Differences between interpreters and the two other groups

**66+**: Difference between interpreters and monolinguals
Results

Table 2. Results – Flexibility

<table>
<thead>
<tr>
<th></th>
<th>25-34 (n= 45)</th>
<th>35-44 (n = 45)</th>
<th>45-54 (n=45)</th>
<th>55-65 (n=45)</th>
<th>66+ (n=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Int / Trans</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Int / Mono</td>
<td>NS</td>
<td>.033*</td>
<td>.027*</td>
<td>.003*</td>
<td>.004*</td>
</tr>
<tr>
<td>Trans / Mono</td>
<td>NS</td>
<td>NS</td>
<td>.034*</td>
<td>.029*</td>
<td>.019*</td>
</tr>
</tbody>
</table>

No differences between interpreters and translators

35 years: Difference between interpreters and monolinguals

45 years: Differences between interpreters/ translators and monolinguals
Results

Table 3. Results – Updating

<table>
<thead>
<tr>
<th></th>
<th>25-34 (n=45)</th>
<th>35-44 (n=45)</th>
<th>45-54 (n=45)</th>
<th>55-65 (n=45)</th>
<th>66+ (n=45)</th>
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</thead>
<tbody>
<tr>
<td>Int / Trans</td>
<td>NS</td>
<td>.015*</td>
<td>.016*</td>
<td>.048*</td>
<td>NS</td>
</tr>
<tr>
<td>Int / Mono</td>
<td>NS</td>
<td>.003*</td>
<td>.001*</td>
<td>.001*</td>
<td>.004*</td>
</tr>
<tr>
<td>Trans / Mono</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
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</tbody>
</table>

35 years: Differences between interpreters and the two other groups

66+: Difference between interpreters and monolinguals
Results

Table 4. Results – Inhibition

<table>
<thead>
<tr>
<th>Age Group</th>
<th>25-34 (n=45)</th>
<th>35-44 (n=45)</th>
<th>45-54 (n=45)</th>
<th>55-65 (n=45)</th>
<th>66+ (n=45)</th>
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<tr>
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<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Int / Mono</td>
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<td>NS</td>
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<td>.008*</td>
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<tr>
<td>Trans / Mono</td>
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<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>.049*</td>
</tr>
</tbody>
</table>

No differences between interpreters and translators

55 years: Difference between interpreters and monolinguals

66+: Differences between interpreters/translation and monolinguals
Results

Table 5. Results – Dual Task

<table>
<thead>
<tr>
<th></th>
<th>25-34 (n=45)</th>
<th>35-44 (n=45)</th>
<th>45-54 (n=45)</th>
<th>55-65 (n=45)</th>
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<td>NS</td>
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<tr>
<td>Int / Mono</td>
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<td>.042*</td>
<td>.008*</td>
<td>.001*</td>
<td>NS</td>
</tr>
<tr>
<td>Trans /Mono</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>.002*</td>
<td>NS</td>
</tr>
</tbody>
</table>

No differences between interpreters and translators

35 years: Difference between interpreters and monolinguals

55 years: Differences between interpreters/translators and monolinguals

66+: No differences between groups
Results - Summary

- No differences between groups

- Differences between interpreters and monolinguals in updating, flexibility, dual tasks and RT
  - Difference between interpreters and translators in updating

- Difference between interpreters and translators in RT
  - Difference between translators and monolinguals in flexibility

- Difference between interpreters and monolinguals in inhibition
  - Difference between translators and monolinguals in dual task

- Difference between translators and monolinguals in inhibition
  - The differences between interpreters and translators in updating and RT disappear
Discussion

• Over a working life, it seems that simultaneous interpreting may slow the decline of executive functions.

  ➔ The stimulation during work activity preserves the most involved functions in simultaneous interpreting (Speed of information processing and Updating).

• However, once retired, interpreters seem to lose the benefits of cognitive stimulation of their work activity even if the benefits of bilingualism are preserved (better inhibition and flexibility than monolinguals).

  ➔ The decline of cognitive stimulation related to retiring causes the loss of the benefits acquired by work.
Thanks for your attention