The Effects of Ageing and Visual Noise on Conceptual Integration during Sentence Reading

Aline Becker
Seminar: “Language Comprehension and Aging“
11.12.2014
The Effortfulness hypothesis

Effortfulness Hypotheses

“Sensory challenge can tax resources for higher order cognition.”

2 Types of noise

Internal (ageing, disease, brain damage)

External (degraded sensory input, e.g. blurry screen)

Empirical Evidence (Retrieval)

Rabitt (1968)

Wingfield et al. (2005)
The Effortfulness hypothesis in sentence processing

Sentence processing

Word-level processing
- Word forms, lexical access

Textbase-level processing
- Conceptual integration
The Effortfulness hypothesis in sentence processing

Word-level processing
- Noise: Increase Sensory Challenge

Textbase-level processing
- Conceptual integration
Today’s issue

The effects of ageing and visual noise on conceptual integration during sentence reading

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Hypotheses

a) Increased levels of visual noise 
   Increased effort in word-level processes 
   Less effort "left" for textbase-processes 
   Especially for the old 

b) Worse performance in subsequent recall test
## Experiment 1: Participants

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Older</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>Mean age in yrs (SD)</td>
<td>23.8 (4.0)</td>
<td>69.5 (7.2)</td>
</tr>
<tr>
<td>Mean education in yrs (SD)</td>
<td>16.2 (1.9)</td>
<td>16.0 (2.6)</td>
</tr>
<tr>
<td>Vocabulary knowledge WAIS-R (SD)</td>
<td>53.1 (8.1)</td>
<td>51.3 (8.5)</td>
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<tr>
<td>Working memory span (SD)</td>
<td>5.7 (1.2)</td>
<td>4.3 (1.0)</td>
</tr>
<tr>
<td>Vision</td>
<td>Normal or corrected to normal</td>
<td>Normal or corrected to normal</td>
</tr>
<tr>
<td>Visual Acuity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Experiment 1: Methods

Block 1
Noise Condition 1
- 4 practice trials
- warm-up trials
- 8 sentences
- Recall Test
- 8 sentences
- Recall Test

Block 2
Noise Condition 2
- 4 practice trials
- warm-up trials
- 8 sentences
- Recall Test
- 8 sentences
- Recall Test

Block 3
Noise Condition 3
- 4 practice trials
- warm-up trials
- 8 sentences
- Recall Test
- 8 sentences
- Recall Test

12/11/2014
Experiment 1: Methods

Ready?
Experiment 1: Methods
Experiment 1: Methods

In
many
Experiment 1: Methods

species
In many species it is the females who shape evolution through their subtle exercise of choice in mating. They often choose mates who are bolder bolder bolder or brightly colored.

**Word-level features:**
- numbers of syllables
- word frequency

**Text-level features:**
- word as a newly introduced concept in the sentence
- cumulative conceptual load at sentence boundaries
Experiment 1: Results

Patterns of Resource Allocation
Three-way interaction of age, noise and level of sentence processing: Noise produced dissociation of word and text based processing only in older adults.

Recall Performance
Only post-Hoc analyses revealed Age*Noise interaction: Decrease in Recall performance for old adults.
# Experiment 2: Participants

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<tr>
<td>n</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Mean age in yrs (SD)</td>
<td>21.5 (4.4)</td>
<td>67.9 (4.9)</td>
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<tr>
<td>Mean education in yrs (SD)</td>
<td>14.7 (1.7)</td>
<td>15.2 (2.7)</td>
</tr>
<tr>
<td>Vocabulary knowledge WAIS-R (SD)</td>
<td>45.3 (5.3)</td>
<td>46.6 (6.9)</td>
</tr>
<tr>
<td>Working memory span (SD)</td>
<td>5.5 (1.2)</td>
<td>4.3 (0.9)</td>
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</tr>
</tbody>
</table>
Experiment 2: Methods

Block 1
Noise Condition 1

• 4 practice trials
• warm-up trials
• 8 sentences
• Recall Test
• 8 sentences
• Recall Test
• 8 sentences
• Recall Test

Block 2
Noise Condition 2

Same design as Experiment 1
But: more noise

Block 3
Noise Condition 3

• Recall Test
• Recall Test
• Recall Test
Experiment 2: Results

Patterns of Resource Allocation
Strong interaction of noise and level of sentence processing,
But did not vary with age

Recall Performance
No Age*Noise Interaction
Decreasing Recall with increasing noise in both age groups
Summary

Effortfulness-Hypotheses
• External noise (Age)
• Internal noise (conditions)
• Cumulation (Interaction in Experiment 1)
• Impact on both textbase processes and Recall
• What is the reason for this ageing effect?

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Thank you
