Garden-path misinterpretation in reading while listening

Guorong Zhang and E. Matthew Husband
Faculty of Linguistics, Philology, and Phonetics, University of Oxford

Reading While Listening
Reading while listening (RWL) to the same text is a common educational technique thought to:
- improve reading ability and language comprehension among young L1 readers, L2 learners, and those with disabilities, with individuals intuitively reporting that comprehension is sometimes easier in RWL;
- some research has found that RWL can improve lexical recognition [1];
- RWL was also reported to increase cognitive load which worsens comprehension [2].

Hypothesis & Methods
Main Hypothesis: For sentence comprehension specifically, we hypothesized that the ability to pause, delay, or regress in reading may be disrupted by co-current speech, thus impairing sentence comprehension. Additionally, under the Implicit Prosody Hypothesis [3], readers’ self-generated prosody may be disrupted by an overt speech signal.

Design
- 48 participants from Oxford University area.
- Stimuli presented using PsychoPy [4]
- 2 (SENTENCE TYPE: garden-path vs. non-garden-path) by 2 (READING CONDITION: silent reading vs. RWL) study
- Silent reading (SR) and RWL stimuli were presented in blocks as a between-subjects factor counterbalancing the presentation ORDER of the blocks (either SR-RWL or RWL-SR).
- 48 pairs of garden-path/non-garden-path sentences were adapted from previous studies, presented with 116 filler items (including 20 training items). [5, 6]
- The auditory stimuli for the RWL condition were generated using Apple’s macOS Text-To-Speech function with the voice “Tom” at the speech rate of 237 m/sec/syllable (SD = 25 m/sec/syllable).
- The display time of text in both SR and RWL blocks was matched to the audio duration.

Stimulus Example
<table>
<thead>
<tr>
<th>Garden-path</th>
<th>Non-garden-path</th>
</tr>
</thead>
<tbody>
<tr>
<td>While Anna dressed the girl that was stylish appeared on TV.</td>
<td>While Anna dressed, the girl that was stylish appeared on TV.</td>
</tr>
<tr>
<td>Question: Did Anna dress the girl?</td>
<td></td>
</tr>
</tbody>
</table>

Results

| Fixation: 300ms |
| Visual stimulus (and auditory stimulus in RWL condition): Duration of the auditory stimulus |
| Comprehension question: Until keys pressed |

Summary & Conclusion

Conclusion: Against our hypotheses, we found that, while our participants displayed the classic misinterpretation effect of garden-path sentences,
- RWL did not affect this misinterpretation negatively or positively when compared to SR.
- Instead, RWL-SR group showed less improvement to comprehension accuracy than the SR-RWL group. It may be that RWL in an initial block disrupted the adaptation process within our study.

Discussion: Given that misinterpretation is a relatively late and offline measure of sentence comprehension, participants may be trading off the costs and benefits of RWL in online processing.
- An eye-tracking study is currently being conducted to investigate whether online reading processes are enhanced/disrupted during RWL.
- Further studies will also use prosody-rich speech as audio stimuli to compare with the findings from the current study.

References

https://sites.google.com/view/adamzhang/home : guorong.zhang@ling.phil.ox.ac.uk