

Children Reveal Offline but not Online Expectation-based Effects in Sentence Processing

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The work of individual differences in English sentence processing is extensive and yet still without clear answers. Work investigating the role of individual differences through pivotal developmental stages, on the other hand, is far and few between. We asked whether children in this crucial phase of life have accumulated enough reading experience to be influenced by expectation-based effects during sentence processing, or whether other cognitive factors better explain sentence processing effects among young readers.

We presented sentences followed by comprehension questions to 10- to 15-year-old first-language users of English ($n = 88$) using a self-paced reading paradigm. Sentences were 32 relative clause sentences (RCs) [1] and 80 temporary ambiguities exploiting verb bias [2]. Age of acquisition (AoA) of lexical items was adjusted to no higher than 10 years. Participants answered questions about their reading habits [3] and completed the Core Academic Language Skill [4] assessment as measures of language skill. In addition, they completed a battery of 13 individual differences tasks to measure attention, processing speed, phonological awareness, short-term memory, and verbal working memory. To assess individual differences scores in analysis, composite z-scores were computed and averaged for tasks in the same construct.

The relative clause effect has been corroborated in adult sentence processing time and time again. This effect is characterized by slower reading times for object relative clauses (ORCs) compared to subject relative clauses (SRCs) at the region following the embedded relative clause. As for temporary Noun Phrase/Sentential Complement ambiguities, slowing down occurs after encountering a verb with a direct-object (DO) bias at the disambiguating region, as opposed to one with a sentential-complement (SC) bias, when the sentence lacks the complementizer *that*, rendering the sentence temporarily ambiguous. We anticipated replicating these effects in the target demographic sample given that the items had been adjusted for AoA, and that these effects would be modulated by individual differences measures.

In our findings, 10- to 15-year-olds did not show online relative clause effects or verb bias effects, although they did slow down when reading ambiguous sentences compared to unambiguous sentences ($\beta = 32.67$, $SE = 10.38$, $p < 0.01$). As for comprehension accuracy, participants performed more poorly when reading infrequent sentence structures: participants scored higher in response to main-clause questions compared to RC questions ($\beta = -1.31$, $SE = 0.32$, $p < 0.001$) and scored higher for SRCs as compared to ORCs ($\beta = -0.50$, $SE = 0.18$, $p < 0.01$). In response to the verb-bias stimuli, participants were marginally better at answering comprehension questions following unambiguous sentences only for DO-biased verbs ($\beta = -0.15$, $SE = 0.09$, $p = 0.09$). Finally, preliminary data results suggest that working memory plays a role in sentence comprehension for both types of sentences: higher scores resulted in better comprehension for RC questions compared to main clause questions ($\beta = 0.35$, $SE = 0.18$, $p = 0.05$) and better comprehension for SC-biased verbs ($\beta = -0.25$, $SE = 0.10$, $p = 0.01$).

In sum, children in this study reflect some classic processing effects in offline measures but not in online measures of language processing. This finding suggests that English sentence processing strategies may need to develop over time to be more adult-like.

References

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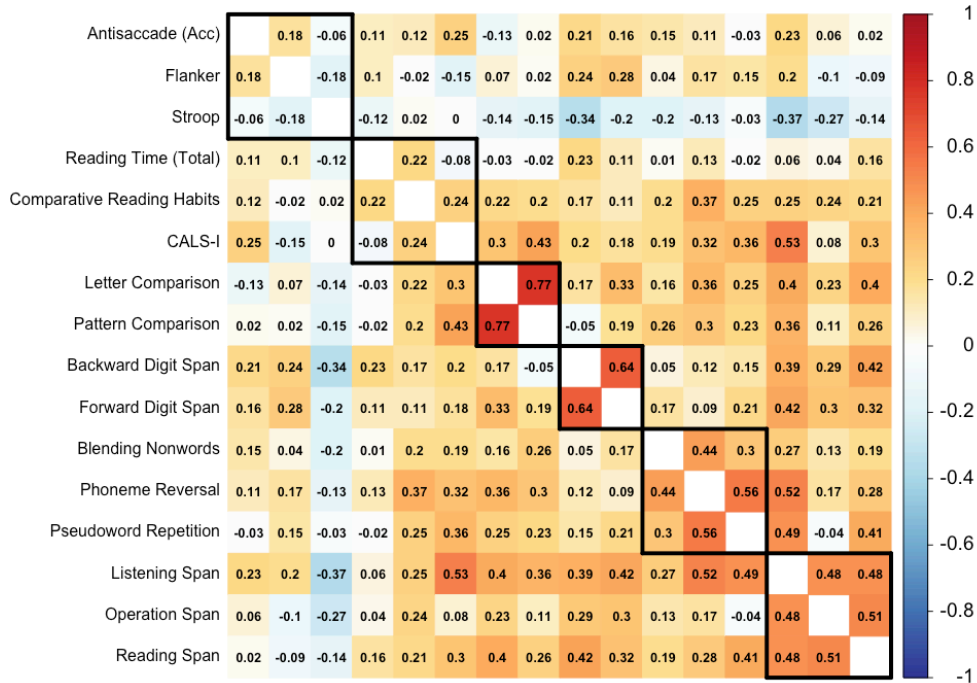


Figure 1. Correlation matrix of individual differences measures.

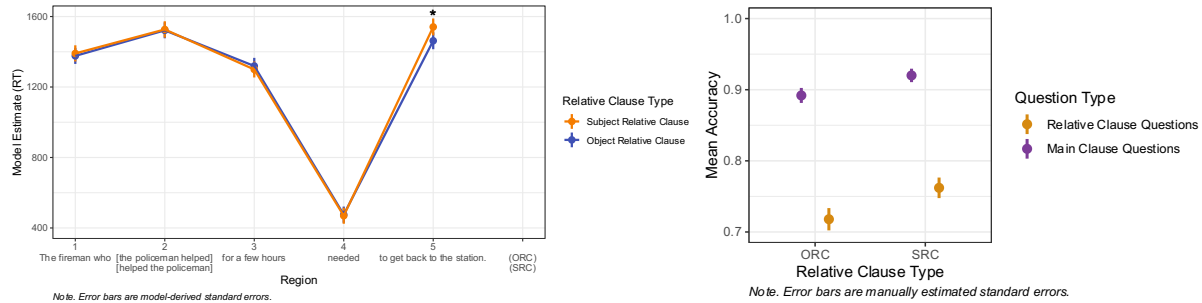


Figure 2. (a) Reading reaction times for Subject- versus Object-Extracted Relative Clauses and (b) comprehension question accuracy for relative-clause and main-clause questions.

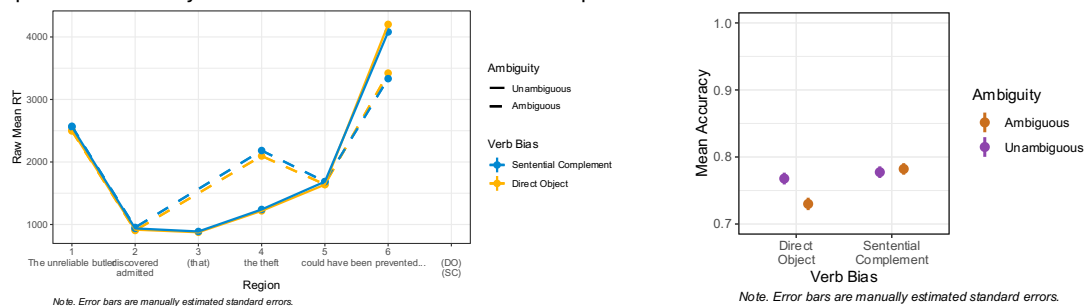


Figure 3. (a) Reading reaction times for ambiguous and unambiguous sentences containing SC- and DO-biased verbs and (b) comprehension question accuracy based on ambiguity and verb bias.