Underspecification in language understanding increases with age: Evidence from reading global syntactic ambiguities

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Introduction

Temporary syntactic ambiguity evokes longer processing times that reflect the reader's attempt to resolve the ambiguity. However, young readers have been found to show ***faster*** processing of global syntactic ambiguities that cannot be resolved. For example, in *The maid of the princess who scratched herself in public was humiliated,* the relative clause can be attached either to the head noun (i.e., the maid scratched) or the object of the preposition (i.e., the princess scratched) (Swets et al., 2007; 2008); readers allocate less time to processing the relative clause in this case than they do for an unambiguous control (e.g., *The son of the princess…*). One account of this phenomenon is that is that readers cope with limited processing resources by strategically underspecifying the connection between concepts (e.g., Sanford & Sturt, 2002; Christianson et al., 2006). We investigated adult age differences in reading time and comprehension accuracy to test the hypothesis that the tendency toward underspecification increases with age.

Research Questions

The aim of the current research is to investigate two main issues:

1. Are there age differences in underspecification when processing unresolvable global syntactic ambiguities?
2. Do patterns of attachment in underspecification vary across readers?

Participants

Table 1: Participant demographics and individual differences.

	Younger Adults	Middle-Aged Adults	Older Adults
	Mean *(SD)*	**Mean** *(SD)*	**Mean** *(SD)*
N	33	31	27
Age range	18-26	30-59	60-81
Age	**21.1** *(2.6)*	**43.9** *(10.1)*	**68.2** *(5.9)*
Education***	**14.9** *(1.8)*	**16.5** *(2.4)*	**17.5** *(3.2)*
WM†	**4.5** *(1.3)*	**4.6** *(1.5)*	**3.9** *(0.9)*
Verbal Fluency†	**45.1** *(8.7)*	**45.1** *(11.0)*	**40.5** *(9.0)*
Vocabulary***	**7.8** *(3.5)*	**10.0** *(3.7)*	**12.2** *(4.3)*
Print Exposure ***	**4.9** *(3.7)*	**9.9** *(4.3)*	**13.2** *(4.3)*

† *p<.12; *p<.05; **p<.01; ***p<.001.*

Method

Design:

There were 36 unique sentences (Swets et al., 2008), each shown in one of 3 relative clause conditions. After each sentence there was a yes/no question in one of the 3 probe conditions below.

Relative Clause Materials:

Ambiguously Attached (12): *The **maid** of the **princess** who scratched herself in public was terribly humiliated.*

N1 Attached (12): *The **son** of the princess who scratched himself in public was terribly humiliated.*

N2 Attached (12): *The son of the **princess** who scratched herself in public was terribly humiliated.*

Probe Question Materials:

N1 Question (6): *Did the **maid** scratch in public?*

N2 Question (6): *Did the **princess** scratch in public?*

Superficial Question (24): *Was anyone humiliated?*

Procedure:

Participants completed a self-paced reading task by pressing a game controller to reveal each word in a sentence shown on a computer monitor. After reading each sentence, participants answered a yes/no probe question with the game controller.

Reading Time Results

Figure 1: Mean processing time for the reflexive pronoun differs across relative clauses ($p<.01$) and interacts with age group ($p<.02$).

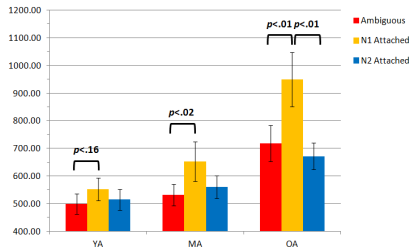
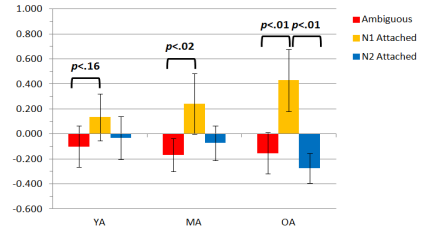


Figure 2: Processing time via z scores differs across relative clauses ($p<.01$) and still tends to interact with age group ($p<.07$).



Probe Question Results

Figure 3: Mean percentage of "yes"/"no" responses to questions about Ambiguous sentences shows that all participants made more N2 attachments, $p<.01$.

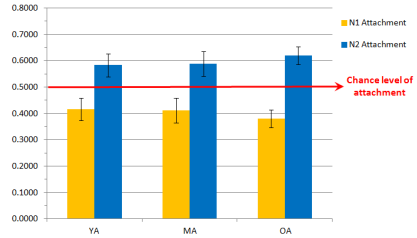
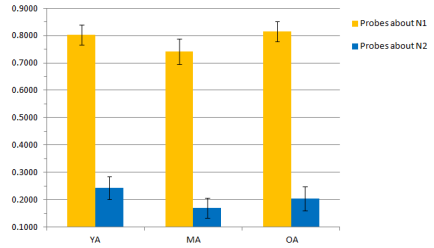


Figure 4: Mean accuracy shows participants responded more correctly to probes referring to N1 attached clauses, $p<.01$.



Conclusions

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Recall that we investigated two questions in this research

1) Are there age differences in underspecification when processing unresolvable global syntactic ambiguities?
Even after controlling for general slowing, underspecification appears to increase with age.

2) Do patterns of attachment in underspecification vary across readers?
There were no significant differences in probe attachment or accuracy across the three age groups. However, participants in all age groups were significantly more accurate in responding to probe questions that referred to the N1 relative clause in the preceding sentence. We will analyze probe response times to continue to look for evidence for differences in attachment.

Acknowledgments

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