Aging and Stereotype Violation During Reading: Eye-tracking Reveals Age Differences in Anaphor Resolution
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RATIONALE

One key component of reading comprehension is the ability to bind current information to previously processed text, which is often accomplished via anaphoric expressions (e.g., a pronoun referring to a previous noun). Some early offline work suggested that aging brings about increased difficulty in resolving anaphoric expressions (e.g., Kahn & Till, 1991; Light & Capps, 1986); however, little work has examined the effects of aging on the online demands of anaphor resolution, to determine the time course of older adults’ anaphor resolution processes.

In the current study, we used eye-tracking to examine older and younger adults’ eye movements as they read sentences containing anaphoric violations of stereotype expectations (e.g., “The firefighter burned herself while rescuing victims from the building.”). If older adults have greater difficulty with resolving anaphoric expressions, they should show longer processing times (reflected in longer fixation durations and/or a higher probability of regressions (i.e., rereading)) when the stereotyped noun does not match the pronoun anaphor.

METHODS

Participants

24 experimental sentences were created, each with a different stereotypical role name. Gender (male/female) and stereotype (match/mismatch) were counterbalanced, such that each participant read equal numbers of sentences of each of the four types (see examples in the Table). Only stereotypical roles that were age-equivalent in ratings of masculinity/femininity were included (based on a norming study with an independent sample of 40 young and 40 old). All sentences were syntactically structured identical to the examples, i.e., a role name character with a reflexive pronoun referring to the character, followed by a main verb.

Materials

Eye Tracking Measures

- **Gaze Duration (GD):** total sum of all fixation durations from the very first fixation to enter the target region through the last fixation before leaving the region in either direction (aka 1st Pass Reading Time). Go-Past Time (GPT): total sum of all fixations from the very first to enter the target region, through the last fixation before going forward in the sentence (including time spent regressing; aka Regression Path Duration). Regressions-In (RGI): Probability of the word being a “landing spot” from a regression.

- **Go-Past Time (Reg Past Path Dur):** Go-past times for the pronoun were also reliably increased by stereotype violation (see Figure 2), $F(1,36)=4.67, p<.05$, $F(1,23)=7.61, p<.05$, suggesting the violation produced special demands for integration. However, there was age-equivalence in the time spent.

- **Pass Word Skipping:** Probability of skipping the word during the 1st Pass Reading Time.

- **Gaze Duration on Target Pronoun:** The sum of the gaze durations on the target pronoun divided by the total gaze duration on the target subject. Regression-Out (RGO): Probability of the word being a “takeoff” from a regression.

- **Regressions-Out:** Older adults were more likely to regress backward in text immediately upon encountering the unexpecte pronoun (see Figure 3), $F(1,36)=7.28, p<.02$, $F(1,23)=16.65, p<.001$.

Results

Eye Tracking Measures

- **Gaze Duration (GD):** total sum of all fixation durations from the very first fixation to enter the target region through the last fixation before leaving the region in either direction (aka 1st Pass Reading Time).

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- **Pass Word Skipping (SKP):** Probability of skipping the word during the 1st Pass Reading Time.

- **Gaze Duration on Target Pronoun:** The sum of the gaze durations on the target pronoun divided by the total gaze duration on the target subject. Regression-Out (RGO): Probability of the word being a “takeoff” from a regression.

- **Regressions-Out:** Older adults were more likely to regress backward in text immediately upon encountering the unexpecte pronoun (see Figure 3), $F(1,36)=7.28, p<.02$, $F(1,23)=16.65, p<.001$.

Conclusions

Readers are sensitive to stereotype violations in anaphoric expressions, but there may be age-related differences in how this sensitivity is reflected in reading patterns: during the initial encounter with the reflexive pronoun, older adults were more likely to spend less time on the pronoun and more likely to regress backward in the text; younger adults spent longer on the pronoun before moving eyes elsewhere; older readers spent less time on the pronoun during the initial encounter. (see Figure 1), $F(1,36)=4.45, p<.05$, $F(1,24)=16.28, p<.01$ (though the interaction did not reach significance, $p=.15$).

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References


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