Age Differences in Processing Narrative Text: Managing Multiple Characters

Soo Rim Noh[1] & Elizabeth A. L. Stine-Morrow[2]

[1] Volen National Center for Complex Systems & Department of Psychology, Brandeis University; [2] Beckman Institute for Advanced Science & Technology & Department of Educational Psychology, University of Illinois at Urbana-Champaign

INTRODUCTION

- Understanding a narrative situation depends on keeping track of multiple characters that enter and exit dynamically as the plot unfolds. While situation model processing appears to be largely preserved with aging (Radvansky & Dijkstra, 2007), little research has focused on the effects of age on the ability to manage multiple characters during narrative comprehension.
- A recent study has shown that older adults had particular difficulty both in accessing the initial character after a new character was introduced and in thoroughly encoding a new character while other characters inhabited the discourse world, in part due to age-related reduced working memory capacity (Noh & Stine-Morrow, 2009).
- We used eye-tracking to further examine age differences in regulating on-line narrative comprehension as a function of whether a new character was introduced or not. We compared younger and older readers' eye movements when reading a penultimate target sentence that always referenced the original character, followed by a paragraph that (a) reintroduces the same character, (b) introduces a new character, or (c) does not mention any character.
- In addition to recording eye movements during reading, a story continuation task was included to assess whether older adults' comprehension was influenced by introducing multiple characters.

METHOD

Participants

	Young		Old	
N	38		37	
Age Range	19-27		61-89	
Education †*	14.3	(.1)	16.6	(.6)
Vocabulary †	9.2	(.6)	15.9	(.9)
Working Memory † * b	5.1	(.2)	4.0	(.2)

† means are provided with standard errors in parentheses
* significant group difference
[a] Extended Range Vocabulary test (Ekstrom, French, & Harmon, 1976)
[b] reading span (Stine & Hindman, 1994)

Materials

- 18 short target narratives were created in which the penultimate target sentence mentioned the initial character, followed by a critical paragraph systematically varying in whether (a) the initial character was rementioned (**Remention**), (b) a new character was introduced (**New**), or (c) no character was explicitly mentioned (**Neither**) (see Table 1).

Design

1 Between-Subjects Factor
  2 Age Groups: Young, Old
1 Within-Subjects Factor
  3 Character Conditions: Remention, New, and Neither

Table 1. Example of Sample Narrative

Set up
A surprise costume party would take place at the house.
Charact er Introd uction
Nancy had so much fun planning with the 70's theme.
The bash was possible with the help of friends and colleagues.
Nancy was even able to find some old disco music.
Everyone woul d bring a favorite relic of that time. — ROI 1
Charact er Ma nipulation
Remention condition
Nancy got most of the decorations from garage sales.
The room was set up like a club w ith a dance floor.
Nancy laughed with delight to see the finished product.
The only thing left to do was to set out all the food. — RO1 2
New condition
Joseph got most of the decorations from garage sales.
The room was set up like a club w ith a dance floor.
Joseph laughed with delight to see the finished product.
The only thing left to do was to set out all the food. — RO1 2
Neither condition
Most of the decorations came from assorted yard sales.
The room was set up like a club w ith a dance floor.
It was a total delight to see the finished product.
The only thing left to do was to set out all the food. — RO1 2
Target Sentence
Nancy heard the doorbell ring earlier than expected. — RO1 3
Post-target Sentence
She saw that the guest of honor was in the hall.
En ding
Nancy smiled brightly and graciously waved him inside.

ROI=region of interest

Apparatus and Procedure

- Eye movements were recorded using a head-mounted SR Research EyeLink II system with a sampling rate of 500 Hz. Passages were shown on a 19-inch CRT monitor with a resolution of 1024 x 768 pixels in 16-bit high color. Each passage was presented on the entire screen with each sentences appearing on separate lines. The text was displayed in white font on a black background and sized so that 2-3 characters equaled roughly 1 degree of visual angle.
- The target passages were randomly presented across participants, with an additional 18 filler passages. Participants were asked to continue the theme of the story for half of the target passages.

RESULTS

Eye-tracking Measures

Regression-in	Probability of being a landing spot from a regression
Regression-out	Probability of being a launching site for a regression
Regression-path Duration (=sum of selective regression-path duration and look-from time)	Sum of all fixations from first entering a region before moving forward, including any fixations made to reinspect earlier portions of the text.
Selective Regression-path Duration	Sum of all first-pass fixations and the re-fixations in a region before moving forward
Total Fixation Duration	Sum of all fixations in a region

Character Introduction (ROI 1)

- Neither the Character effect nor the Character by Age interaction was significant for the regression-in and for the total fixation duration.

Character Manipulation (ROI 2)

(1) Total Fixation Duration

- Character x Age interaction, $F(2, 146)=3.63$, $p<.05$, $\eta_p^2=.05$
  Character effect for Old: $F(2, 72)=3.56$, $p<.05$
  Character effect for Young: $F<1$

Older adults spent more time reading in the New than in the Remention condition.

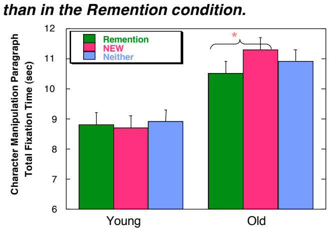

Figure 1. Total fixation durations for the character manipulation region as a function of age and character condition. * $p<.05$

(2) Regression-path Duration

- Character x Age interaction, $F(2, 146)=3.03$, $p=.05$, $\eta_p^2=.04$
  Character effect for Old: $F(2, 72)=3.56$, $p<.05$
  Character effect for Young: $F(2, 72)=2.26$, $p<.11$

Older readers had longer regression-path durations in both the New and Neither conditions than in the Remention condition.

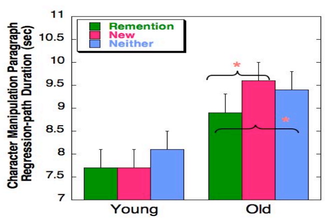

Figure 2. Regression-path durations for the character manipulation region as a function of age and character condition. * $p<.05$

(3) Selective Regression-path Duration

- Character x Age interaction, $F(2, 146)=3.10$, $p<.05$, $\eta_p^2=.04$
  Character effect for Old: $F(2, 72)=2.90$, $p=.06$
  Character effect for Young: $F(2, 74)=2.47$, $p=.09$.

Older adults differentially spent more time rereading the New condition relative to the Remention condition during regressions.

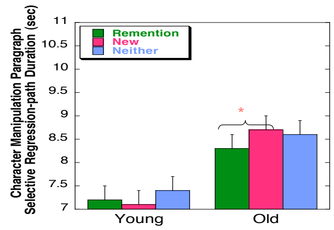

Figure 3. Selective regression-path durations for the character manipulation region as a function of age and character condition. * $p<.05$

Target Sentence (ROI 3)

(1) Regression-out

- Character x Age interaction, $F(2, 146)=2.45$, $p=.09$, $\eta_p^2=.03$
  Character effect for Old: $F(2, 72)=4.28$, $p<.05$
  Character effect for Young: $F(2, 74)=1.14$, $p=.33$

Older readers launched regressions more often from the target sentence in the New and Neither conditions than in the Remention condition.

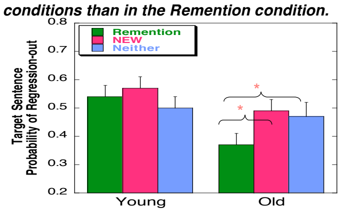

Figure 4. Probability of regression from the target sentence region as a function of age and character condition. * $p<.05$

(2) Regression-path Duration

- Character x Age interaction, $F(2, 146)=2.34$, $p=.10$, $\eta_p^2=.03$
  Character effect for Old: $F(2, 72)=3.85$, $p<.05$
  Character effect for Young: $F<1$

Older readers spent more time reexamine earlier texts during regressions in the New condition than in the Remention condition.

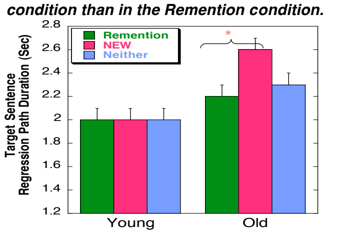

Figure 5. . Regression-path durations for the target sentence region as a function of age and character condition. * $p<.05$

Story Continuation

- Character x Age interaction, $F(2, 130)=3.82$, $p<.05$, $\eta_p^2=.06$
  Character effect for Old: $F(2, 60)=3.94$, $p<.05$
  Character effect for Young: $F(2, 70)=1.05$, $p=.36$.

Older adults showed a significantly reduced complexity in the New condition than in the two other conditions.

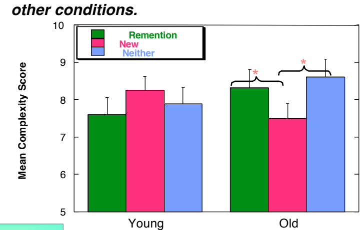

Figure 6. Mean complexity scores as a function of age and character condition. * $p<.05$

CONCLUSIONS

- Eye-tracking data show that older adults spent more time processing a paragraph when it introduced a new character, suggesting that older readers allocate more effort to instantiating a new character relative to younger readers.
- Nevertheless, there were age differences in regressions from the target sentence as a function of the character condition: while younger adults' regressions from the target were not affected by the character condition, older adults were more likely to launch regressions from the target when a new character was introduced, and they spent more time rereading the previous text before moving on. Finally, older adults produced relatively simple story continuations after reading two-character stories.
- Our data support that idea that older may have difficulty managing character representations during narrative comprehension.

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Contact Information: srn@brandeis.edu