Adult Age Differences in Information Foraging in Interactive Multi-Text Environments

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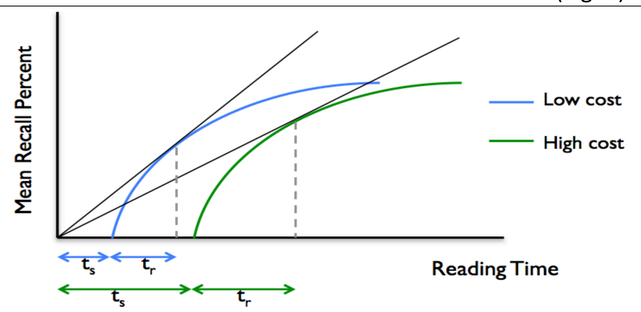
RATIONALE

- Adult age differences in memory for discourse are well established (Johnson, 2003). However, in the dominant paradigm, texts are presented under controlled conditions. Thus, little is known about learning from text when individuals have the opportunity to explore and select texts, as in the typical ecology of reading.
- Theories of self-regulated learning predict how people select items, allocate study time, and decide when to stop studying (See Table 1 for comparison).

Table 1. Theories of self-regulated learning.

Theory	Predictions in reading	
	Selection	Persistence in reading
Discrepancy Reduction theory (Dunlosky & Connor, 1997)	Complex first	More to complex
The Region of Proximal Learning model (Metcalfe, 2002)	Simple first	More to simple
Information Foraging (IF) theory (Pirolli & Card, 1999)	Simple first	More to high cost in environment (Fig. 1)

Figure 1. Effect of switch cost on reading persistence of single texts (t_s: search time, t_r: reading time), according to IF theory.



- We investigated the age differences in selection of and persistence in reading texts that varied in information richness (i.e., elaboration, informational complexity), under conditions of varying switch cost to test these theories and their applicability across adult age.

METHOD

- Participants were measured on cognitive measures. See Table 2.
- Materials: Sentences (n=21 per set) about Connecticut and Rhode Island with 7 in each of three elaboration levels (low: 2-4, medium: 6-8, high: 10-12 propositions). See Table 3 for sample text.

Table 2. Demographics of participants.

Mean (SD)	Young (N=24)	Old (N=24)	*t*-test	p value
Age	24.1 (4.8) (18-35)	69.0 (5.5) (61-81)		
Education	15.7 (1.7)	15.1 (1.7)	1.3	.20
Vocabulary	16.9 (6.0)	20.3 (6.2)	-1.93	.06
Speed*	12.9 (2.7)	9.3 (2.1)	5.21	<.001
WM*	4.6 (1.3)	3.7 (0.9)	2.96	.005
Print Exposure*	5.4 (3.0)	10.3 (4.0)	-4.84	<.001

Table 3. Sample texts for Connecticut.

Elaboration	Sample text
Low	Samuel Colt was a gunsmith from Connecticut.
Medium	The Mountain Laurel is a flower that swathes the hills in pink and white, mostly in the spring.
High	After the first exploration in 1614, Dutch fur traders sailed up Connecticut River and built a fort at Hartford, which was called "House of Hope."

- Procedure: Participants selected and read texts on an iPad with the goal to learn as much about each state as possible. See Figure 2.
- Switch cost was manipulated as a varying loading time (short:0-2sec, long:6-8sec).
- There was an 11-mintue limit to learn about each state.

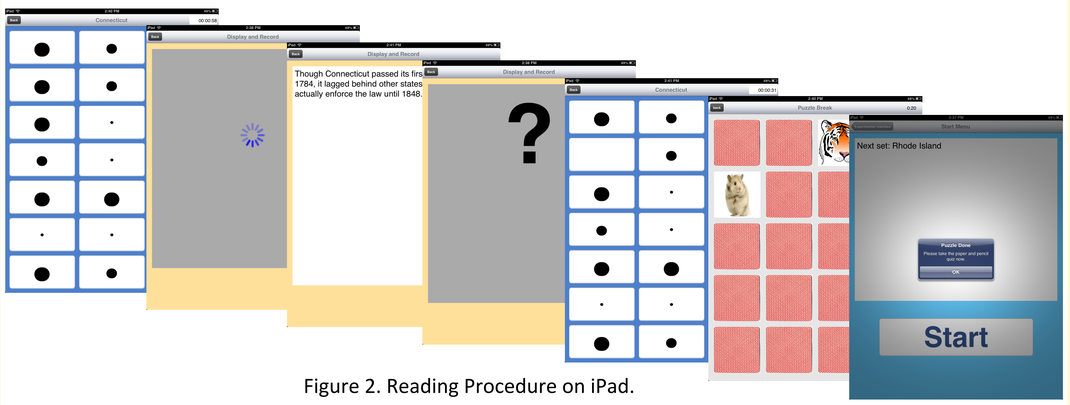


Figure 2. Reading Procedure on iPad.

RESULTS

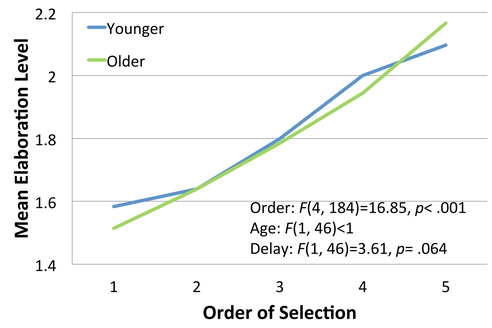


Figure 3. Mean elaboration level (1=low, 3=high) as a function of selection order (group of 3 sentences) and age.

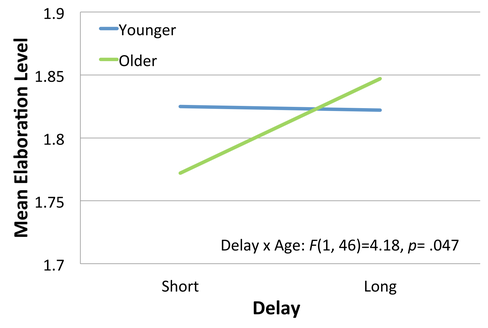


Figure 4. Mean elaboration level (1=low, 3=high) of the first 15 sentences selected as a function of age and delay.

- Selection (search):
  - All participants selected simpler sentences before complex ones (Figure 3).
  - Younger adults were not affected by the delay condition, but older adults were more likely to select complex sentences under the long delay condition (Figure 4).

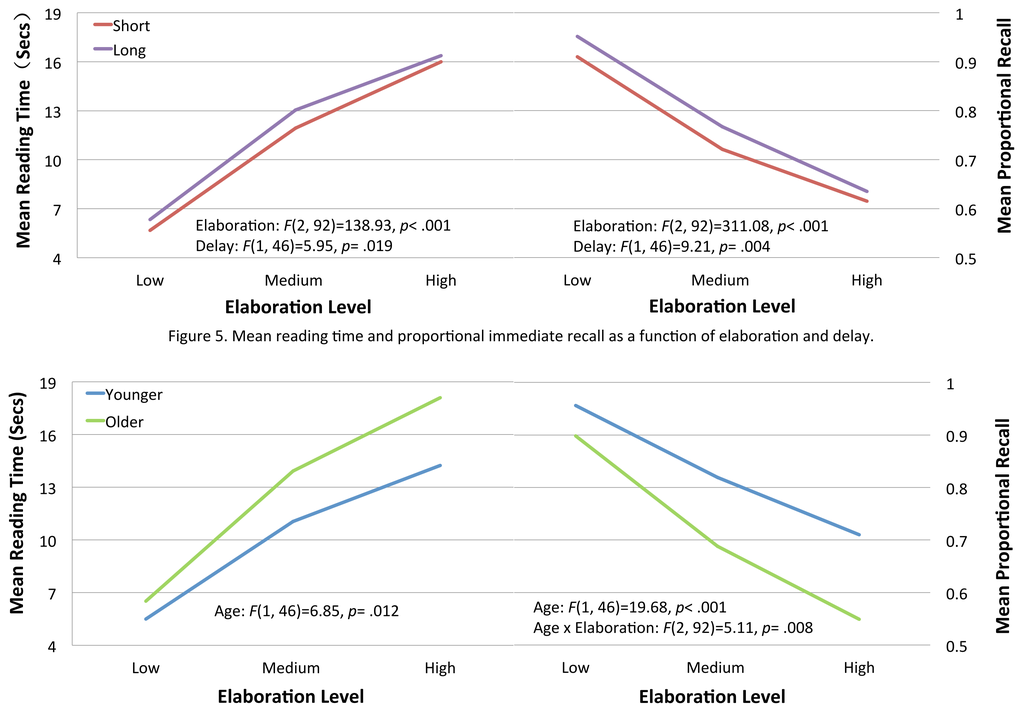


Figure 5. Mean reading time and proportional immediate recall as a function of elaboration and delay.

- Reading (exploitation):
  - The long delay increased persistence in reading, regardless of elaboration level and age (Figure 5).

Figure 6. Mean reading time and proportional immediate recall as a function of elaboration and age.

- Older adults allocated more time than younger adults, but recalled less, especially for more informative sentences (Figure 6).

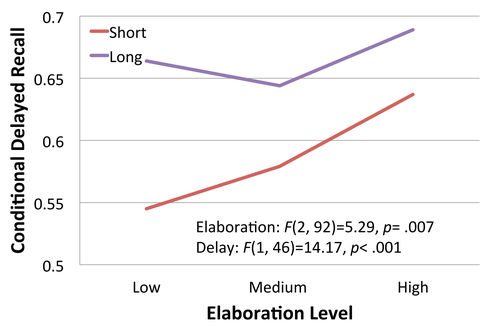


Figure 7. Mean proportion of conditional delayed recall as a function of elaboration and delay.

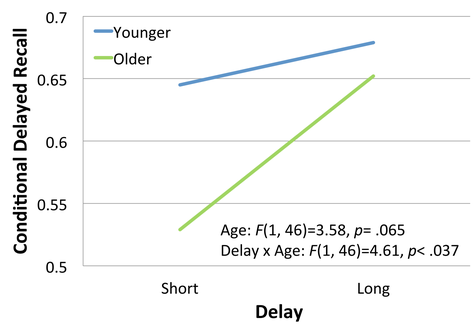


Figure 8. Mean proportion of conditional delayed recall as a function of delay and age.

- Delayed cued test (retention of learning):
  - The long delay produced better recall performance, regardless of elaboration level and age (Figure 7).
  - Although older adults showed poorer performance, this age difference was largely reduced when there was a long delay during reading (Figure 8).

CONCLUSION

- Consistent with IF model, both younger and older adults made selection for reading from simple to complex texts. However, older adults were more adapted to the high cost by choosing texts with richer resources first.
- Consistent with IF model, high cost promoted longer persistence and better memory of the texts regardless of the complexity of sentences and age.
- Elaboration did not reduce the age difference in memory performance, and older adults were less effective in reading.

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