Memory Self-efficacy Reliably Predicts Resource Allocation in Sentence Reading Across Time

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RATIONALE

Cross-sectional studies examining adult age differences in sentence processing often find that aging is associated with reduced allocation of attentional resources to conceptual processing and semantic integration (i.e., textbase construction). Such data suggest that differences in reading engagement may contribute to text memory deficits (Stine-Morrow et al., 2008). Meanwhile, other studies indicate that meta-cognitive control may contribute to age differences in memory performance (Dunlosky & Connor, 1997). However, the specific mechanisms through which meta-cognitive control regulate attentional engagement so as to optimize cognition are not well understood (Lachman, 2006). In this study, we investigated the effects of memory self-efficacy (Dixon et al., 1988) on resource allocation during reading and subsequent recall across two time points. It was hypothesized that those older adults with higher memory self-efficacy would allocate more time to the textbase construction, which in turn would be predictive of recall (Figure 1).

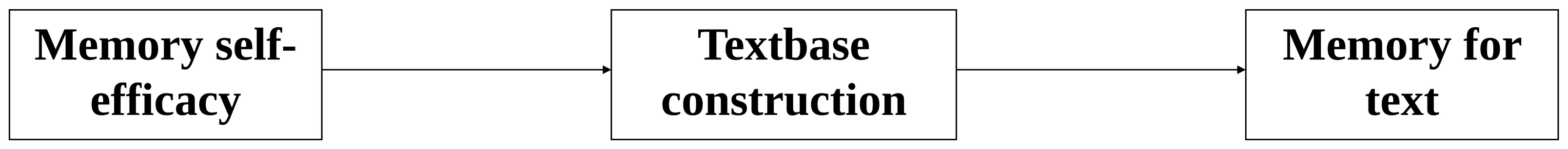

Figure 1. Hypothetical relationships between memory self-efficacy, textbase allocation and text memory

METHODS

Participants

Community-dwelling older adults (N=137; 60-89 yrs, M =72.0, SD=7.3), who had a mean of 15.7 years of education (SD=2.6), participated in this study.

Materials and Design

The text materials consisted of 24 18-word sentences covering various topics involving nature, science, and history (sample below). Each target sentence was followed by a short filler continuation sentence. The order of sentence presentation was randomized across participants.

Sample Sentence:
Every morning housewives in Bali put some rice on small pieces of banana leaves to ward off spirits. The rice is considered to have magical properties.

Procedure

Participants were tested at two time points at an interval of six months. At each testing point, participants read sentences word-by-word in a self-paced fashion in a moving window paradigm for immediate recall on a randomly selected third of the trials. In addition to the reading task, memory self-efficacy (MSE; Dixon et al., 1988) and reading span, a measure of working memory (WM; Stine & Hindman, 1994) were measured.

RESULTS

Individual regression analysis of word-by-word reading times was used to isolate resources allocated to conceptual processing and integration for textbase construction, while controlling for word-level features. A composite score reflecting textbase-level processing was created by averaging the standardized coefficients. Resource allocation was moderately stable across the 6-month interval, as was MSE and sentence memory (Table 1). Because our critical variables were reliable measures of the theoretical constructs across two testing points, combined scores were generated for analysis.

Table 1. Test-retest reliabilities for reading span, memory self-efficacy, textbase allocation and sentence memory.

	Reliability
Reading span	.300 **
MSE	.794 ***
Textbase allocation	.557 ***
Sentence memory	.621 ***

$^{**}p<.01$, $^{***}p<.001$.

RESULTS (cont.)

Table 2. Correlations between age, education, reading span, memory self-efficacy, textbase allocation and sentence memory

	Age	Education	Reading span	MSE	Textbase allocation
Age					
Education	-.044				
Reading span	-.217 *	.085			
MSE	.192 *	-.030	-.044		
Textbase allocation	-.036	-.018	.173 *	.223 **	
Sentence memory	-.187 *	.319 ***	.481 ***	-.165 †	.261 **

$^{\dagger}p<.1$, $^{*}p<.05$, $^{**}p<.01$, $^{**}p<.001$.

Controlling for WM capacity, MSE was a positive predictor of textbase allocation: those with higher confidence in their memory consistently allocated more attention/time to textbase construction (Table 3).

Table 3. Hierarchical regression analysis examining the effects of age, education, reading span and memory self-efficacy on textbase resource allocation.

Predictors	F	Adj. R^2	β
	3.20*	0.06	
Age			-0.005
Education			-0.012
WM			0.188 *
MSE			0.353 **

$^{*}p<.05$, $^{**}p<.01$.

Recall was predicted by textbase allocation, controlling for the effects of WM, age, and education, highlighting the importance of attentional engagement in text memory beyond individual's capacity (Table 4). (Surprisingly, MSE was negatively correlated with recall. This appears to have been due to the fact that the oldest individuals in our sample (aged 80-89) had relatively high MSE but poor recall. When data from this group were removed from analysis, the regression coefficient was reduced to non-significance).

Table 4. Hierarchical regression analysis examining the effects of age, education, reading span, memory self-efficacy and textbase resource allocation on sentence recall.

Predictors	F	Adj. R^2	β
	16.01***	0.36	
Age			-0.001
Education			.017 ***
WM			.079 ***
Textbase			.051 ***
MSE			-.060 **

$^{**}p<.01$, $^{***}p<.001$.

CONCLUSIONS

Resource allocation during sentence processing was reliable across time in later adulthood.

Memory self-efficacy regulated attentional engagement in textbase construction during reading, which in turn contributed to memory performance for text.

Meta-cognitive control in later adulthood can partially determine attentional engagement during reading as an adaptive strategy to compensate for age-related deficits in text memory.

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