

Age Differences in Word Form Processing Revealed by an Implicit Memory Test

Celina Rolgeiser (celina.rolgeiser@uni-saarland.de)¹, Katja I. Haeuser¹

¹Saarland University, Saarbrücken, Germany

According to previous studies, word prediction entails the pre-activation of the expected word and of its form features [1]. As a consequence of this pre-activation, expected words linger in memory even when the prediction is disconfirmed [2]. Recent studies suggest that form prediction might lead to the inhibition of form-related neighbors of the expected words, which is reflected in reduced accessibility of these form-related words following prediction [3]. Since it is assumed that prediction abilities decline across the lifespan and that form prediction is particularly affected [1,4], we here investigated in an implicit memory test whether inhibition of form-related neighbors is reduced in older adults.

We used a two-stage encoding and retrieval task in which German-speaking younger ($n = 77$, $m = 24$, $f = 52$, $nb = 1$, $M = 22.9$ years old, range = 18-35 years old) and older adults ($n = 77$, $m = 32$, $f = 45$, $M = 67.4$ years old, range = 56-79 years old) read sentences in which the initial prediction was confirmed or disconfirmed (mean cloze probability of 87.7%). After a distractor task, they completed an implicit memory test, in which they were asked to quickly recognize blurred words that became gradually deblurred over time (Figure 1). We compared recognition times of expected words and their form-related neighbors to unrelated control words, when predictions were disconfirmed (Table 1). Faster recognition times indicate that words were pre-activated. If initially predicting a word leads to its pre-activation and inhibition of its form-related neighbors, we expect to find a pattern of results whereby expected words are recognized more quickly and form-related neighbors are recognized more slowly than control words.

Results (Figure 2, Table 2) showed that form-related words were recognized significantly more slowly than control words. This effect is consistent with inhibition of form-related neighbors during predictive processing, leading to reduced accessibility of the words in memory. Moreover, the form effect interacted with age group: The slower recognition of form-related words relative to control words was more pronounced in younger adults (i.e., indicating stronger inhibition) than in older adults. However, inconsistent with this, expected words were not recognized significantly more quickly than control words.

In sum, older adults showed less slowing for form-related neighbors than younger adults, suggesting weaker inhibition of form-related competitors during predictive processing. This aligns with age-related deficits in inhibitory control [5]. However, the absence of a reaction time benefit for expected words precludes a strong prediction-based interpretation of the effect. Methodologically, the deblurring procedure in the implicit memory test may not be equally sensitive in capturing facilitatory and inhibitory effects of predictive processing.

References

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Figures and Tables

Figure 1: Example of the gradually deblurred effect on the word “Keller” (basement) over time



Table 1: Example sentence and corresponding words in the implicit memory test

Prediction disconfirming sentence	Words in the implicit memory test		
	Expected word	Form-related word	New word
Da Anne Angst vor Spinnen hat, geht sie bei sich Zuhause nur ungern nach unten in den <u>Garten</u> oder in die Waschküche. As Anne is afraid of spiders, she doesn't like going down to the <u>garden</u> or the laundry room.	Keller basement	Kellner waiter	Brille glasses

Figure 2: Recognition times in the implicit memory test

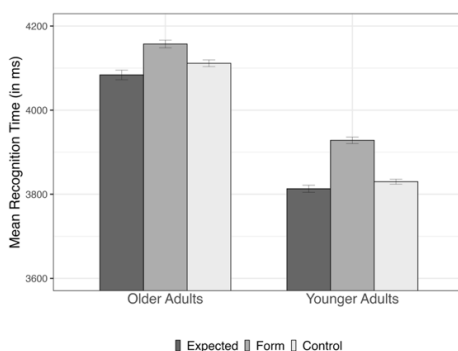


Table 2: Model syntax and output (significant results in bold)

log (recognition time in ms) ~ word_condition_treatment_coded * age_group_treatment_coded + scale (trial number in implicit memory test) + scale (word frequency) + scale (word length) + scale (number of form-related neighbors) + scale (visual acuity) + log (proxy for motor response speed in ms) + (1 | participants) + (1 | words)

(3 levels of word condition: expected, form, control words as reference category; 2 levels of age group: younger adults as reference category, older adults)

	<i>b</i>	SE	<i>t</i>	<i>p</i>
(Intercept)	8.084	0.088	92.276	<.001
control_expected	0.002	0.009	0.210	.834
control_form	0.027	0.009	2.860	.005
age_group	0.049	0.012	4.156	<.001
trial number in implicit memory test	-0.004	0.001	-2.566	.010
word frequency	-0.007	0.004	-1.967	.052
word length	0.007	0.006	1.272	.206
number of form-related neighbors	-0.004	0.005	-0.746	.457
visual acuity	0.006	0.005	1.148	.253
motor response speed	0.028	0.015	1.878	.062
control_expected * age_group	-0.002	0.003	-0.682	.496
control_form * age_group	-0.011	0.003	-3.209	.001