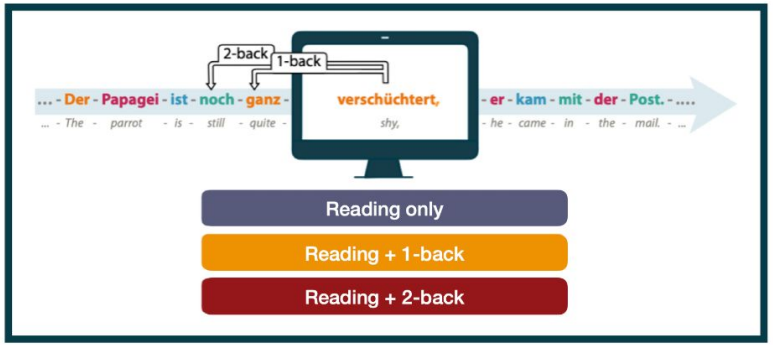
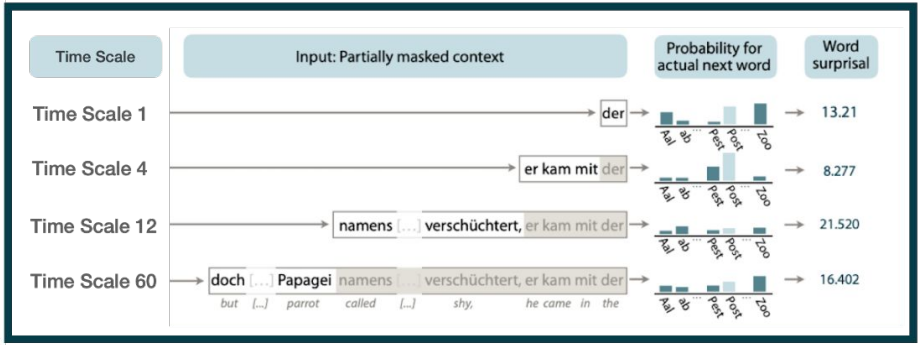
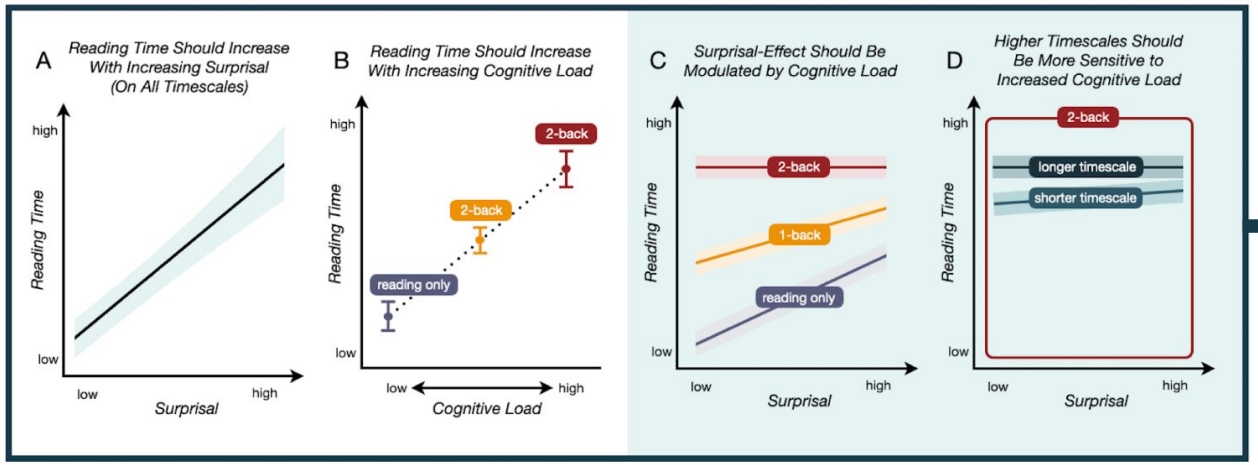
EXNAT-1 Results

February 2024

Task Design & Hypotheses





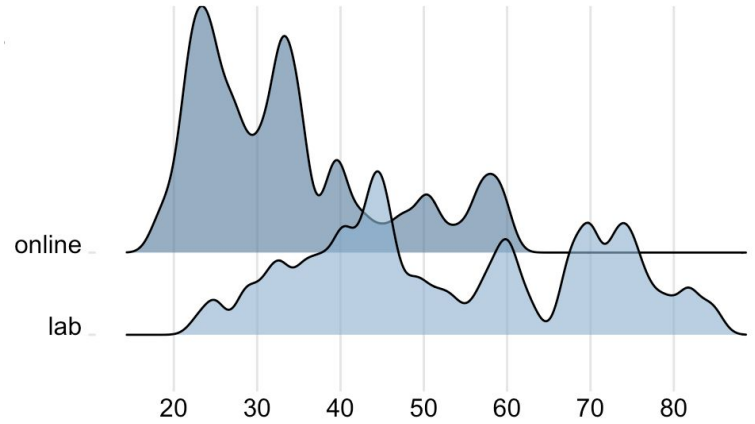


Research questions

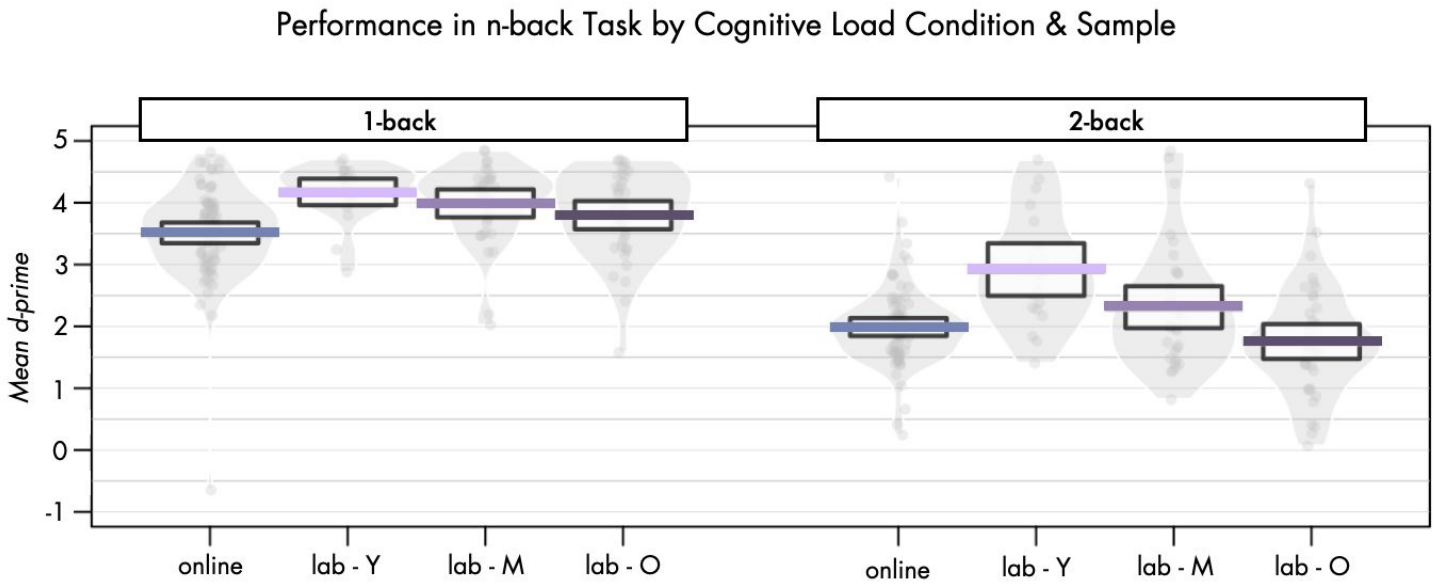
1. How is natural language prediction during text reading affected by increasing cognitive control demands through a non-verbal task?
2. Does the generation of predictability draw on cognitive control resources?
3. Which impact does cognitive aging have on these processes?

Participants

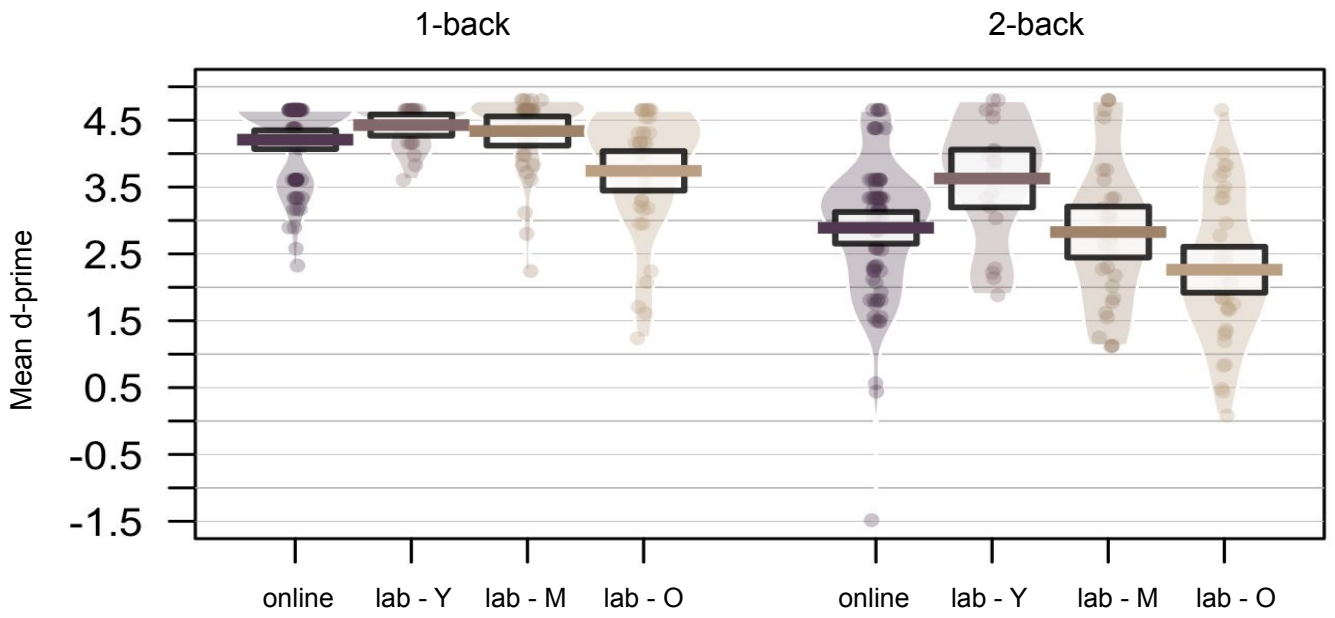
	Online	Lab	Mean age	Range	Education (lab)	MMSE (lab)	Spot-the-word Test (lab)
Young adults	60	20	29.1 (5.5)	18-39	19 (2.6)	*NA*	*NA*
Middle-aged adults	19	34	47.6 (6.2)	40-59	18.5 (3.6)	29.57 (0.84)	31.63 (2.85)
Older adults	1	40	71.3 (7.0)	60-85	15.6 (2.6)	28.23 (1.62)	32.48 (3.27)
Total	80	94	44.9 (17.9)	18-85			



n-back Task Performance Results (dual task)



n-back Task Performance Results (single task)

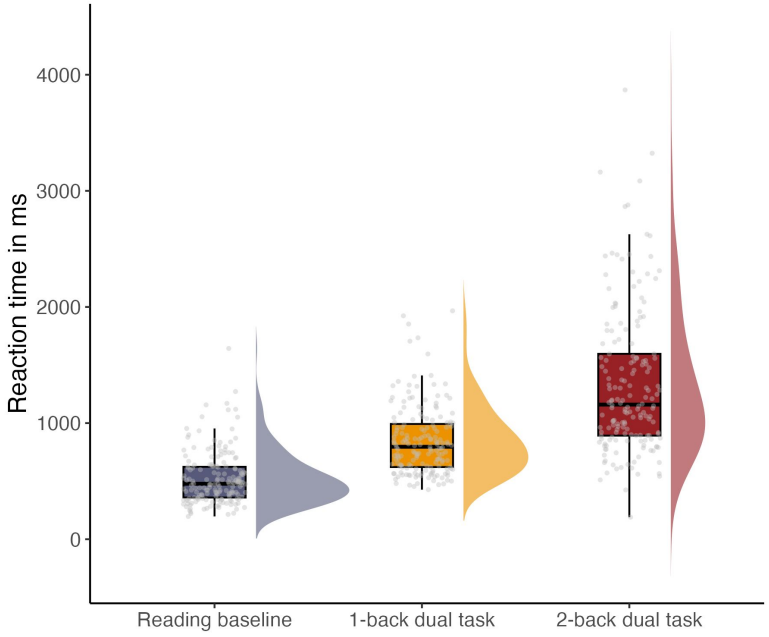


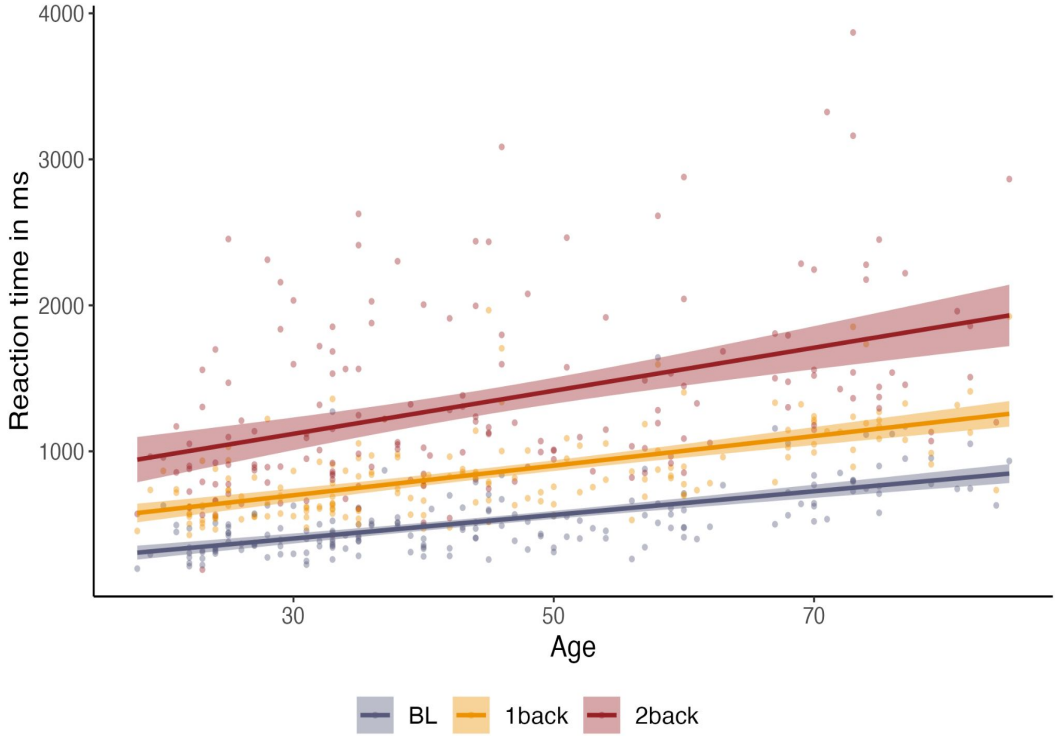
Reading Time Analyses: Linear Mixed Models

log(reaction time) ~ previous_reading_times_log_centered + dprime_centered + mean_dprime_singletasks_centered +
compr_Qs_percent_correct_mean_centered + compr_Qs_percent_correct_diff_centered +
recording_location + word_frequency_centered + word_length_single_centered +
reaction + block_nr + trial_nr +
surprisal_4_centered_scrambled + surprisal_12_centered_scrambled + surprisal_60_centered_scrambled +
surprisal_1_centered * age_centered * cognitive_load +
(1 + cognitive_load | ID) + (1 | text_nr) + (1 | word) + (1 | colour)

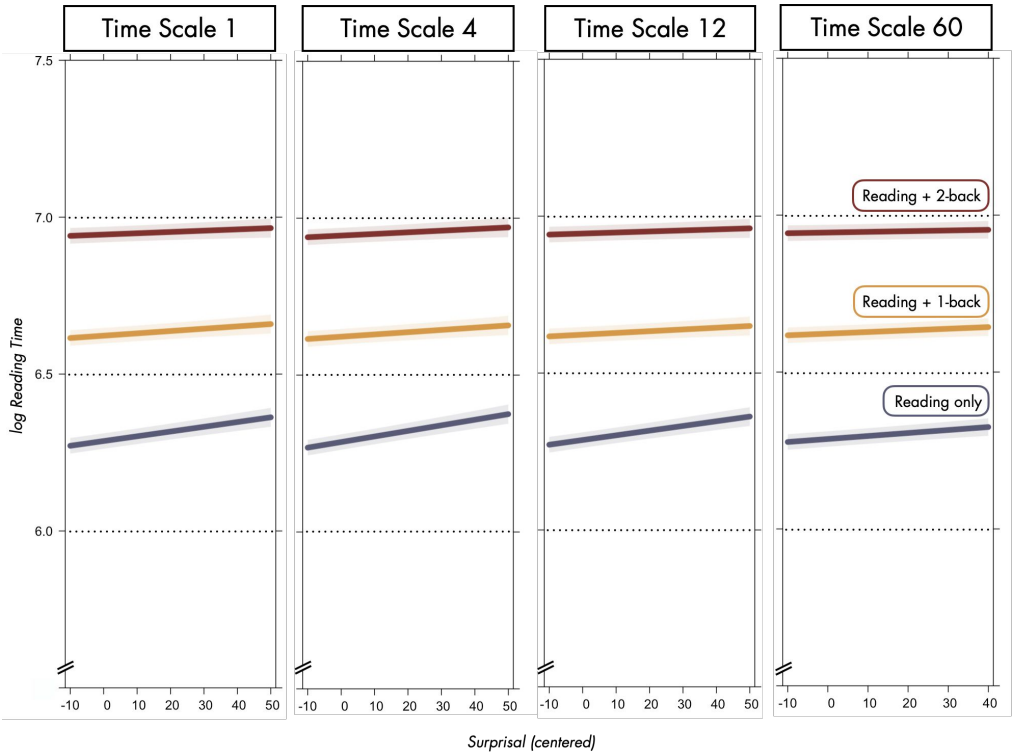
- one model per time scale (time scales 1, 4, 12, and 60 words)
- model is based on stepwise selection procedure
- simple slopes analysis (package *interactions*) to resolve three-way interaction:
  explore the effect of age on the slope of surprisal considering different levels of cognitive load (single- vs dual-task)

Effects of cognitive load and age on reaction times





Effects of Cognitive Load & Surprisal



- Increasing Reading Times with Increasing Cognitive Load
- Beneficial Effect of Low Surprisal on Reading Times
- Effect on TS 60 a bit weaker than on TS 1, but no huge differences

Effect of Age on the Slopes of Surprisal