READING THE FUTURE: Effects of Predictive Processing in Elderly Readers

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INTRODUCTION:

Previous ERP studies have suggested that predictive processing is impaired in elderly readers, which may account for reduced and delayed contextual effects during online sentence comprehension (Federmeier, 2007). Alternatively, eye-tracking data provide evidence that elderly readers engage in risky reading strategies, suggesting anticipatory mechanisms are intact or even enhanced (Rayner, Catelhano, & Yang, 2009).

Brothers, Swaab, & Traxler (2015) assessed specific effects of successful lexical prediction by separately averaging ERP trials based on **prediction accuracy**. Prediction accuracy had a large independent effect on N400 amplitudes that preceded the effects of contextual support by approximately 100ms. Using this paradigm, we examined if elderly readers would show behavioral or ERP deficits in predictive processing and if successful predictions facilitate **access to lexical form information**.

METHODS:

48 undergraduate and elderly subjects read 180 moderately constraining 2-sentence passages during EEG recording (32 channel electrocap). After each passage, participants were ask to report whether they **correctly predicted the final word.**

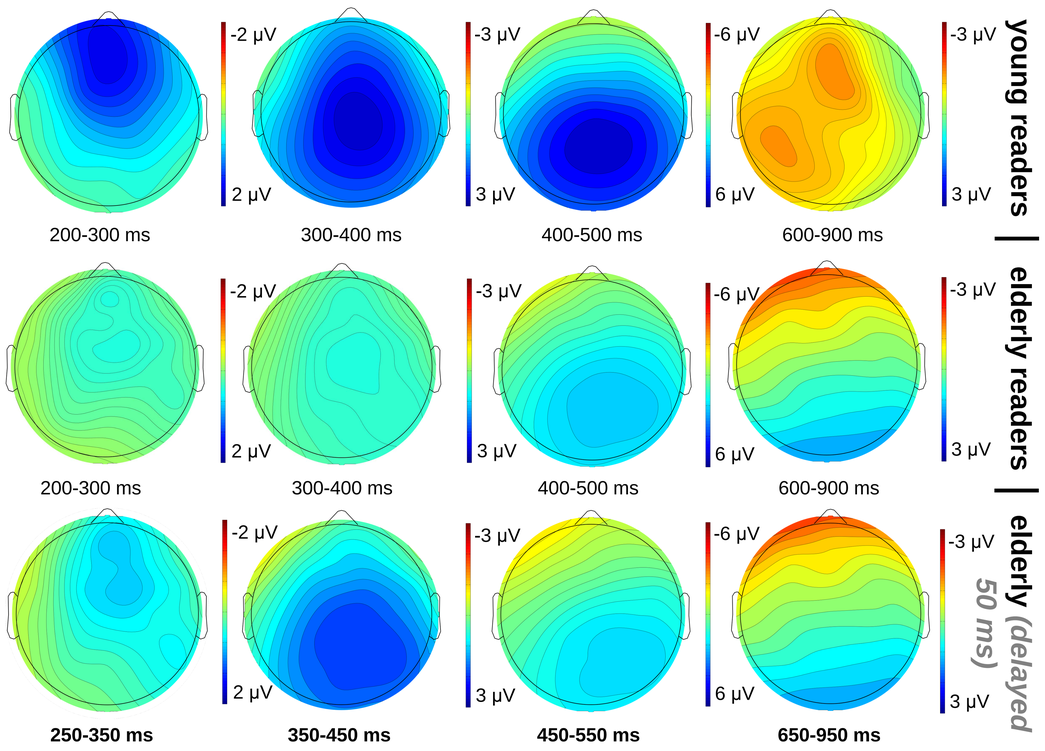
MODERATE CLOZE (supportive):
Debbie wanted a long crunchy vegetable to dip into the ranch dressing. She decided to buy some ***celery*** (40-60% cloze).

→ **50% Predicted**
→ **50% Unpredicted**

LOW CLOZE (unsupportive):
At the checkout, Debbie needed a treat that would quiet her fussy children. She decided to buy some ***celery*** (0-8% cloze).

→ **95% Unpredicted**

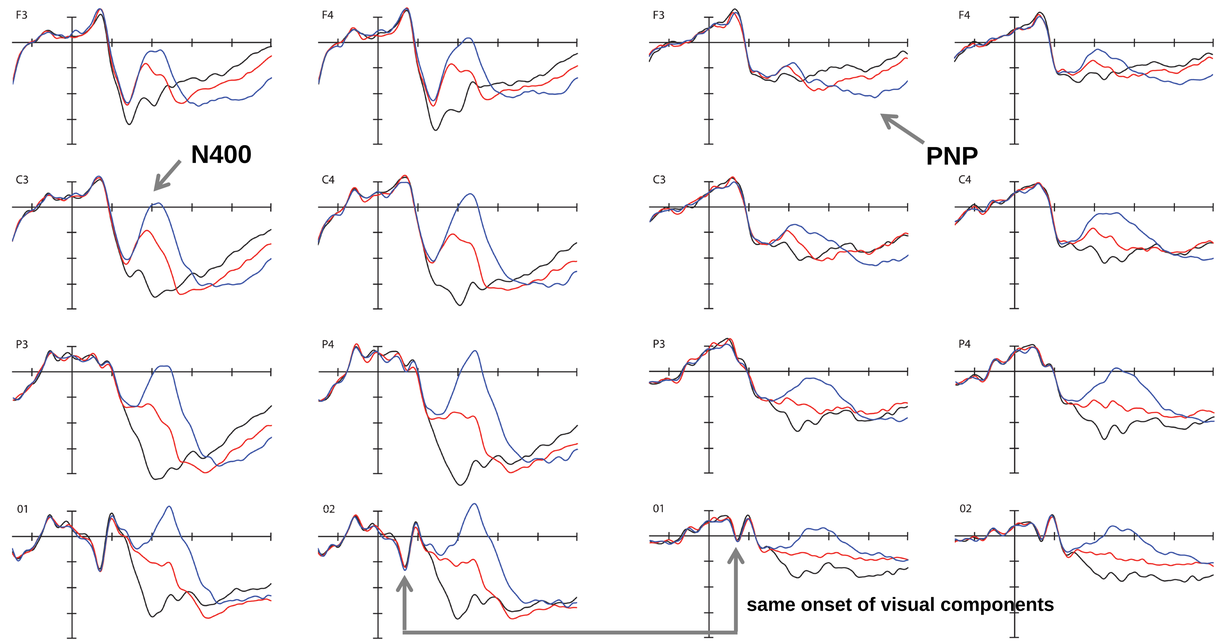
PREDICTION EFFECT TOPOGRAPHICAL DISTRIBUTION



PREDICTION AND CONTEXT EFFECTS ON THE FINAL CRITICAL WORD

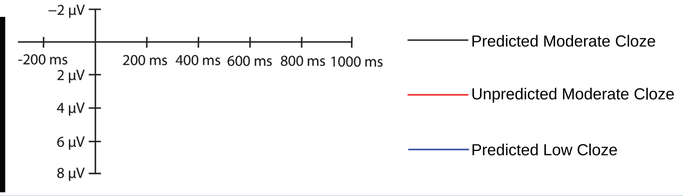
Young Readers (n=24)
Average Age = 20.39 years, Range: 18-33 years

Elderly Readers (n=24)
Average Age = 71.08 years, Range: 65-79 years

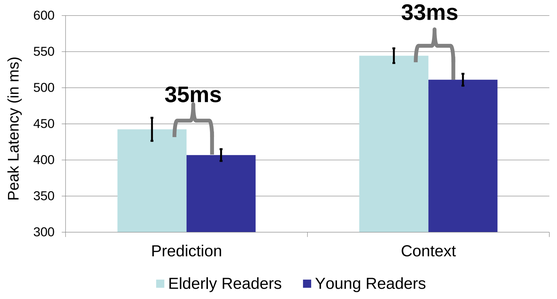


	Young	Elderly
Pred Accuracy – Mod. Cloze	48.85% ± 10.62	51.81% ± 19.42
Pred Accuracy – Low Cloze	4.38% ± 3.80	5.51% ± 5.25

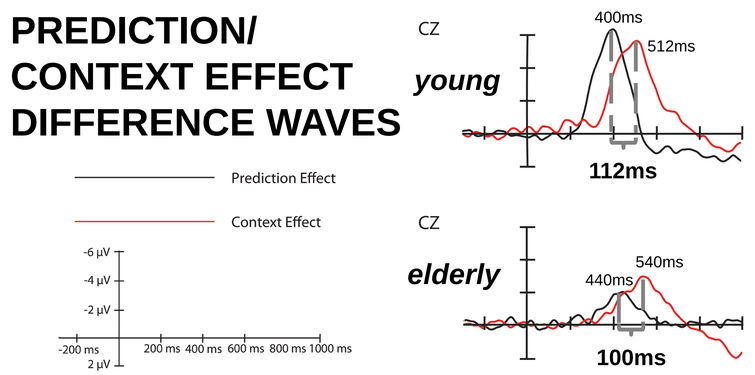
Behaviorally, young and elderly readers self-reported **equal** levels of accuracy in their prediction.



COMPARISONS OF PEAK LATENCIES ACROSS AGES



PREDICTION/ CONTEXT EFFECT DIFFERENCE WAVES



RESULTS:

In both groups, prediction accuracy influenced the N400 ~100ms before contextual support (*p*s<.01).

- Early visual component (P1) peaks did not differ across age groups.
- The onset and peak of prediction and context effects were delayed (*p*s<.05) in elderly readers (~60ms, ~35ms, respectively).
- **50 ms delays** in elderly topographic data yielded young-like patterns of prediction and context effects.

DISCUSSION:

Despite overall delays and reductions in N400 amplitude, elderly readers showed the **same pattern of processing benefits from successful lexical predictions** as young adults.

These results suggest that prediction failures are **not** the primary cause of delayed language processing in healthy aging.

REFERENCES: Brothers, T., Swaab, T. Y., & Traxler, M. J. (2015). Effects of prediction and contextual support on lexical processing: Prediction takes precedence. *Cognition, 136,* 135-149.
Federmeier, K. D. (2007). Thinking ahead: The role and roots of prediction in language comprehension. *Psychophysiology, 44*(4), 491-505.
Rayner, K., Castelhano, M. & Yang, J. (2009). Eye movements and the perceptual span in older and younger readers. *Psychology and Aging, 24,* 755-760.