UC San Diego
Cognitive Science

Emily Robles' Dissertation Defense

Always Adding Additional Alliteration: an ERP Exploration of Word Form Prediction

Thursday, May 21, 2026
12:00 – 2:00pm, Cognitive Science Building, Room 180
or https://ucsd.zoom.us/j/98023814185

Abstract:
While prediction is now an accepted part of language comprehension, to what degree that includes prediction of a word's form is still under debate. Most event-related brain potential (ERP) studies using the related anomaly paradigm have argued for word form prediction during reading, especially when sentential context strongly constrains a specific word (ex. The student went to the library to borrow a…in this case, book). Comparing the amplitude of the N400 (mean area under ERP between 300-500 ms) known to be modulated by semantic analysis, the expected word (book) elicits no N400, the semantic anomaly (sofa) has the largest N400, and a word, pseudoword, and/or letter string that shares letters with the expected continuation (hook, booq, etc.) has an intermediate N400. The reduction of N400 amplitude not just to the expected word but also to orthographic neighbors or other continuations that share many letters in common with the expected word suggests there may be word form prediction ongoing, but the brain seems to be inherently predictive in perception and production, with the processes running in parallel, in all modalities and levels of representation, concrete and abstract.

To separate word form prediction from prediction for a specific word (lexical item) or a word's meaning, we developed a paradigm in which the first letter of each of the first four or five words in the sentence context is the same and the next word either begins with the same letter (alliterative) or not (nonalliterative). (ex., Becky's bewildered beagle barked before beggars (alliterative) / workers (nonalliterative) entered the tunnel). With this paradigm we find a small reduction in N400 amplitude for alliterative compared to nonalliterative continuations, which has been taken by some as evidence of word form prediction (at least for initial letter of an upcoming word). We ruled out the hypothesis that word form prediction is contingent on prior semantic prediction, as the sentence constraints for a specific word were quite weak, even when the identity of the alliterative letter carried some information about word form/orthography. We used these ERP paradigms in two studies to investigate word form prediction and its characteristics and sensitivities as well as how well the extant theories of prediction during language comprehension explain experimental results assuming certain models of reading words.

These sentence reading studies are done in the visual modality, and yet we can't get away with restricting our discussion to how words look (orthography) and avoid how they sound (phonology). We find that orthographic and phonological predictions both seem to occur but they are distinct, by having a different time course and sensitivities to the strength of contextual constraints. Orthographic predictions benefit processing earlier presumably because orthographic information of visual input is processed first (modulating the P2 between 200-300 ms); then phonological information, and benefits of its predictions activate later (modulating the N400).

Next we interleaved our sentence paradigms with different word level tasks (word categorization, rhyming, letter match) in an alternating (switch task) fashion to see whether activation of reading-related cognitive skills can modulate prediction strength or specificity. We find that these tasks did not significantly modulate effects that presumably index lexical prediction, but they did modulate phonological and orthographic effects in the alliterative paradigm. Finally, by adding neuropsychological/cognitive assessments of phonological awareness, spelling ability, and reading comprehension, among other tests, we can use individual differences in these core abilities to determine their influence on orthographic and phonological predictions during comprehension of written sentences. We find that prediction-related effects are modulated by individual differences in relevant cognitive domains, both supporting the original interpretation of the effects and suggesting that participants can harness their reading-related skills to flexibly predict with different forms.

In sum, our data suggest that word form (both orthographic and phonological) predictions can be made in the absence of a specific lexical prediction. These data do not fit with either the unidirectional feature prediction structure of the prediction by production account (Pickering & Garrod, 2007) or the lexical-based prediction of the parallel activation account (Pickering & Strijkers, 2025). Rather, our data align with both the prediction by association (Pickering & Gambi, 2018) and parallel architecture (Huettig et al, 2002) accounts, which allow for less constrained feature preactivation. However, all of these models seem to assume that word form prediction is inherently phonological; our data suggest a distinct form of orthographic form prediction that can influence processing at an earlier timepoint.

Committee members:

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