“Make Me a Sandwich” - “Poof, You’re a Sandwich!”: Ditransitive Syntax in the Brain

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How does the brain distinguish between sentences with nearly identical structures? Neurolinguists have begun to form a fascinating picture of language in the brain in the decades since the first observation of event-related potentials during language tasks. A deeper understanding of syntactic activity—including pattern recognition, ambiguity resolution, and interpretation of functional constituents during sentence processing—would yield insights beneficial to the fields of language education, brain-computer interface, human-computer interaction, and neurolinguistic programs for language acquisition, speech therapy, and rehabilitation of communicative disorders.

To map the brain’s responses to sentence structures, we will use scalp electroencephalography (EEG) to measure event-related potentials (ERPs) associated with two specific syntactic constructions. We have developed 250 sentences that use ditransitive verbs--100 ditransitive non-attributive (giving condition), as in “Francine called the clown a taxi”; 100 ditransitive attributive (characteristic condition), as in “Francine called the clown a liar”; and 50 that could be reasonably interpreted either way (ambiguous condition). At the beginning of the IRB-approved experiment, participants will be trained to classify sentences with ditransitive verbs as either giving or characteristic. Then participants will classify each of the 250 sentences, reading and responding to one sentence at a time, approximating a semi-natural reading experience as much as possible.

We hypothesize that (1) syntactically ambiguous stimuli will elicit larger P600 effects, (2) misclassification of pre-assigned giving or characteristic stimuli will result in stronger ERN effects related to confidence indicators, and (3) correctness, response time, and confidence will correlate with level of exposure to grammar instruction and recent parsing or diagramming practice. Conclusions will inform a potential follow-up study combining EEG with eye-tracking methodology. By observing language processing in the brain, the study contributes to a syntactic map that will aid in overcoming reading barriers and neurological communication disorders such as speech aphasia.