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Prediction in Speech Perception

Prediction occupies a role in a wide range of cognitive functions. It is known that prediction can be implemented at different levels (i.e. conscious or automatic). When subjects have explicit (i.e. conscious) expectations about incoming stimuli, the presentation of deviants elicits ERP responses with shorter latencies and higher amplitudes.

In the case of speech perception, evidence shows that listeners are able to make predictions about incoming speech stimuli. But so far, the examples found rely on semantic knowledge. We hypothesize that prediction serves a role in speech processing, independently from semantic knowledge.

To test this hypothesis, we performed two electroencephalography experiments with an oddball design. The experiments were virtually identical, with the exception of the instructions given to the subjects. In experiment 1, participants heard repetitions of pseudo-words, and were instructed to count the occurrence of "mistaken"words (i.e. deviants). In experiment 2, no information about the occurrence of the deviants was given. This allowed us to achieve two goals. First, to probe for the presence of ERP responses that act as error signals, triggered when a prediction is not met (i.e. a deviant is presented). Second, to study how these prediction error signals, are modulated by participant's explicit (conscious) expectations about the stimuli.

Our results show that participants can use the first phonemes of a word to make predictions about the rest of the word, even in the absence of semantic information. We identified two canonical ERP signals that haven been linked to prediction. A mismatch negativity response (MMN) was present regardless of the expectations of the participant about the presence of deviant words. Additionally, a P300 response was registered only when the participants had expectations about the presence of deviants.

Our results provide evidence for a role of prediction in speech perception, even in the absence of semantics.

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