

The Patterns of Cross-Sentence: An Event-Related Potential Study of Mathematical Word Problem

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Abstract : Understanding human language processing is one of the main challenges of current cognitive neuroscience. The aims of the present study were to use a sentence decision task combined with event-related potentials to investigate the psychological reality of "cross-sentence patterns." Therefore, we take the math word problems the experimental materials and use the ERPs' P600 component to verify. In this study, the experimental material consisted of 200 math word problems with three different conditions were used (multiplication word problems÷division word problems type 1÷division word problems type 2). Eighteen Mandarin native speakers participated in the ERPs study (14 of whom were female). The result of the grand average waveforms suggests a later posterior positivity at around 500ms - 900ms. These findings were tested statistically using repeated measures ANOVAs at the component caused by the stimulus type of different questions. Results suggest that three conditions present significant ($P < 0.05$) on the Mean Amplitude, Latency, and Peak Amplitude. The result showed the characteristic timing and posterior scalp distribution of a P600 effect. We interpreted these characteristic responses as the psychological reality of "cross-sentence patterns." These results provide insights into the sentence processing issues in linguistic theory and psycholinguistic models of language processing and advance our understanding of how people make sense of information during language comprehension.

Keywords : language processing, sentence comprehension, event-related potentials, cross-sentence patterns

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