

Image Schemas in Second Language Learning of English Prepositions: An Event-Related Potential Study

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Image schemas are dynamic patterns of recurrent bodily experience (Johnson, 1987). There has been converging evidence supporting that language comprehension relies on image schemas (Rohrer, 2005). During language processing, people create embodied construals of spatial representations (Gibbs, 2005). As each language highlights slightly different conceptualizations of the spatio-physical world, second language (L2) learners often face challenges mapping the differences between their L1 and the L2 representations (Munnich & Landau, 2010). Schema-based instruction, which expose learners to the target L2 schematic representations, have been suggested to be a plausible solution to this learning problem (Tyler, 2012; Wong et al., 2018).

The current study was the first to employ a computer-based training paradigm together with an event-related potential (ERP) approach that examines the neurocognition of acquiring English prepositions via schema-based instruction. 51 Chinese-L1 intermediate EFL learners were trained in a sentence-picture matching task. The participants were randomly assigned to a schema-feedback group (SF) or a correctness-feedback group (CF). The SF group was given the image-schematic representation that is mapped to the sentence as well as a verbal explanation of the mapping. The CF group was only informed of whether their choice was correct or wrong. Before and after training, participants were examined by an acceptability judgment test (AJT) (behaviorally and with ERPs). The AJT measured the processing of the target preposition (*He waved at the mosquitoes*), distractor preposition (*waved to the mosquitoes*), and unacceptable preposition (*waved across the mosquitoes*). We predict that the processing of distractor prepositions is most problematic for learners.

At the pretest, no significant difference was found between the two groups. Behavioral responses showed a significant main effect for semantic violation, which confirmed our prediction. Target prepositions showed higher accuracy than unacceptable prepositions; unacceptable prepositions showed higher accuracy than distractor prepositions. Both behavioral and ERP results showed a main effect for time, indicating significant learning effects after training.

At the posttest we found an N400 component between 400-500 ms post preposition onset. We found a three-way interaction between preposition type, feedback type, and time. The amplitude of the N400 induced by schema-feedback was larger than what was induced by correctness-feedback in the processing of distractor prepositions, but not of target or unacceptable prepositions. This suggests that schema feedback stimulated learners' strong brain reaction to the semantic abnormality in the processing of distractor prepositions, albeit correctness feedback failed to achieve a comparable effect. The above findings provide strong neurological evidence suggesting that schema-based instruction promotes deep learning of poorly acquired L2 knowledge (Tyler, 2012; Zhao et al., 2018).

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