

Abstract

Chinese characters exhibit certain statistical properties. For example, among 3,764 characters learned in Hong Kong primary school, the untaught logographeme appears in nine characters and is localized on the left in two (i.e., 縣 (county) and 顛 (reverse)) and on the right in seven (e.g., 值 (value), 鎮 (town), and 植 (plant)). A few cross-sectional behavioral studies have shown that school-aged Chinese children are sensitive to such distributional properties of character input (e.g., He & Tong 2017a). This sensitivity is known as statistical learning. However, the questions of when and where statistical learning occurs remain unclear. The proposed study aims to answer these important questions by applying the event-related potential (ERP) measure to investigate longitudinally the role of statistical learning in children's acquisition of Chinese characters.

Specifically, our study will examine: 1) the neural signatures of statistical learning of semantic and phonetic regularities of Chinese characters, 2) the developmental trajectories of statistical learning of semantic and phonetic regularities, and 3) the predictive effects of early neural activities of statistical learning of semantic and phonetic regularities on children's later orthographic and reading performance.

We will recruit 120 Hong Kong Chinese first graders to participate in this three-year longitudinal study. Two artificial orthographic learning ERP experiments will assess their statistical learning of phonetic and semantic regularities on an annual basis from grades 1 to 3. Statistical information in the two experiments will be manipulated by varying the phonetic and semantic consistency levels of target radicals embedded in the learning pseudocharacters including high, moderate and low levels. Each experiment will consist of a learning phase and a recognition phase. Children's brain activities will be recorded only during the learning phase. Those children will also be administered a battery of tasks on nonverbal reasoning, working memory, orthographic awareness, phonological awareness, vocabulary knowledge, and Chinese character reading.

This longitudinal study will identify the neural substrates of statistical learning of orthographic regularities, thereby advancing the theoretical understanding of the mechanism underlying Chinese word reading. Our results will also shed light on the developmental trajectories of statistical learning of Chinese orthographic regularities, which greatly inform the design of Chinese reading curriculum. Furthermore, this study will reveal the link between online neural activities of statistical learning of orthographic regularities and offline orthographic and reading abilities. This has pedagogical implications for guiding and transforming orthographic teaching and learning strategies to improve children's orthographic learning and reading abilities.