Brain oscillations in developmental dyslexia


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Developmental dyslexia is characterized by deficits in speech processing, phonological and morphological awareness skills. The Lexical Quality hypothesis suggests that the lack of tight integration of orthography, phonology, and lexico-semantic information consequently leads to poor reading and comprehension. Recent studies suggested that theta frequency band is functionally related to early orthographic and phonological processing and retrieval of lexico-semantic information. But little is known about brain oscillation dynamics associated with reading in dyslexics.

In this study we use event-related time-frequency analysis to investigate the awareness of morphological representations in dyslexics. Age-matched typically developing and dyslexic children were asked to verify whether a visually presented target word matched the preceding spoken word in a homophone verification task. The semantic congruency of the heterographic homophone pairs was manipulated.

Results found that incongruent word pairs elicited greater theta power than congruent ones in the anterior regions. However, semantic congruency effects were only found in the control group, and absent in dyslexic readers. In addition, dyslexic children elicited larger theta power than controls over the whole scalp, particularly in the anterior left region.

In line with previous findings indicating the role of theta band in ambiguity resolution and early orthographic processing, we suggest that greater theta power reflects increased overall effort in lexical retrieval and semantic processing in dyslexia. Furthermore, the lack of congruency effects in dyslexic readers may suggest a weak integration between orthographic form, lexical semantic functional networks and working memory.

Keywords: brain oscillations, language, dyslexia.