

ORIGINAL ARTICLE

Assessment of P300 ERP Component, Cortical Scalp Mapping and Correlation With Age in Children With Dyslexia Using True and Pseudo Words in the Malay Language: A Quantitative Cross-sectional Study in Kelantan, Malaysia

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ABSTRACT

Introduction: Children with dyslexia have disparate visual attention while reading varied structures of grapheme-phoneme that have different congruency. Exploring more related with attention and reading disability, we investigated the visual attention, topographic mapping and correlation of ages of children with dyslexia using ERP study. **Methods:** A quantitative cross-sectional, non-interventional study was performed with simple randomization to select participants. A total of 24 children were recruited into two groups; control (n=12) and dyslexic (n=12) groups. 128-ERP net was used for ERP experiment. Congruent (true meaningful Malay, 80%) and incongruent (meaningless, 20%) words were used for stimuli. Participants pressed button '1' and '2' when they saw congruent and incongruent words, respectively. Amplitudes and latencies of P300 ERP component were analysed at 19 electrode sites in 10-20 system. **Results:** Dyslexics evoked significantly higher P300 amplitude at T6 and shorter P300 latency at Fp1 areas compared with the control group. Moreover, pseudo word stimulations showed a high P300 voltage distribution in the prefrontal and right occipital area in the dyslexics, whereas there was more activation in the bilateral occipito-parietal areas in the controls. Significantly moderate positive correlation was found in the control group at F3, F7 and negative correlation in the dyslexic group at T4 areas for P300 latency. **Conclusion:** Children with dyslexia have higher visual attention with fronto-central topographic distribution for true Malay words and prefrontal and right occipital areas for pseudo Malay words. Age correlation results indicated that attention is directly related to the brain maturity of children.

Keywords: Visual attention, Dyslexia, Event Related Potential, Pseudoword, Congruence

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INTRODUCTION

Dyslexia is a language learning-difficulty that affects approximately four to eight percent of school age children in Malaysia (1) and most children with dyslexia encounter difficulties in reading, spelling, writing, and pronouncing the words. Even though children with dyslexia have limitations in learning, they are not considered as intellectually impaired children since dyslexics usually have a normal or above normal intellectual quotient (IQ) (2). Dyslexics have limited ability to perceive orthographical symbols of language and have difficulty to identify the alphabets (3). Visual

attention reduction may induce difficulties in lexical reading strategies (4), thus causing difficulty in reading irregular, unfamiliar and pseudo words (5). Dyslexics have poor visual attention to distinguish the pseudo words from true words (4–6) and lack of visual specialization for letter-processing (7). Phonological deficits (8) and impaired processing of rapid sequence stimulus (9) might interfere in visual attention processing. All these factors trigger inefficiency and difficulty of reading to unfamiliar structural words seen in pseudowords especially in the dyslexics. In recent years, there has been an increasing interest in visual attention to linguistic structures in dyslexics. Yet, the available data on visual attention among dyslexics was still limited. Besides, very few studies have examined visual attention in a different language phonemic system; specifically, in a language system such as Malay word structures. Hence, we primarily studied visual attention towards pseudo word incongruency based on Malay phonemic language