ORIGINAL ARTICLE

Fronto-Temporal N200 Event-Related Component in Dyslexic Malay Children During Audio–Visual Paired Stimuli

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ABSTRACT

Introduction: Shifted attention can be studied in paired stimuli using different experimental paradigms. Pre-existing literatures showed that children with dyslexia have difficulty in learning. Hence, there might be a relationship between learning difficulty and shifted attention. We investigated shifted attention and topographic distribution of the N200 component using audio–visual paired stimuli in an event-related potential (ERP) study among dyslexic Malay children. **Methods:** A 128 ERP net designed for children was used for the study. A total of 24 age-matched children were divided into control (n=12) and dyslexic (n=12) groups. A modified audio–visual paired stimuli paradigm was used for the ERP study. Congruent (animal-matched sound) and incongruent (animal-not matched sound) stimuli were used. All participants were instructed to press key '1' and '2' when congruent and incongruent stimuli are presented, respectively. Amplitudes and latencies of the N200 ERP component were analysed at 19 electrode locations in the 10-20 system. A topographic map was analysed for the N200 component for both groups. **Results:** There was no significant differences in the N200 amplitudes and latencies between children with dyslexia and control children at any sites. The topographic map distribution revealed that the dyslexic group had right frontal and left temporal N200 voltage distribution during the incongruent stimuli. **Conclusion:** We conclude that Malay children with dyslexia have no difficulties/intact in shifted attention. Moreover, children with dyslexia have diverted left temporal areas during auditory sound attention.

Keywords: Event-related potential, N200 component, Shifted attention, Congruence, Incongruence

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INTRODUCTION

Reading, writing, and spelling are the learning processes for human beings. In this learning process, children learn about different alphabets with their pronunciation in primary school. When the learning process is completed at the alphabet level, they learn word pronunciation and reading and writing properly at the sentence level. When this normal learning procedure is interrupted, disability might occur. Dyslexia is a learning impairment that is possibly caused by neuronal (1), genetic, and environmental factors (2). Approximately 13%–14% school children in the USA have disabilities and need special education, of which 80% have poor reading and language processing ability (3). In Malaysia, as of 2012, 165,281 school children had learning disabilities, including dyslexia; this number increases each year (4). As dyslexia is involved in the underlying mechanism of language processing in the brain in multisensory systems (5), we need to understand the neuronal mechanisms underlying this disability at an early stage for better management.

Children with dyslexia have issues such as poor spelling and reading, slow learning, poor recognition of audio–visual matching, and poor writing. (6,7). Recognition of audio–visual stimuli is important for reading. Failure of any auditory or visual system might cause dyslexia (8,9). Moreover, lack of attention on a particular stimulus can cause difficulty in reading (10). During shifted attention, we need additional attention during the switching task, and this procedure is called shifted attention (11). There is a lack of evidence related to shifted attention toward audio–visual paired stimuli in children with dyslexia at the neuronal level. Hence, we performed an attentional study using audio–visual stimuli, in which different animal pictures were used as the visual stimuli and their matching sound was used as the paired auditory stimuli, among children with dyslexia in Malaysia.

Neuronal recording during attention was successfully performed in an event-related potential study (ERP)