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PhD Dissertation Defense

Entitled

CORTICAL ACTIVATION AS A RESULT OF READING STIMULI FOR STUDENTS WITH DYSLEXIA AND TYPICALLY DEVELOPING: NEW INSIGHTS FROM FUNCTIONAL NEAR INFRARED SPECTROSCOPY NEUROIMAGING (FNIRS)

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Abstract

As far as we know, there are few studies that investigated cortical activation using fNIRS and none has examined these hemodynamic changes associated with reading Arabic skills.This study evaluated the changes in cortical activation parameters in terms of oxyhemoglobin, deoxyhemoglobin, hemoglobin difference, and total hemoglobin concentrations observed in the brain (cerebral cortex) of 3rd grade students during reading Arabic language tasks. The concentrations of cortical activation's parameters were measured using a functional near infrared spectroscopy (fNIRS) device. The sample size was comprised of 14 3rd grade students that were enrolled in an inclusive environment public school in Al-Ain, Unied Arab Emirates. Following an initial dyslexia-screening test, the participated students were divided into two groups and labelled as typically developed (TD) students (n=7) and students with dyslexia (Dys) (n=7). Using an experimental block design, all of the students were asked to complete 3 Arabic reading tasks with each task consisted of 2 rounds, where the items in round 2 in each task were shuffled to serve as a new challenge for the students. Reading performance was measured by accuracy and latency. The results showed fewer errors and shorter latency for TD students than Dys students. The obtained cortical activation values for TD students were significantly higher (p 0.05) when compared to Dys students, indicating that TD students exhibited greater brain activity and were more effective at reading tasks. A negative correlation between cortical activation parameters and performance was observed. Therefore, this research showed the potential of fNIRS to track these brain activity changes and supported its application in the field of educational neuroscience.

Keywords: fNIRS, dyslexia, Cortical activation, Performance, Latency