Measuring the Written Language Disorder among Students with Attention Deficit Hyperactivity Disorder

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Abstract

Background:
Attention Deficit Hyperactivity Disorder (ADHD) is a mental health disorder. People diagnosed with ADHD are often inattentive (have difficulty focusing on a task for a considerable period), overly impulsive (make rash decisions), and are hyperactive (move excessively, often at inappropriate times). ADHD is often diagnosed through psychiatric assessments with additional input from physical/neurological evaluations. Written Language Disorder (WLD) is a learning disorder. People diagnosed with WLD often make multiple spelling, grammar, and punctuation mistakes, have sentences that lack cohesion and topic flow and have trouble completing written assignments. Typically, WLD is also diagnosed through psychological educational assessments with additional input from physical/neurological evaluation.

Literature Review:

Previous research has shown a link between ADHD and writing difficulties. Students with ADHD have an increased likelihood of having writing difficulties, and rarely is there a presence of writing difficulties without ADHD or another mental health disorder. However, the presence of writing difficulties does not necessarily indicate the presence of a WLD. There are other physical and behavioral factors of ADHD that can contribute to a student having a WLD as well. Therefore, a statistical association between these factors (in conjunction with written performance) and WLD must first be established.

Research Question:

To determine the statistical association between WLD and physical and behavioral aspects of ADHD that indicate writing difficulties, this research reviewed methodologies from the literature pertaining to contemporary diagnoses of writing difficulties in ADHD students, and reveal diagnostic methods that explicitly associate the presence of WLD with these writing difficulties among students with ADHD. The results demonstrate the association between writing difficulties and WLD as it pertains to ADHD students using an integrated computational model employed on data from a systematic review. These results will be validated in a future study that will employ the integrated computational model to measure WLD among students with ADHD.

Methodology:

To measure the association of WLD among students with ADHD, the authors created a novel computational model that integrates the outcomes of common screening methods for WLD (physical questionnaire, behavioral questionnaire, and written performance tasks) with common screening methods for ADHD (physical questionnaire, behavioral questionnaire, adult self-reporting scales, and reaction-based continuous performance tasks (CPTs)). The outcomes of these screening methods were fed into an artificial neural network (ANN) first, to ‘artificially learn’ about measuring the prevalence of WLD among ADHD students and second, to adjust the prevalence value based on information from different screening methods. This can be considered as the priming of the ANN. The ANN model was then tested with data from previous studies about ADHD students who had writing difficulties. The ANN model was also tested with data from students without ADHD or WLD, to serve as control.

Results:

The results show that physical, behavioral, and written performance attributes of ADHD students have a high correlation with WLD (r = 0.72 to 0.80) in comparison to control students (r = 0.30 to 0.20), substantiating the link between WLD and ADHD. It should be noted that due to lack of female participation, most studies in the literature only employed and reported on the relationship between WLD and ADHD for male participants.

Discussion and Conclusion:

By testing ADHD students and control students against the WLD criteria, the study shows a strong correlation between WLD and ADHD. There are limitations to the results’ accuracy in terms of a) sample size (average n=88, mean age = 19, 8 studies used for a meta-analysis), b) analysis (original study reviewing ADHD factors first, WLD factors second), and c) causation (the study only reviews prevalence of WLD in ADHD students, not causation). A clinical trial will validate the data and address some of these limitations in a future phase of the research. A computational causal model will be introduced in the discussion portion to illustrate how causation between writing metrics and WLD as it pertains to ADHD can be achieved. These results open the door to advancing pedagogical techniques in education, where students afflicted with ADHD and/or WLD could not only receive assistance for the behavioral aspects of their disorder, but also expect assistance for the learning aspects of their disorder, empowering them to succeed in their studies.