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Research Brief

Are Similar Achievement Deficits Caused by Different Cognitive Processing Profiles for Individuals with ADHD and TBI?

Adam W. Shunk, Andrew S. Davis, & Raymond S. Dean
Ball State University

Richard W. Woodcock
Woodcock-Muñoz Foundation

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Correspondence concerning this research brief should be addressed to Dr. Raymond S. Dean at Ball State University; email: rdean@bsu.edu

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Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common psychological disorders among children and adolescents; an estimated 3-7% of children are diagnosed with ADHD (American Psychiatric Association [APA], 1994, 2000; Barkley, 1998). According to Barkley (1981), ADHD constitutes 30 to 40 percent of referrals to child guidance clinics. Individuals who have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) present a variety of difficulties in the academic setting. Indeed, almost all clinic-referred children with ADHD typically underperform relative to their known levels of ability as determined by intelligence and academic achievement tests (Barkley, 1998).

Individuals who have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and individuals who have been diagnosed with a Traumatic Brain Injury (TBI) present similar academic difficulties (i.e., inattention, distractibility, memory difficulties). These difficulties often result in similar difficulties in achievement areas such as reading, writing and mathematics. The process of differential diagnosis presents a challenge for Neuropsychologists, especially in the case of a mild TBI. Cognitive and behavioral sequelae following a TBI often go untreated or receive a diagnosis of ADHD, or a similar disorder.

The purpose of the current study was to investigate and differentiate cognitive and academic profiles for individuals diagnosed with ADHD from individuals who have experienced a Traumatic Brain Injury, according to the Cattell-Horn-Carroll (CHC, i.e., Carroll, 1993) cognitive processing theory and the Gf-Gc (i.e., Cattell, 1941, & Horn, 1965) cognitive processing theory. The CHC theory is currently one of the most psychometrically studied theories of cognitive processing, and has a history of extensive validation.

The authors hypothesized that clear cognitive differences would emerge between the two samples, since it is likely that the academic similarities are caused by different cognitive processes, to which the CHC and Gf-Gc theory should be sensitive.

Methodology

The current study examined a group of 100 individuals (mean age = 22.14 months, standard deviation = 7.42) with a diagnosis of ADHD and a group of 100 individuals with a diagnosis of a Traumatic Brain Injury (mean age = 22.23 years; SD = 6.91). Each of the 200 individuals had been referred for a neuropsychological assessment and received, as part of a comprehensive battery, cognitive tests and achievement tests that were selected from the *Woodcock-Johnson Psycho-Educational Battery-Revised* (WJ-R, Woodcock & Johnson, 1989).

<u>Cognitive Composites</u>	<u>ADHD Mean</u>	<u>TBI Mean</u>	<u>F</u>	<u>p</u>
Broad Cluster-Ext	99.45	89.45	4.589	.034*
Broad Cluster- Stand	97.89	88.96	4.696	.032*
Short-Term Mem (gsm)	102.07	93.94	6.188	.014*
Long-term Ret (Glr)	93.26	91.35	.006	.940
Processing Speed (Gs)	95.64	86.44	2.537	.113
Auditory Proc (Ga)	100.56	94.61	1.123	.291
Visual Proc (Gv)	102.04	95.68	1.803	.181
Cross-out	97.29	87.40	4.799	.030*
Visual Closure	104.14	98.71	4.388	.038*
Knowledge (gc)	100.16	91.49	3.803	.053
Fluid Reasoning (Gf)	104.35	96.11	2.113	.148
Memory for Sentence	106.97	94.27	20.978	.000*
Sound Blending	104.14	95.80	4.094	.045*
Concept Formation	100.85	95.99	4.253	.041*

<u>Achievement Composites</u>	<u>ADHD Mean</u>	<u>TBI Mean</u>	<u>F</u>	<u>p</u>
Broad Reading	98.47	97.77	.310	.579
Broad Math	95.13	93.81	.014	.905
Broad Written Lang	89.52	90.56	.838	.362
Broad Knowledge	96.49	89.93	6.83	.01*
Academic Skills	91.79	91.40	1.03	.313

* Indicates statistical significance at .05 level

Results and Summary

The results of a Multivariate Analysis of Variance (MANOVA) indicated that the change in the combined dependent variable of the subtests for group participants was significantly related to diagnosis, Wilks' Lambda = .329, F (51, 89) = 3.552, $p < .05$.

Significant academic differences for performance on the Reading composite, $p > .05$; Writing composite, $p > .05$; and Math composite, $p > .05$ were not present. However, clear and salient cognitive processing differences between the two groups were found. Subsequent univariate tests revealed a number of significant cognitive processing differences between the two samples, including tests of memory, visual processing and broad CHC indices. Individuals with ADHD performed significantly better on an overall measure of intelligence (standard and extended) and memory indices which included the CHC composite of short term memory (gsm) and memory for sentences subtest. Individuals with TBI performed worse on subtests which relate to visual processing (Cross-out, Visual Closure). The similar academic difficulties are likely caused by differences in cognitive processing profiles due to differential areas of neurological impairment.

Overall, the group with ADHD performed at a higher level than did the group with Traumatic Brain Injury in regards to cognitive processing. This may indicate that individuals with ADHD have greater cognitive processing ability in the academic setting, but other sequelae (i.e. inattention, distractibility, hyperactivity) that may not be measured by the CHC theory prevent the group from performing to their ability level. Furthermore, the individuals with TBI in this study had a deficit in short term memory which can lead to academic difficulties similar to individuals with ADHD.

Future research should continue to explore these processing difficulties and examine other differences to assist neuropsychologist practitioners in the process of differential diagnosis.

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