ADHD Differences on the Stanford Binet Intelligence Scales, 5th Edition

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Abstract

Attention-deficit/hyperactivity disorder (ADHD) is a common psychiatric diagnosis in childhood that requires a level of attention or hyperactivity that falls short of the expected developmental level. Past research shows cognitive discrepancies in ADHD populations with verbal deficiencies observed primarily in tasks that require a combined auditory and verbal component. Working memory has been a long acknowledged deficit in persons with ADHD. This research examines cognitive differences among children with ADHD on working memory and other components of the Stanford Binet, 5th edition (SB5). Stanford Binet verbal and nonverbal working memory was hypothesized to be different for the ADHD sample compared to controls and between ADHD subtypes. Participants were gathered from the Stanford Binet standardization sample that were diagnosed with ADHD and matched with a group of normal controls. Data was analyzed using ANOVA followed by a cluster analysis of discrepancies found at subtest and testlet levels. Due to matching and statistical control, results showed no differences in FSIQ, VIQ, or PIQ between normals and those with ADHD, but those with ADHD took an average of 20 minutes longer to complete the SB5, consistently showed greater response variability, and exhibited significant differential item functioning for Vocabulary, Object Series/Matrices, and the routing scales. Deficits in working memory appear to account for these differences.

Introduction

Research has examined cognitive discrepancies between ADHD and non-ADHD individuals (Bridgett & Walker, 2006) with further research on differences between ADHD subtypes of hyperactive, inattentive, and combined (Frazier, Demaree, & Youngstrom, 2004). Frazier et al. (2004) observed significant effects on overall cognitive ability for individuals with ADHD and ADHD with a co-occurring learning disability compared to controls. The results of Frazier's meta-analysis found lower FSIQ for ADHD participants compared to controls, and showed no difference in FSIQ between ADHD subtypes (2004).

Cognitive discrepancies in ADHD populations have shown verbal deficiencies observed primarily in tasks that require a combined auditory and verbal component (Andreou, Agapitou, & Karapetsas, 2005). The working memory and freedom from distractibility constructs have become frequently used to determine deficits in concentration, attention, and short-term memory.

In addition to general working memory deficits, it has been found that ADHD groups had lower verbal comprehension and lower scores on the freedom from distractibility index (Andreou, Agapitou, & Karapetsas, 2005).

Barkley's (1997) theory of behavioral inhibition and executive functioning produced a launching point for numerous aspects of neuropsychological and cognitive research with ADHD. Studies frequently observe specific neuropsychological deficits in ADHD children compared to controls. Fuggetta (2006) demonstrated specific deficits in processing speed, task switching, and attentional processes.

Methods

Participants for this study were children and adolescents younger than 18 years. Participants were gathered from the normative data of the SB5 (Roid, 2003). Demographic characteristics of the participants were matched to US census data based on the stratification used in the original sample compilation. Stratification was based on a national sample and included variables of gender, geographic region, ethnicity, and socioeconomic level.

General criteria for participant inclusion included a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) and age from 2 years to 17 years, 11 months. Since this research is based on ADHD symptoms and cognitive performance, participants who met the criteria for inclusion, but who also had a confirmed Traumatic Brain Injury or a pervasive developmental disorder were excluded from analysis. A sample of control participants without an ADHD diagnosis was selected by matching for demographic characteristics. All participants matching the inclusion and exclusion criteria were selected out of the total sample. The ADHD sample group included 34 participants. Additionally, a control sample of 203 participants was selected from the SB5 normative sample and matched based on age, gender, and other demographic characteristics. Data were analyzed using analysis of covariance (ANCOVA) with age and Full Scale IQ controlled to assess for differential item function at the item level. For this analysis, Block Span, Vocabulary, and Matrix Reasoning items were examined. Similar analyses of covariance were performed at the testlet and subscale levels as well.

The Stanford Binet Intelligence Scale, Fifth Edition is an individually administered standardized assessment of intellectual and cognitive abilities. Permission was gained to use the normative data for the SB5 from the test's author, Dr. Gale Roid.

Organizational Structure of the SB5

Results

Analysis of variance revealed no mean differences between ADHD participants and normal participants on FSIQ, VIQ, PIQ, or the Abbreviated IQ measures. However, ADHD participants took a significantly longer time to complete the SB5 than the normal participants; duration on average was 20 minutes longer (89.19 vs 109.18 minutes; p < .001, Cohen's d = .57).

A further observation was that even where no mean differences were detected, ADHD participants generally showed significantly greater variability in their responses to these items. The variability among ADHD participants was higher on all measured variables. Thus ADHD individuals consistently
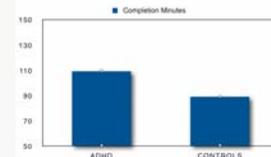
produced more variable responses even though they had similar SB5 mean scores for the full scale and sub-scales.

For Vocabulary and Object Series/Matrices, the verbal and non verbal routing domain, significant effects related to ADHD were found by means of ANCOVA.

Discussion

The present results found no differences in FSIQ, VIQ, and PIQ for ADHD and normal participants. However, ADHD participants took longer to complete the SB5, showed more variable response patterns, and performed significantly more poorly on a number of vocabulary, matrix, and Block Span items. Most of these differences appear to be a function of relative deficits in working memory for ADHD participants. Vocabulary, the verbal routing scale, showed differential function for ADHD participants. Matrices, the non-verbal routing scale for the SB5 also showed significant differential item function for ADHD participants. These differences suggest that ADHD participants likely completed more routing items than their normal counterparts; this may account for some of the additional time required for ADHD participants.

Exploration of the rest of the SB5 items, testlets, and subscales for differential item function appears warranted. It appears that persons with ADHD are likely to show a unique pattern of functional skills. Lower levels of working memory will impair their performance on tasks requiring a large working memory capacity. These data are generally supportive of the findings that implicate working memory as a significant deficit among those with ADHD. Differential item functioning at the item level may also contribute to the increased testing time for participants with ADHD. Emerging cognitive and neuropsychological research indicates the increasing interest in understanding the factors that contribute to etiology, assessment and treatment of ADHD in children. Fuggetta (2006) demonstrated specific deficits in processing speed, task switching, and attentional processes. Additionally, past research has shown greater difficulties with response inhibition and cognitive flexibility for ADHD (Geurts et al., 2005). Further understanding of ADHD can lead to improved detection and intervention of the disorder.