Good Holders, Bad Shufflers: An Examination of Working Memory Processes and Modalities in Children with and without Attention-Deficit/Hyperactivity Disorder

Ashley N. Simone; Anne-Claude V. Bédard; David J. Marks; Jeffrey M. Halperin

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Abstract
The aim of this study was to examine working memory (WM) modalities (visual-spatial and auditory-verbal) and processes (maintenance and manipulation) in children with and without attention-deficit/hyperactivity disorder (ADHD). The sample consisted of 63 8-year-old children with ADHD and an age- and sex-matched non-ADHD comparison group (N=51). Auditory-verbal and visual-spatial WM were assessed using the Digit Span and Spatial Span subtests from the Wechsler Intelligence Scale for Children Integrated - Fourth Edition. WM maintenance and manipulation were assessed via forward and backward span indices, respectively. Data were analyzed using a 3-way Group (ADHD vs. non-ADHD)×Modality (Auditory-Verbal vs. Visual-Spatial)×Condition (Forward vs. Backward) Analysis of Variance (ANOVA). Secondary analyses examined differences between Combined and Predominantly Inattentive ADHD presentations. Significant Group×Condition (p=.02) and Group×Modality (p=.03) interactions indicated differentially poorer performance by those with ADHD on backward relative to forward and visual-spatial relative to auditory-verbal tasks, respectively. The 3-way interaction was not significant. Analyses targeting ADHD presentations yielded a significant Group×Condition interaction (p=.009) such that children with ADHD-Predominantly Inattentive Presentation performed differentially poorer on backward relative to forward tasks compared to the children with ADHD-Combined Presentation. Findings indicate a specific pattern of WM weaknesses (i.e., WM manipulation and visual-spatial tasks) for children with ADHD. Furthermore, differential patterns of WM performance were found for children with ADHD-Predominantly Inattentive versus Combined Presentations.