**Title:** *Behavioral presentation of children with Down syndrome and co-occurring Attention Deficit Hyperactivity Disorder*

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**Introduction:** The prevalence of Attention Deficit Hyperactivity Disorder (ADHD) is 3-5 times higher in children with Down syndrome (DS) compared to typically developing children (Edvardson et al., 2014; Ekstein et al., 2011; Oxelgren et al., 2017). Several medical, developmental, and behavioral co-occurring conditions that are commonly present in children with DS can mirror symptoms of inattention and hyperactivity, making diagnosis of ADHD in children with DS difficult. These include cognitive/adaptive delays, noncompliance, anxiety, negativity, impaired social engagement (autism-related symptoms), sleep disturbance or sleep apnea, hearing and/or vision loss, hypothyroidism and medication side effects (Capone et al., 2006). Preliminary efforts using diagnostic algorithms from archival data found higher rates of some co-occurring conditions in children with DS presenting with ADHD symptoms (Esbensen et al., 2022). However, these preliminary findings warrant replication with confirmed rigorous clinical diagnoses to better understand the presentation of ADHD in children with DS in terms of developmental, medical and mental health comorbidity, behavioral, and adaptive functioning profile. Additionally, a clearer understanding of the neuropsychological and academic functioning of children with DS with compared to without ADHD is needed to inform the diagnostic process and tailor supports or treatments accordingly.

**Method:** We examined 126 children with DS ages 6-17 years (M = 11.1, SD = 3.5) with a comprehensive assessment battery evaluating ADHD diagnostic criteria as well as behavioral, cognitive, academic, and functional impairments. Children were classified as having ADHD if they (1) had a prior diagnosis of ADHD and met ADHD criteria on the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS) or (2) met criteria for ADHD on the KSADS, and on both the parent and teacher Vanderbilt ADHD rating scales. Children meeting criteria for ADHD were compared to those without ADHD on the outcomes of (1) demographic factors, (2) co-occurring medical and mental health diagnoses, (3) parent- and teacher-rated behavior and executive functioning (CBCL, BRIEF2, ABC), (4) performance on neuropsychology assessment and academic tasks, and (5) adaptive functioning and functional impact (Vineland-3, Family Impact Questionnaire [FIQ]).

**Results:** Among these rigorous clinically valid groups of children with DS with (n=42) and without ADHD (n=84), there were no group differences on any demographic factors or co-occurring medical or mental health diagnoses. Use of ADHD medication differed among groups, χ2(1) = 34.2, *p* < .001, and was controlled for in MANCOVAs. Regarding behavioral ratings, MANCOVAs replicated prior findings of greater challenges with inattention and hyperactivity among children with DS and ADHD than without ADHD on parent, *F*(6,108) = 14.72, *p* < .001, and teacher ratings, *F*(6,82) = 8.95, *p* < .001. MANCOVAs also replicated greater behavioral challenges (CBCL/TRF, ABC) on parent, *F*(17,97) = 3.76, *p* < .001, and teacher ratings, *F*(16,72) = 2.11, *p* = .017, and greater challenges with executive functioning (BRIEF2) on parent, *F*(13,100) = 3.98, *p* < .001, and teacher ratings, *F*(13,91) = 2.94, *p* = .001, among children with DS and ADHD than without ADHD. No group differences were seen in performance on clinical neuropsychology assessments, computerized neuropsychological tasks, or academic tasks for children with DS with or without ADHD. Regarding functional impairment, no group differences were identified in daily living skills on the Vineland-3, although FIQ results revealed higher negative impacts on the family in children with DS and ADHD than those without ADHD, *F*(3,113) = 3.04, *p* = .03.

**Discussion:** We replicated and extended prior findings of increased behavioral and executive functioning challenges in children with DS and ADHD compared to those without ADHD. Furthermore, we demonstrated greater negative functional impacts in children with DS and coexisting ADHD versus those without ADHD. However, we did not replicate prior findings of higher rates of specific co-occurring medical and mental health diagnoses in children with DS and ADHD compared to those without ADHD. This discrepancy in findings highlights the need for accurate clinical diagnoses and differential diagnosis for youth with DS. Given that children with DS have a unique neurophysiological profile and, therefore, may not respond to ADHD treatments in the same way as individuals with heterotypical intellectual disability, an improved understanding of the phenotypic profile of children with DS and ADHD may aid in identifying appropriate supports, treatment, and care for this dual diagnosis.

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