Title: The Association Between Executive Functioning and Maladaptive Behaviors in Youth with Down Syndrome

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Introduction: Down syndrome (DS) is characterized by global cognitive and adaptive function impairments. In addition, individuals with DS demonstrate deficits in executive function (EF). Research has profiled the maladaptive behavioral characteristics (i.e., internalizing and externalizing problems) in this population. Specifically, children with DS show higher rates of behavioral problems than typically developing peers, with 10-15% of youth with DS being diagnosed with a conduct or oppositional disorder (Myers and Pueschel, 1991). However, Dykens, Shah, Sagun, Beck, and King (2002) found that the majority of these externalizing behaviors are low-level aggressive behaviors or provocative behaviors rather than instances of extreme aggression, such as fighting. Research in typically developing youth has found a link between executive function and maladaptive behavior (Riggs, Blair, & Greenberg, 2003); however, this association is not well understood in populations with DS. Thus, the current research sought to examine relations between EF and internalizing and externalizing behaviors in DS.

Method: Participants in the current study were a part of a larger research study being conducted at Drexel University. Twenty-nine youth with DS participated (12 males; Age: \( M = 11.5 \) years; \( SD = 3.3 \); IQ: \( M = 52.8; SD = 10.2 \)). Parents completed the Vineland Adaptive Behavior Scales – Second Edition (VABS-2; Sparrow, Cicchetti, & Balla, 2005), which includes two scales assessing maladaptive behaviors (i.e., Internalizing and Externalizing Maladaptive Scales), and the Behavior Rating Inventory of Executive Functioning – Second Edition (BRIEF-2, Gioia, Isquith, Guy, & Kenworthy, 2015), which assesses everyday EF in the home setting. Performance-based EF testing was also completed. Parent report and performance-based tasks were assessed in the areas of working memory (i.e., BRIEF-2 Working Memory scale; WISC-IV Digit Span subtest), Inhibition (i.e., BRIEF-2 Inhibit scale, the Flanker Inhibitory Control and Attention task) and cognitive flexibility (i.e., BRIEF-2 Shift scale, the Dimensional Change Card Sort; DCCS). Raw scores of each measure were utilized to allow for a range of scores in the given sample; however, age was included in all models to account for the effects of age on performance.

To examine the contributions of EF in predicting variance in the VABS-2 Internalizing and Externalizing scales, three regression analyses were completed for each VABS-2 scale. In each analysis, step 1 included age and Step 2 included the parent and performance-based EF scores for the 3 domains considered separately.

Results: When the contributions of working memory to the Internalizing and Externalizing maladaptive scales of the VABS-2 were evaluated, neither the parent reported working memory measure, nor the performance-based measure predicted unique variance in either Internalizing or Externalizing problems (\( p s > .05 \)). In contrast, models including parent report and performance-based measures of inhibition and shift resulted in statistically significant increases in variance explained beyond the effects of age (\( ps < .05 \)). However, an examination of the beta coefficients revealed that only the parent report measures of inhibition (\( \beta > .55, ps > .009 \)) and cognitive flexibility (\( \beta = .56, ps < .004 \)) were statistically significant predictors of internalizing and externalizing behavioral problems.

Discussion: These findings suggest that parent report of cognitive flexibility and inhibition may be useful for identifying youth at risk for internalizing and externalizing behaviors. Further, identifying these executive functioning skills as a target of intervention may have important implications for improving behavioral difficulties in this population. As problem behavior has been associated with various downstream consequences, such as reduced time in mainstream classroom setting (Powers, Bierman, & Coffman, 2016), further research into this area is warranted.

References:


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