Title: An Examination of the Relations between Parent-Reported Fine Motor Abilities and Executive Functioning in Youth with Down Syndrome (DS)

Authors: Moshe Maiman¹, Mary Godfrey¹, Emily Hostetter¹, Manisha Udhnani¹, Nancy Raitano Lee ¹

¹Drexel University

Introduction: Fine motor and executive development were once thought to be independent of one another (Diamond, 2013). However, recent research demonstrates that these constructs are inter-connected (van der Fels et al., 2015; Luz et al., 2015). Understanding relations between fine motor (FM) abilities, which are readily assessed in early childhood, and executive function (EF) may inform research trying to identify early markers of later EF impairments in clinical populations, such as Down syndrome (DS). Few studies have investigated this link in youth with DS, with preliminary findings suggesting that FM and EF abilities may be related within this clinical population (Chen et al., 2014; Schott & Holfelder, 2015; Holzapfel et al., 2015). Still, gaps in the literature remain that preclude a complete understanding of these relations in youth with DS, as these relations have not been investigated using parent-report measures of FM and EF. This is important as research has shown that parent-report and performance-based measures of FM and EF may measure different constructs (Ten Eyck & Dewey, 2016; Kennedy et al., 2012). Moreover, existing studies have not examined youth with DS across the entire school-age period, which may provide insight into the developmental trajectory for these relations as FM and EF skills continue to develop across childhood and adolescence. The current study seeks to further characterize the relations between FM and EF abilities in school-age children with DS using parent-report measures of FM and EF skills.

Method: Parents of 28 children (Female: 57%) with DS (Age: Mean=11.90; SD=3.44; IQ: Mean=53.48 SD; 9.85) completed the FM scale (e.g., writing, cutting) of the Developmental Coordination Disorder Questionnaire (DCDQ; Wilson et al., 2009) and the Behavior Rating Inventory of Executive Function-Second Edition (BRIEF-2; Gioia et al., 2015) as part of a larger study being conducted at Drexel University investigating the cognitive predictors of reading comprehension.

Result: Partial correlations, controlling for age, were used to assess the relations between DCDQ FM/Handwriting and BRIEF-2 scales. When controlling for the influences of age, we found that DCDQ FM/Handwriting was significantly related to the following BRIEF-2 scales: Working Memory (r=-.51, p=.007), Inhibition (r=-.41, p=.04), Task Monitor (r=-.74, p<.001), Self-Monitor (r=-.51, p=.007), and Initiate (r=-.58, p=.001). Conversely, DCDQ FM/Handwriting was not associated with Shift, Planning/Organization, Organization of Materials, and Emotional Control (p>.05). To control for multiple comparisons, a false discovery rate (FDR) experiment-wise adjustment was conducted for each of the aforementioned analyses. Relations that remained significant after correcting for multiple comparisons were Working Memory, Task Monitor, Self-Monitor, and Initiate.

Discussion: Preliminary findings from this investigation suggest that parent-reported fine motor abilities are related to specific parent-reported EF skills in school-age children with DS, with the caveat that the strength of these relations appears to vary by EF domain. Specifically, after controlling for age, parent-reported FM abilities were related to parent-reported working memory, task-monitoring, self-mentoring, and initiation, with effect sizes ranging from medium to large. Conversely, inhibition, shift, planning/organizational skills, organization of materials, and emotional control, were not significantly associated with parent-reported FM skills. This study provides preliminary support for significant relations between parent-reported FM and EF abilities measured concurrently. Given this study’s cross-sectional study design, the directionality of these relations cannot be determined. Thus, future longitudinal studies should be conducted to evaluate the predictive validity of parent-reported FM skills for later parent-reported executive impairments in children with DS.

References/Citations:


