Title: Differential Effects of Sex and Intellectual Ability Level on "Cool" and "Hot" Executive Function Impairments in Youth with Down Syndrome

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Introduction: Children and adolescents with Down syndrome (DS) frequently exhibit executive functioning (EF) deficits on lab-based tasks and standardized parent-questionnaires. For example, on average, youth with DS present with impaired working memory and planning skills relative to both chronological and mental age matched peers. However, research indicates that there is considerable variability in cognitive abilities within the DS group. Understanding factors that relate to this variability may be helpful for identifying which children are at greatest risk for poor cognitive or behavioral outcomes. The current research focused on parent report of executive function in DS using the Behavior Rating Inventory of Executive Function (BRIEF) and examined how sex and IQ differences relate to EF difficulties.

Method: Parents of 34 youth (19 females) with DS (Age: Mean=11.5; SD=3.0; IQ: Mean=49.5; SD=10.1) completed the BRIEF as part of larger studies being conducted at the NIH and University of Arizona. In addition, participants were administered either the Differential Ability Scales–II or the Kaufman Brief Intelligence Test–II to estimate intellectual functioning. Participants were divided into subgroups based on sex and IQ level (group split based on median IQ score of 46) in order to examine the effects of these factors on BRIEF ratings. Analyses were as follows. First, performance on the two BRIEF indices – the Behavior Regulation Index (BRI) and Metacognition Index (MCI) – were compared for males and females and the two IQ groups using t-tests. Then performance on the scales that comprise these indices (BRI: Inhibit, Shift, Emotional Control; MCI: Initiate, Plan/Organize, Organization of Materials, Monitor, and Working Memory) were examined utilizing repeated measures ANOVA.

Results: First, with regard to sex effects, no significant differences were noted on the BRI or MCI scales for males and females using t-tests (ps > .25). This pattern held true when the individual MCI scales were evaluated using a 2 (sex) x 5 (MCI scale) repeated measures ANOVA. However, a different picture emerged when the individual BRI scales were considered. Specially, a significant sex x BRI scale interaction was observed (F[2,64]=5.25, p<.01), such that males had significantly higher (more impaired) Shift scores than females (p<.05). However, these groups did not differ on Inhibit or Emotional Control (ps>.2). In addition, the profile of scores differed for males and females. While Shift was most impaired for males, Inhibit was most impaired for females.

With regard to IQ effects, those with IQ scores above the median had higher (i.e., more impaired) MCI (t (32)=2.4, p<.05) but not BRI (t (32)=1.4, p >.13) scores overall. When the individual scales of the MCI and BRI indices were evaluated in relation to IQ group using repeated measures ANOVA, a similar pattern of findings emerged. Namely, while there was a main effect of IQ group on MCI scales overall (F[1,32]=5.8, p<.05), this effect was not observed on the BRI scales.

Discussion: To the best of our knowledge, this is the first study identifying sex differences in parent-reported EF profiles in youth with DS. While these sex differences were not found across the board, the different profile of BRI scale scores for males and females is noteworthy – namely males were more impaired on shift. This finding is interesting in light of sex differences in the rates of disorders, such as ASD, that are known to effect flexibility. Thus, they draw attention to the need to consider sex as a factor influencing EF profiles in DS. With regard to the effects of IQ status, the present study’s findings are largely consistent with those reported for youth with mixed etiology ID, namely that having a lower IQ adversely impacts EF. However, unlike prior findings, we found that IQ adversely impacted cool EF scores more than hot EF scores (i.e., the MCI but not BRI indices differed significantly for the two IQ groups). These findings highlight the need to examine the domain of EF being considered when IQ effects are discussed.
References/Citations:


