Title: A Profile of Strengths and Weaknesses Emerges Over Early Development in Down Syndrome

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Introduction: Down syndrome (DS) is the most common known genetic cause of intellectual disability and is caused by the presence of an additional chromosome 21. This neurodevelopmental disorder is often characterised by an assortment of biological, cognitive, and behavioural atypicalities that include congenital heart disease, distinctive facial features, and intellectual disability with particular difficulties in expressive language and motor ability. Some assume that the emergence of the DS phenotype—with its loose assemblage of relative strengths and weaknesses—is under the control of genetic activity (trisomy 21). However, there is growing evidence that the profile is not the direct result of genes but their atypical modulation of complex developmental processes (e.g., D’Souza et al., 2017). Thus, the DS pattern of strengths and weaknesses gradually emerges over development. In order to understand this pattern, it is important to examine it over developmental time.

Method: One hundred and four children with DS between 6 and 63 months of age participated in this study. Forty-five of these children were seen longitudinally. The Mullen Scales of Early Learning (Mullen, 1995), an experimenter-led standardized developmental assessment, was administered to test children’s mental age in five domains: gross motor, fine motor, visual reception, receptive language, and expressive language.

Result: In order to understand how the profile of strengths and weaknesses in DS emerges over the first five years of life, we constructed cross-sectional developmental trajectories for each domain (Thomas et al., 2009). Longitudinal data with a smaller group of children with DS were used to validate these trajectories. We compared the trajectories across five domains using ANCOVA. There was a significant main effect of domain (partial eta-squared= .03) suggesting that the profile across the five domains was uneven. Furthermore, there was a significant interaction between domain and age (partial eta-squared= .05) suggesting that the profile changes across developmental time. In order to understand these changes, intercept and slopes were compared for each pair of domains. Notably, the gross motor domain differed significantly in intercept from the fine motor domain (partial eta-squared= .06) and in slope from the receptive language domain (partial eta-squared= .04), suggesting that the gross motor domain presents an area of weakness across development. Furthermore, there was a difference in the slope of expressive language when compared to the fine motor, visual reception, and receptive language domains (partial eta-squared>.06). Although expressive language starts relatively high early in development, it becomes an area of weakness due to a slower pace of development.

Discussion: We describe a persistent weakness in the gross motor domain, and an emerging weakness in the expressive language domain, across the first five years of life in DS. This developmental profile is consistent with an interpretation that as children with DS get older, there are certain developmental milestones (e.g., word production) which they find particularly challenging. This may alter the speed of development in a particular domain and change the profile of strengths and weaknesses. Understanding this profile and how it changes over developmental time presents an important step towards future tailored intervention.

References/Citations: