Title: Children with Chromosome 22q11.2 Deletion Syndrome Show Common Visuospatial Impairments in Two Analogous Line Bisection Tasks

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Introduction: Chromosome 22q11.2 Deletion Syndrome (22q) produces cognitive impairments, including in the spatial domain. We have proposed that these impairments result, in part, from reduced resolution of mental representations. Here we attempted to assess the degree of impairment using visual and motor variants of a Line Bisection task.

Method: Two tasks were completed by 74 children with 22q as well as 57 typically developing (TD) controls aged 7 to 15 years. For Line Bisection, children marked on paper the perceived center of a set of horizontal lines. For Landmark, children used a button box to indicate if marks on similar lines shown on a computer monitor were to the left, right, or in the center. We used two-sample t-tests to compare groups on overall performance and linear mixed effects models evaluated further group differences and associations with age, gender, FSIQ or handedness.

Results: For Line Bisection, the 22q group on average marked the center significantly further left when using their right-hand than did the TD group; $t(113.83) = -2.54, p = 0.013$. There were no differences for left hand use. For the Landmark task, those with 22q were significantly less accurate than the TD group left side trials; $t(87) = -3.34, p = 0.0012$. There was no significant difference on right side trials. Additionally, across all participants, performance on both tasks correlates with error distance; $t(74) = .33, p = 0.003$. This suggests that across all participants, those who performed better at Line Bisection also performed better at the Landmark task.

Discussion: Results from both tasks support the hypothesis that children with 22q exhibit significant impairment in visuospatial abilities. A significant correlation between performance on both tasks further supports the hypothesized cognitive, not motor, source of impairment. Patterns of group differences in Line Bisection bias, in addition to differences in accuracy and above chance thresholds on Landmark task, may suggest a limitation on performance due to differences in the quality of the underlying mental representations. Further research and interventions, such as digital therapeutic video games designed to enhance spatial and temporal acuity, may elucidate and reduce visuospatial processing difficulties in children with 22q.

References/Citations: