Title: Inhibitory Control in 6- to 8-year-olds with Williams Syndrome: Relations with Adaptive Skills, School Readiness, and IQ

Authors: C. Holley Pitts & Carolyn B. Mervis

*University of Louisville

Introduction: Individuals with Williams syndrome (WS) often evidence deficits in several aspects of executive functioning, including inhibition (Greer, Riby, Hamilton, & Riby, 2013). In this study, we directly evaluated verbal and motor inhibitory control in 6- to 8-year-old children with WS. The goals of the current study were: (1) to examine the relations among child performance on inhibitory control measures, parent report of executive function, and child intellectual ability and (2) to evaluate if higher verbal and/or motor inhibitory control had a positive impact on school readiness or adaptive functioning.

Method: Data collection is ongoing. To date, 26 children (14 girls, 12 boys) with genetically-confirmed classic-length WS deletions have participated. Children ranged in age from 6.03 – 8.05 years (M: 7.02 years, SD: 0.64). Children completed two laboratory measures of inhibitory control: Stroop task (replacement of prepotent verbal response by another = proportion correct) and Go/No-Go task (GNG; inhibition of prepotent motor response = proportion correct go-trials multiplied by proportion correct no-go trials; Howard & Melhuish, 2017). Parent report of executive function was measured by the Behavior Rating Inventory of Executive Functioning-2 (BRIEF-2; Gioia, Isquith, Guy, & Kenworthy, 2015) questionnaire. The BRIEF-2 yields T-scores for three indices: Cognitive Regulation Index (CRI), Behavior Regulation Index (BRI), and Emotion Regulation Index (ERI). For the general population, all T-scores have a mean of 50 (SD: 10). Higher T-scores indicate greater difficulty. Intellectual ability was assessed using the Differential Ability Scales-II (DAS-II; Elliott, 2007) General Conceptual Ability (GCA; similar to IQ) standard score (SS).

Early school achievement was measured by the DAS-II School Readiness (SR) diagnostic cluster SS. The Vineland Adaptive Behavior Scales-3 (Vineland-3; Sparrow, Cicchetti, & Saulnier, 2016) semi-structured, parent comprehensive interview was administered to assess adaptive functioning across three domains: Communication (COM), Socialization (SOC), and Daily Living Skills (DLS). For the general population, all SSs have a mean of 100 (SD: 15).

Results: Mean proportion correct was .68 (SD: .30, Mdn: .75, range: 0 – 1) for Stroop and .53 (SD: .21, Mdn: .57, range: .14 – .92) for GNG. Mean GCA SS was 63.04 (SD: 13.04, range: 38 – 84). For the BRIEF-2, mean T-scores were 68.19 (SD: 8.27, range: 45 – 81) for CRI, 65.54 (SD: 10.63, range: 41 – 82) for BRI, and 63.04 (SD: 9.91, range: 47 – 81) for ERI. To evaluate the relation between Stroop, GNG, BRIEF-2 T-scores, and GCA, correlations were conducted. Stroop and GNG were strongly correlated (ρ = .49, p < .011). Stroop was moderately correlated with CRI (ρ = -.43, p = .030) and BRI (ρ = -.34, p = .089). GNG was moderately correlated with CRI (ρ = -.42, p = .034) and BRI (ρ = -.35, p = .084). ERI was weakly correlated with Stroop (ρ = -.22, p = .278) and GNG (ρ = -.12, p = .565). GCA was moderately to strongly correlated with Stroop (ρ = .45, p = .021) and GNG (ρ = .59, p = .001) and weakly correlated with CRI, BRI, and ERI (r < .17, p ≥ .389).

Mean SR SS was 70.70 (SD: 17.04, range: 31 – 106). For the Vineland-3, mean SSs were 68.52 (SD: 9.82, range: 40 – 85) for COM, 70.35 (SD: 9.03, range: 46 – 90) for SOC, and 65.00 (SD: 7.16, range: 47 – 82) for DLS. To determine predictors of SR and Vineland-3 domain SSs, four separate multiple regressions were conducted. Stroop, GNG, and GCA were included as independent variables. The model was significant for: SR SS [R² = .71, F(3, 25) = 17.90, p < .001], COM SS [R² = .65, F(3, 25) = 13.38, p < .001], SOC SS [R² = .50, F(3, 25) = 7.45, p < .001], and DLS SS [R² = .39, F(3, 25) = 4.66, p = .011]. For SR, GCA (p < .001) was a significant predictor, after controlling for Stroop (p = .581) and GNG (p = .941). For COM SS, Stroop (p = .027) and GCA (p = .008) were significant predictors, after controlling for GNG (p = .999). For SOC SS, Stroop (p = .028) was a significant predictor after controlling for GNG (p = .530) and GCA (p = .057). No significant predictors were identified for DLS SS (p ≥ .078).

Discussion: Children’s performance on laboratory measures of verbal inhibitory control and motor inhibitory control were positively correlated with one another and with intellectual ability. Scores on the parent report measure of behavioral and cognitive aspects of executive function were only moderately related to children’s performance on lab-based measures of inhibitory control. The highlights the importance of including performance-based measures to objectively assess aspects of child executive function. Better verbal inhibitory control was related to higher functioning in social situations, after controlling for motor inhibitory control and intellectual ability. Better verbal inhibitory control and intellectual ability were related to stronger communication skills, after controlling for motor inhibitory control. Theoretical and practical implications will be discussed.

References/Citations: