Title: Short-Term Memory and Discourse Demands on Syntactic Ability in Females with Fragile X Syndrome

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Introduction: Despite the relevance of complex syntax (i.e., multiclause utterances) to advanced communicative success and its vulnerability to impairment, little research has addressed weaknesses, or sources of individual differences, in expressive syntactic abilities in females with fragile X syndrome (FXS). Understanding correlates and constraints on expressive syntax will lay the groundwork for appropriate interventions. Phonological memory and verbal working memory are two cognitive skills that are weak in individuals with FXS (Baker et al., 2011), related to language in males with FXS (Pierpont et al., 2011), and related specifically to expressive syntax in other populations (Kemper & Sumner, 2001). The current study examined spontaneous expressive syntactic ability during conversation and narration in females with FXS in relation to phonological and verbal working memory. We addressed two research questions: (1) Are individual differences in syntactic complexity among females with FXS related to phonological memory or verbal working memory? Memory skills were expected to correlate with complexity, especially in narration—the more cognitively challenging of the two language sampling tasks, and (2) Do phonological and verbal working memory account for differences in complex syntax between contexts of use? This exploratory analysis was designed to investigate differences in discourse demands between conversation and narration.

Method: Language samples (an interview-like conversation; telling a story from a wordless picture book) were collected from females with FXS (n = 16; M age = 12 years; SD = 1.5 years; M nonverbal IQ = 70; SD = 15). Samples were transcribed and complex syntax was scored with Developmental Level (DLevel) Coding, which scores the frequency of complex sentences with weightings assigned based on order of acquisition of complex sentence types (Rosenberg & Abbeduto, 1987). The dependent variables were proportion of complex utterances and average complexity (DLevel) of utterances. Phonological memory was assessed with Digit Recall; verbal working memory was assessed with Backward Digit Recall (Working Memory Test Battery for Children; Gathercole & Pickering, 2001). The independent variables were trials correct for digit recall and backward digit recall. (1) We tested partial correlations between syntactic ability and memory skills controlling for Leiter-R nonverbal cognition growth scores. (2) We tested partial correlations between memory and an exploratory complex syntax difference score for conversation versus narration.

Results: (1) Digit recall positively correlated with total proportion of complex sentences across contexts, partial \( r = .46, p = .042 \). Backward digit recall was also positively correlated with proportion of complex sentences in narration and average complexity in narration, \( r = .54, r = .55, ps < .02 \), but not after controlling cognition. (2) Digit recall and backward digit recall scores were positively correlated with the DLevel average complexity difference score between conversation and narration, even controlling for nonverbal cognition, partial \( r = .56, partial \ r = .54, ps < .03 \). To further explore this finding, subgroups of girls with FXS above and below the mean on digit recall were compared: they differed significantly in average complexity differences scores, \( t(14)=2.83, p = .013 \). In contrast, subgroups above and below the mean for nonverbal IQ did not differ in DLevel scores.

Discussion: Phonological and verbal working memory—the ability to hold auditory information in mind and to manipulate it, respectively—account for some variability in complex syntax production observed in females with FXS. The findings suggest that discourse demands (i.e., characteristics of the communicative task) play a role in the language produced by females with FXS. Future research on pathways to outcomes and ways to support syntactic ability is warranted.

References/Citations: