**Title:** Examining Physiological Arousal and Language During Mother-Child Conversations in Boys with Fragile X Syndrome

**Authors:** Emily Lorang\(^{1,2}\) & Audra Sterling\(^{1,2}\)

**Introduction:** Fragile X syndrome (FXS) is an X-linked disorder that results from expansions on the *FMR1* gene. Boys with FXS have co-occurring intellectual disability as well as deficits in social skills and language abilities. Previous research has hypothesized that physiological arousal contributes to communication deficits in individuals with FXS (Belser & Sudhalter, 1995; Belser & Sudhalter, 2001). Electrodermal activity (EDA) is one measure of the sympathetic nervous system that measures under-the-skin moment-to-moment arousal via skin conductance. Examining physiological arousal may be helpful in understanding the underlying processes supporting or hindering communication in individuals with FXS. Previous work has uncovered links between physiological measures of arousal (i.e., skin conductance, vagal tone, and heart rate) and behavioral measures (i.e., perseverative language, pragmatic impairment, and vocabulary) in boys with FXS (Belser & Sudhalter, 1995; Hall et al., 2009; Klusek et al., 2013). Continuing to investigate and establish links between physiological arousal and language abilities can provide insight into explanatory mechanisms of language and social deficits in FXS, inform biological pathways, and provide critical information for future intervention studies. One context through which we can measure both language and arousal is during conversations with familiar partners, such as a child’s mother. By measuring maternal EDA in addition to child EDA, we can also examine whether physiological arousal is related between conversational partners. This study asked the following questions:

1. Is there a relationship between EDA variability and behavioral measures of language and ASD severity in boys with FXS?
2. Is there a relationship between maternal and child mean EDA and EDA variability in a sample of mother-child dyads including boys with FXS?

**Method:** To date, eight boys with FXS ages 10-16 years (M=14.63, SD=2.06) have completed the study. The participants completed an eight-minute conversational interaction with their mother while they both wore Empatica E4 wristbands to track EDA. Mean EDA and EDA variability (indexed by standard deviations) were calculated. Language samples were transcribed using the Systematic Analysis of Language Transcripts Software conventions, resulting in measures of grammatical complexity (mean length of utterance) and vocabulary diversity (number of different words). Child expressive and receptive vocabulary were measured using the Expressive Vocabulary Test – 2nd Edition and the Peabody Picture Vocabulary Test – 4th Edition, respectively. ASD severity was measured using the algorithm from the Autism Diagnostic Observation Schedule – Second Edition.

**Results:** Preliminary results indicate that there may be an inverted u-shaped curvilinear relationship between language and child arousal (EDA variability) in boys with FXS. This may indicate that both blunted EDA variability as well as highly variable EDA do not facilitate optimal expressive and receptive language performance. The relationship between arousal and ASD severity is less clear. Furthermore, the relationships between maternal and child mean EDA and EDA variability need further investigation to identify if maternal and child arousal are related in mother-child dyads including boys with FXS. Different profiles of arousal were present across the boys with FXS (see figures below).
Discussion: While the wristbands can provide vital information on arousal in FXS, tracking EDA during conversational language samples does not provide information on whether increased arousal is associated with positive or negative emotions (such as excitement or anxiety). However, examining indices of the sympathetic nervous system in tandem with behavioral measures while taking an individual differences approach can help to disentangle how arousal relates to ASD symptoms and language performance during naturalistic interactions in boys with FXS. Examining both parent and child physiological arousal as well as behavioral aspects of the interaction can inform biobehavioral models and lead to targeted interventions in FXS. Future research should examine EDA during stress-inducing tasks versus tasks that elicit excitement in order to examine how EDA varies and relates to observable behaviors in boys with FXS in a variety of contexts.
References:

1 University of Wisconsin – Madison
2 Waisman Center