Title: Evaluation of EEG Success in Challenging Populations

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Introduction: Autism Spectrum Disorder (ASD) is a heterogeneous disorder with varying levels of symptom severity and phenotypic presentation. Increased attention is being drawn to the underrepresentation of research surrounding individuals on the spectrum who have severe functional impairments, low cognitive abilities, or are minimally verbal (Tager-Flusberg & Kasari, 2013). The contribution of cognitive impairments in ASD is unclear in part due to the inability for some children to complete traditional cognitive and behavioral testing. Advances in techniques such as electroencephalography (EEG) that focus on reliable, biological signals may improve measurement success for challenging populations. EEG is noninvasive and can be conducted using a wide array of paradigms that do not require a response (i.e. passive tasks). Our objective was to evaluate the success of EEG for children with varying levels of cognitive impairment with the hypothesis that EEG will be successful (i.e. session completed, high quality and quantity of data) for a majority of subjects. We will describe our strategies for behavioral management, and as our primary objective, we will evaluate success on a passive auditory oddball EEG paradigm that measures attention.

Methods: Participants included 144 probands (M=11.6, SD=3.87, range 4.08-22.34), ascertained for ASD-associated disruptive genetic variants and/or autism. Full-scale IQ scores were confirmed via clinical assessment for probands except for four individuals who were unable to complete cognitive testing. During EEG, children completed a passive auditory Oddball paradigm (Salmond et al, 2007) in which children heard auditory stimuli (tones, sounds) while watching silent zoo movies. Proband behavior was monitored and redirected as necessary by a behavior assistant who used personalized behavioral plans based on the child’s needs. An experimenter marked trials in with excessive movement, noise, or problematic behaviors for exclusion during EEG processing. The percentage of trials retained (i.e., without noted behavior problems) was used as a metric of EEG success.

Results: Overall, 97.2% of probands completed IQ testing with valid scores (FSIQ, M=74.53, SD=31.90, range=14-145) and 93.8% of probands completed the EEG session (9 probands were unable to tolerate the EEG net and/or exhibited distress). Of those that completed EEG, 89.6% (n=129) retained at least 60% of trials. Pearson correlations indicated that full-scale IQ was correlated with EEG success, r(137)=.53, p<.0001, particularly in groups with low cognitive ability, FSIQ <50: r(37)=.41, p<.01; FSIQ 50-79: r(30)=.38, p<.034. There was no correlation for probands with FSIQ over 80 r(66)=.13, p=.31.

Discussion: Our results indicate that 135 of 144 participants were successful in completing the EEG; 129 of whom completed with high levels of data retention. Considering that nearly 50% of our probands had a full-scale IQ of less than 80, EEG may be a helpful alternative for understanding the underlying brain patterns associated with intellectual disabilities and other neurodevelopmental disorders for which standardized testing is difficult. Although the amount of data retained is correlated with cognition, particularly in low functioning individuals, nearly 90% of probands still completed the task with at least 60% success. We believe that flexible, individualized behavioral strategies in large part aided this success and will be highlighted within this poster.

References/Citations: