Digital Phenotyping Autism: Investigating Objective Vocal and Movement Quantification for Characterizing Autism Severity

Mathew, Emilin (School: American Heritage School)

Autism Spectrum Disorder is a neurodevelopmental disorder that lacks objective diagnostics. The current gold standard, Autism Diagnostic Observation Schedule (ADOS), suffers from problems such as subjective evaluations of clinicians, inability to distinguish symptom severities, and poor early detection because it only evaluates existing conditions of children. Additionally, COVID-19 severely affects this diagnostic because it prevents the close social interaction necessary to observe children's behavior. As the pandemic disrupts autism diagnoses, new methods are needed. This research used computer vision motion tracking technology to assess mean distances of autistic children from parent and examiner during the ADOS and vocalization recorders to analyze children's language ability. Both predictive measures (movement and vocalization) were analyzed for correlations with the total ADOS score, Restricted and Repetitive Behavior score, and Social Affect score to characterize autism severity. Using univariate correlations and stepwise multiple regressions, the researcher identified significant models to quantify autism severity. The vocalization hypothesis, which predicted the number of conversational exchanges (CE) initiated by the child to be correlated with the social affect score, was supported and produced the best fit model accounting for 16.1% variance. It predicted that a decrease in child-initiated CEs would correlate to an increase in autism social affect symptoms. Overall, this study provides a foundation for automating autism diagnosis through digital phenotyping which may be integrated into smartphone apps. This easy and portable method can provide real time data in natural environments and revolutionize autism diagnosis, especially in the crisis of COVID-19.

Awards Won:
First Award of $5,000
American Statistical Association: Certificate of Honorable Mention
American Psychological Association: Second Award of $1,000