Predicting Autism Spectrum Disorder Based on Parents' Traits: ASD early biomarker and parents' traits

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Introduction: Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by social deficits and restrictive behaviors. ASD has a significant genetic component and parent phenotypes can account for variance in ASD child traits. Parents and other relatives of individuals with ASD may present a sub-clinical version of certain ASD-related traits called the Broad Autism Phenotype (BAP). However, there are limited data in terms of predicting ASD diagnosis based on parents' phenotypical traits.

Objectives: The aim of the study is to classify ASD and NT based on parents' characteristics and examine if the model will have a robust accuracy in terms of predicting ASD diagnosis. We are specifically interested in learning how traits related to empathy, negative states, social processes and other in mothers and fathers can accurately predict ASD diagnosis.

Methods: Parents of children with ASD and parents of children without ASD were recruited through Research Match. Participants completed a lab-developed 240 question survey covering RDoc criteria and the following domains: Cognition/Attention, Social Connectedness/Extraversion, Empathy, Negative Valence, Restrictive Interests and Sensory Processing. We conducted machine learning analysis to find best predictors. A random forest model was generated, and then Shaply Additive exPlanations Values (SHAP) were used to assign importance to each feature in the model.

Results: The random forest model showed that parents' data was able to predict ASD diagnosis 70% of the time, indicating that our parental survey questions were good predictors of ASD diagnosis in children. Features such as mathematical skills, science abilities, cognitive empathy abilities in fathers were among the most important predictors.

Conclusion: The survey helped predicting ASD diagnosis based on specific traits in parents. Future studies will aim at using behavioral and brain function to collect objective data from parents and to predict ASD diagnosis with higher accuracy and precision and to perhaps predict specific subtypes of ASD.

