

Classifying Conduct Disorder Using a Biopsychosocial Model And Machine Learning Method

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Conduct disorder (CD) is a common syndrome with far-reaching effects. Risk factors for the development of CD span social, psychological, and biological domains. Researchers note that predictive models of CD are limited if the focus is on a single risk factor or even a single domain. Machine learning methods are optimized for the extraction of trends across multi domain data but have yet to be implemented in predicting the development of CD.

Methods: Social (e.g., family, income), psychological (e.g., psychiatric, neuropsychological), and biological (e.g., resting-state graph metrics) risk factors were measured using data from the baseline visit of the Adolescent Brain Cognitive Development (ABCD) Study[®] when youth were 9 to 10 years old (N = 2368). Applying a feed-forward neural network machine learning method, risk factors were used to predict CD diagnoses 2 years later.

Results: A model with factors that included social, psychological, and biological domains outperformed models representing factors within any single domain, predicting the presence of a CD diagnosis with 91.18% accuracy. Within each domain, certain factors stood out in terms of their relationship to CD (social: lower parental monitoring, more aggression in the household, lower income; psychological: greater attention-deficit/hyperactivity disorder and oppositional defiant disorder symptoms, worse crystallized cognition and card sorting performance; biological: disruptions in the topology of subcortical and frontoparietal networks).

Discussion: The development of an accurate, sensitive, and specific predictive model of CD has the potential to aid in prevention and intervention efforts. Key risk factors for CD appear best characterized as reflecting unpredictable, impulsive, deprived, and emotional external and internal contexts.

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