A Neuropsychosocial Profile of Future Adolescent Alcohol Misusers

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Biographical Notes: Dr. Robert Whelan has a Ph.D. in psychology and is currently a post-doctoral associate in the Department of Psychiatry at the University of Vermont, in the laboratory of Prof. Hugh Garavan. He previously worked at Trinity College Dublin, Ireland, in the Neural Engineering group at the Trinity Centre for Bioengineering. His current research focuses on analyzing data from the IMAGEN project, a longitudinal study of substance misuse in a large sample of adolescents. In 2012, he was lead author on a study that included fMRI data from almost 1,900 14-year olds, which described dissociable networks for substance misuse, ADHD, and behavioral correlates of inhibitory control. Dr. Whelan's recent work has extended this research by applying a machine learning approach to develop models of current and future adolescent alcohol misuse.

Abstract: Substance misuse is common among adolescents. For instance, nearly 40% of all 13-14 year-old adolescents in the USA report having used alcohol and 10% of this age group exhibit regular use. It has been demonstrated repeatedly that early substance use is a strong risk factor for adult substance dependence; therefore, identifying predictors of substance use in adolescence would be undeniably advantageous. Owing to the uniquely large sample size of the IMAGEN study (n~2000), we were able to employ machine-learning methods to create a predictive model of binge drinking at age 16 from data acquired at age 14. The predictive model incorporated structural and functional brain data, psychometric data including personality measures, and family history data. This model was accurate and highly generalizable and points to neurodevelopmental immaturity, including deficits in the prefrontal cortex and atypical personality development, as an antecedent of alcohol initiation. Individual differences in brain structure and function at age 14 (prior to misuse) had more utility than personality differences at age 14 in identifying alcohol misusers at age 16. By identifying the vulnerability factors underlying individual differences in alcohol misuse, these models shed light on the etiology of alcohol misuse and suggest targets for prevention.

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