Working Memory Ability and Early Drug Use Progression as Predictors of Adolescent Substance Use Disorders

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AIMS: To test a neurobehavioral model of adolescent substance use disorder (SUD) resulting from an imbalance between a hyperactive reward motivation system and a hypoactive executive control system. Specifically, we tested (1) if early weakness in working memory (WM) and associated imbalance indicators of acting-without-thinking (AWT) and delay discounting (DD) predict SUD in late adolescence, and (2) if early drug use progression mediates this relation.

DESIGN: Five waves of longitudinal data collected annually from 2005-2010, with a final follow-up in 2012.

SETTINGS & PARTICIPANTS: Sample of 387 community adolescents (baseline ages 11-13) recruited from the Philadelphia, Pennsylvania, USA area.

MEASUREMENTS: WM was assessed at baseline using 4 different computerized tasks. AWT and DD were assessed at baseline using self-reports. Early drug use patterns were modeled using annual self-reports of recent drug use across the first four waves. Final outcome of SUD was assessed at last wave using self-reports matched to the DSM-5 criteria for three commonly used substances: alcohol, marijuana, and tobacco.

FINDINGS: Weakness in WM at baseline, associated with neurobehavioral imbalance indicators of AWT, B (SE) = -0.06(0.02), $p < 0.01$, and DD, B (SE) = -7.30(1.93), $p < 0.01$, was a significant predictor of SUD at final follow-up. WM predicted SUD both independent of early drug use, B (SE) = -0.36(0.12), $p < 0.01$, and as mediated by early drug use progression, B (SE) = -0.06(0.02), $p < 0.01$.

CONCLUSIONS: Adolescents with weak working memory have less control over impulsive urges, placing them at risk for later substance use disorder with some of the effects mediated by early drug use progression.

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