**Title:** Substance-Specific Cognitive Mechanisms Underlying Drug and Alcohol Use Across Development in a Low-Use Sample

**Abstract:**

We examined cognitive predictors (executive function, EF; impulsivity; delay discounting; sensation seeking, SS) of substance use in teens and young adults in a low-use sample. Alcohol use was correlated with SS in both age groups, while cannabis and nicotine use were linked to lower EF and higher impulsivity in adults. Shapley regressions addressing potential collinearity among variables confirmed that SS contributes strongly to alcohol use in both teens (87.9%) and adults (79.5%). In contrast, cannabis use is explained by mixed contributions from EF (37.5% in teens, 23.2% in adults), impulsivity (26.8% in teens, 55.3% in adults), and delay discounting (30.8% in teens). Nicotine use in teens was primarily tied to impulsivity (68.6%), with smaller contributions from delay discounting (14.1%) and EF (12.7%), while in adults, EF was the strongest predictor (50.8%), followed by impulsivity (25.3%) and delay discounting (23.4%). MANCOVAs controlling for use frequency showed an age-moderated alcohol–SS link (p=.022) strongest in teens (B=1.06, p < .001), age-invariant cognitive differences for cannabis, and no effects for nicotine. Findings suggest dissociable correlates of specific substances habits at different points in development.