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Risky driving and sexual behaviors as developmental outcomes of co-occurring substance use and antisocial behavior



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ABSTRACT

Purpose: To examine the associations between substance use and antisocial behavior trajectories and seven risky behaviors over time.

Method: Data were collected from a high-risk sample of adolescents followed into young adulthood. Five trajectory classes, identified based on dual development of substance use and antisocial behavior symptoms, were used to predict three risky driving and four risky sexual behaviors.

Results: In this high-risk sample ($n = 530$), participants reported notably high overall rates of reckless driving (55.5%) and unprotected sex under the influence (44.8%) in the past year. Risky behaviors that are typically of low base rates in population-based studies were also elevated, with 8.8% reporting past-year driving under the influence (DUI) charge, 17.6% reporting lifetime sexually transmitted infection (STI), and 10.4% reporting lifetime injection drug use. The *Dual Chronic* class had the highest levels of all seven risky behaviors, and were 3–4 times more likely to report risky driving, lifetime STI, and injection drug use than the *Relatively Resolved* class. Rates of past-year reckless driving and DUI were elevated among classes with persistent antisocial behavior, whereas rates of DUI, DUI charge, and unprotected sex under the influence were elevated among classes with persistent substance use.

Conclusions: Young adults with persistent co-occurring substance use and antisocial behavior engage in multiple very costly risky behaviors. Differential associations between risky behaviors and trajectory classes highlight the need for targeted interventions.

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1. Introduction

Substance use and antisocial behaviors are very costly to society. In the United States, excessive drinking, tobacco and illicit drug use together cost over 700 billion dollars each year due to loss in productivity, health care expenses, and criminal justice costs (Centers for Disease Control and Prevention, 2014; National Drug Intelligence Center, 2011). The estimated cost of a 14-year-old high-risk juvenile progressing into a criminal lifestyle ranges from 2.6 to

5.3 million dollars (Cohen and Piquero, 2008). Substance use and antisocial behaviors are highly correlated and are associated with numerous risky behaviors and negative developmental outcomes (Beauchaine and McNulty, 2013; Compton et al., 2005).

The externalizing spectrum model suggests a common etiological pathway to substance use and antisocial behaviors (Krueger et al., 2002, 2007), but limited research has extended this work to simultaneously examine co-occurrence of other risky behaviors such as risky driving or sexual behaviors. Risky driving can lead to fatal accidents, non-fatal injuries, and damaged vehicles. Motor vehicle crashes in the United States attributable to speeding and alcohol involvement have been estimated to cost 50.9 and 40.4 billion dollars, respectively (Blincoe et al., 2002). Sexual risk behaviors, including having multiple partners and unprotected sex, can lead to unplanned pregnancy and sexual transmitted infections (STIs; Capaldi et al., 2002; Valois et al., 1999). Adolescents with STIs were more than twice as likely to have a subsequent HIV infection (Newbern et al., 2013). Injection drug use is a risk factor for HIV

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infection, with the prevalence of HIV estimated at 15% among injection drug users (Mathers et al., 2008). The total direct estimated medical cost of STIs, including HIV, among adolescents is 6.5 billion dollars (Chesson et al., 2004). In sum, risky driving, sexual risk behaviors, STIs, and injection drug use are all costly risky behaviors that are of significant public health relevance. Less well understood is whether these risky behaviors are developmental outcomes of externalizing psychopathology.

1.1. Substance use, antisocial behavior, and risky behaviors

Adolescent substance use is a strong predictor of concurrent and subsequent risky driving behaviors, including driving while impaired by alcohol or drugs (Bingham and Shope, 2004; Li et al., 2013; Vassallo et al., 2008). Of all motor-vehicle-related deaths in 2014, 31% were attributable to alcohol-impaired driving (National Center for Statistics and Analysis, 2015). In a national epidemiological study, cross-sectional data indicated that substance use disorder (SUD) and antisocial personality disorder (ASPD) were independently associated with reckless driving (Vaughn et al., 2011). Individuals convicted of driving under the influence (DUI) showed substantially higher rates of comorbid alcohol and drug use disorders than individuals in the general population (Lapham et al., 2001, 2006).

Adolescent substance use is also a significant predictor of sexual risk behaviors in young adulthood (Bryan et al., 2012; Guo et al., 2002; Khan et al., 2012; Tapert et al., 2001). A recent meta-analysis indicated that adolescent substance use is associated with unprotected sex, more sexual partners, and sex with an intravenous drug user (Ritchwood et al., 2015). Antisocial behaviors in adolescence predicted sexual risk behaviors in young adulthood (Adalbjarnardottir and Rafnsson, 2002; Mason et al., 2010). Adolescents with a history of conduct disorder (CD) reported a greater number of lifetime sexual partners, and ASPD symptoms were positively associated with sexual risk behaviors (Lavan and Johnson, 2002). Taken together, both substance use and antisocial behaviors are likely important developmental precursors of risky driving and sexual risk behaviors.

1.2. The current study

No prior study has examined whether both the *co-occurrence* and *persistence over time* in substance use and antisocial behavior are associated with risky behaviors. In a highly affected sample of adolescents with early onset of problematic substance use and antisocial behavior, five latent classes with distinct “dual trajectories” of substance use and antisocial behaviors from adolescence into young adulthood were previously identified (Trim et al., 2015). In the current study, we used this sample to examine whether risky driving and sexual risk behaviors were elevated in trajectory classes characterized by persistent substance use, persistent antisocial behavior, or the persistent co-occurrence of both behaviors. We hypothesized that the *Dual Chronic* class (characterized by persistent high levels of substance use and antisocial behavior) would have the highest rates of risky driving and sexual risk behaviors, whereas the *Relatively Resolved* class (characterized by relatively resolved substance use and antisocial behavior) would have the lowest rates of risky behaviors. While recognizing that alternative hypotheses could be supported by existing literature, our *a priori* hypotheses were theorized based on whether the risky behaviors of interest were related to substance use or not. Because DUI of alcohol or drugs, DUI charges, unprotected sex under the influence, and injection drug use are conceptually substance use related, we hypothesized that they would be more prevalent in the trajectory classes characterized by persistent substance use and relatively lower antisocial behavior. Because reckless driving, number of sex-

ual partners, and STIs are not by definition related to substance use, we hypothesized that they would be more prevalent in the trajectory classes characterized by persistent antisocial behaviors and relatively lower substance use.

2. Method

2.1. Participants

Data were drawn from a high-risk sample of youth originally recruited for a study on familial transmission and genetic linkage of SUD and CD (Derringer et al., 2015; Melroy et al., 2014). The original sample included 799 youth (M age = 16.1 years, range 13–19 years) recruited from facilities in Denver, CO (substance use treatment programs and the juvenile criminal justice system) and San Diego, CA (treatment programs and alternative schools). At the baseline assessment (age range 13–19 years), each youth was asked to report on substance use and antisocial behavior for the past year. Follow-up interviews occurred on average 6.5 years (range from 3 to 12 years) after the original assessment. At the follow-up assessment (age range 19–30 years), in addition to providing ratings for the past year, participants also provided retrospective reports on these behaviors at age 18 years and at age 21 years when applicable. For participants who were older than 21 years old at follow-up, data from up to four time points were included (past year at baseline, past year at follow-up, and retrospective reports of behaviors at age 18 years and age 21 years collected at follow-up). For participants who were 19–21 years old at follow-up, data from up to three time points were included (past year at baseline, past year at follow-up, and retrospective report of behaviors at age 18 years collected at follow-up). In total, a majority of participants provided reports of substance use at three or four time points (69%) and most provided reports of antisocial behavior at three or four time points (90%).

Participants who completed a young adult follow-up interview were included as part of the trajectory class analyses based on substance use and antisocial behavior symptoms ($n = 536$; Trim et al., 2015). Six of the participants had no follow-up data on risky behavior outcomes and were therefore excluded from the current study. The current sample ($n = 530$) had an average of 6.5 CD symptoms and 10.4 symptoms of non-tobacco substance abuse or dependence (summed for alcohol, marijuana, and other drugs) at initial assessment, and was similar to the full trajectory class sample in demographics, substance use, and antisocial behavior at baseline and follow-up. At follow-up, 27% ($n = 142$) of the sample were still in school and 59% ($n = 312$) were currently employed. Because of a skip pattern in our questionnaire, where only individuals who endorsed having sex with two or more different sexual partners in the past five years were asked all the sexual risk behavior questions, approximately 20% of the sample had missing responses to two questions on sexual risk behaviors (unprotected sex under the influence and STIs). Compared to participants with data on these two sexual risk behaviors, those with missing these data were significantly older (M age 23.1 vs. 22.5 years, $t = 2.78$, $p < 0.01$), but there were no significant differences across sex, race/ethnicity, or trajectory class. Age was controlled for in the primary analyses of all risky behavior outcomes.

2.2. Measures

2.2.1. Substance use and antisocial behavior trajectories. Past-year substance use and SUD criteria were assessed at baseline and follow-up using the Composite International Diagnostic Interview Substance Abuse Module (CIDI-SAM; Crowley et al., 2001), a structured diagnostic interview covering all major substances using the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-

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