



Full length article

Cross-lagged relations between motives and substance use: Can use strengthen your motivation over time?

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ABSTRACT

Motives for substance use have garnered considerable attention due to the strong predictive utility of this construct, both in terms of use and problems associated with use. The current study examined the cross-lagged relations between alcohol use and motives, and marijuana use and motives over three yearly assessment periods in a large sample ($N = 526$, 48% male) of college students. The relations between substance use and motives were assessed at each time point, allowing for the examination of these inter-relations over time. Results indicated different trends based on the type of substance. For alcohol use, cross-lagged trends were found between freshman and sophomore year for coping, social, and conformity motives with cross-lagged relations between enhancement motives and alcohol use across all years. However, outside of enhancement motives, cross-lagged relations were not found between sophomore and junior year. In contrast, cross-lagged effects were found for marijuana use and coping, enhancement, and expansion motives between sophomore and junior year, but not freshman year. These results suggest that people's expectations that drinking or smoking marijuana makes activities more reinforcing and helps them cope with distress may perpetuate use. In turn, use itself may enhance these expectations over time. Results have direct implications for treatment, with recommended focus on motives, behavior activation, and healthy coping skills in order to interrupt the cycle of substance use.

1. Introduction

According to the Substance Abuse and Mental Health Services Administration (SAMHSA, 2016), college students are one of the highest risk groups for alcohol use; almost 60% of college students ages 18–22 engaged in alcohol use in the past month. Other substance use is also on the rise among college students with the annual prevalence of marijuana use at 34% (Johnston et al., 2015).

Motives for substance use have garnered considerable attention due to the strong predictive utility of this construct (Carey and Correia, 1997; Simons et al., 2000; Simons et al., 1998). The four most commonly used motives originated in the alcohol use literature, and include enhancement (e.g., drinking is expected to make activities more reinforcing), coping (e.g., drinking is expected to reduce distress), social (e.g., drinking is expected to be sociable), and conformity (e.g., drinking because my friends pressure me to drink; Cooper, 1994). Motives can be positively or negatively valenced and refer to internal or external factors. Further, motives can serve as predicted positive or negative reinforcement, which may influence the maintenance of substance use over time.

Substance use motives also align with biobehavioral theories of problematic substance use, which suggest two distinct risk “pathways” of reward and stress (Koob, 2015; Koob et al., 2004; Kreek et al., 2005). The initiation of substance use and resulting problematic use is based on a hypo-activated physiological response and generalized genetic disposition to reward, which may be particularly relevant for social and enhancement motives. As problematic use develops, the reward system is then compromised and stress pathways, defined by psychological, behavioral, physiological, and biological predispositions, are activated. Stress is associated with more problematic substance use and relapse, which may activate coping or conformity motives in substance users.

1.1. Alcohol motives

Cross-lagged relations examine how two variables predict each other over time while controlling for baseline levels of both variables. Therefore, the predictive utility and unique variance accounted for by both variables can then be identified, over and above simply the stability of each variable over time. Surprisingly, few studies have examined cross-lagged relations among motives and alcohol use

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longitudinally, and most focused on only one follow-up time point. Crutzen and colleagues (2013) found that among a sample of adults ($N = 2440$), motives, excluding conformity, were able to predict number of days drinking and number of days drinking was also able to predict increased motives. Further, in a study of Swiss men ($N = 4575$), cross-lagged relations were present between social motives and risky single occasion drinking as well as between social motives and alcohol consequences (Labhart et al., 2016). In that same study, coping motives and alcohol consequences also displayed a cross-lagged relationship. These are the only two studies that the authors are aware of that have found longitudinal cross-lagged relationships between motives and alcohol use.

1.2. Marijuana motives

There is also evidence that marijuana-related motives may exist as a mechanism to engaging in marijuana use. Simons et al., (1998) constructed a marijuana motives measure adapted from Cooper's (1994) drinking motives measure with a fifth subscale assessing "expansion motives," which taps into motivation for experiencing the enhancement of perceptual and cognitive experiences due to marijuana's psychedelic properties.

A limitation of the marijuana motives literature is the lack of longitudinal investigations. Anderson et al. (2015) conducted the first (and only, to our knowledge) longitudinal examination of marijuana motives on use and related problems from adolescence through young adulthood. The authors found that over time, both positive and negative reinforcement motives in adolescence were related to increased consumption and problems related to marijuana use in adulthood, though it is unclear whether marijuana use in turn may impact motives in a cyclical effect. Thus, longitudinal data may inform the development of marijuana maintenance theories.

1.3. The current study

The current study examined the cross-lagged relations between alcohol and marijuana use and motives in a sample of college students assessed three times over three years. The relations between substance use and motives were assessed at each timepoint, allowing for the examination of these inter-relations over time.

Based upon the wealth of previous work in this area, we hypothesized that there would be significant positive cross-lagged relations between multiple motives and alcohol or marijuana use at each timepoint. More specifically, based upon repeated findings in the alcohol literature, we hypothesized that alcohol use would have positive cross-lagged relations with social, coping, and enhancement motives (Crutzen et al., 2013; Kuntsche et al., 2005; Vernig and Orsillo, 2015) and that marijuana use would have positive cross-lagged relations with enhancement, expansion, social, and coping motives (Benschop et al., 2015; Bonn-Miller et al., 2007; Brodbeck et al., 2007).

2. Methods

2.1. Participants

Participants ($N = 526$, 48% male) were recruited from introductory psychology courses and were assessed yearly for three years starting freshman year of college. Recruitment occurred across two years. Average age of participants at assessment was 18.95 years (range = 18.00 to 26.33 years old) with approximately 81% of participants identified as Caucasian.

"High risk" participants were identified via pre-study screening and were sent email invitations to enroll. The goal of this screening was to ensure that the sample contained enough participants at risk for escalating substance use to have sufficient variability to address the questions of interest. Notably, the sample intentionally included non-

Table 1
Descriptive Statistics.

	Year 1		Year 2		Year 3	
	Mean	SD	Mean	SD	Mean	SD
DMQ: Coping	2.33	1.04	2.26	1.09	2.29	1.09
DMQ: Social	3.53	1.22	3.65	1.19	3.71	1.16
DMQ: Enhancement	3.07	1.17	3.16	1.13	3.16	1.13
DMQ: Conformity	1.88	0.83	1.88	0.87	1.83	0.89
Weekly alcohol use	5.05	6.61	6.28	7.67	6.56	7.85
MMQ: Coping	1.65	0.86	1.76	0.87	1.79	0.91
MMQ: Social	2.04	1.15	2.19	1.02	2.19	1.05
MMQ: Enhancement	2.70	1.44	2.89	1.32	2.84	1.34
MMQ: Conformity	1.32	0.57	1.38	0.51	1.36	0.53
MMQ: Expansion	1.75	1.01	1.96	1.15	1.95	1.12
Weekly marijuana use	7.77	21.51	9.41	21.81	11.26	24.32

Min. = Minimum, Max. = Maximum, DMQ = Drinking Motives Questionnaire, MMQ = Marijuana Motives Questionnaire. Weekly Alcohol Use = Average number of drinks per week. Weekly Marijuana Use = Average number of hits per week.

substance users to study those who developed substance use habits over the course of the study. Students were administered a screening questionnaire developed by the study team to assess the presence of conduct problem behaviors based upon the Diagnostic and Statistical Manual of Mental Disorders IV Conduct Disorder criteria (American Psychiatric Association, 2000), that occurred prior to age 18 (12 items, $\alpha = 0.75$). A composite score determined the distribution of scores for predicted substance use risk. "High risk" participants (e.g., those with scores that fell within the top 25% of their gender) identified via this method made up 23.1% of the final sample.

2.2. Measures

Past year alcohol and marijuana use and alcohol and marijuana motives were assessed during all three years of the study. Only data from those endorsing use for alcohol ($n = 483$; 92% of sample) or marijuana ($n = 285$; 54% of sample) at any of the three assessment points were used in analyses. Descriptive statistics for the measures are found in Table 1.

2.2.1. Substance use

The Life History Calendar (LHC) is a retrospective interview method for collecting data on life events and behaviors (Caspi et al., 1996) that has been previously used in young adult populations (Pedersen et al., 2012; Rueger et al., 2012). For each assessment, participants reported retrospectively on their past year of alcohol or marijuana use. For alcohol and marijuana use, participants selected from seven choices describing the average amount they used per occasion during each period (e.g., for alcohol, 1 = 1 drink, 2 = 2 drinks... 6 = 6-10 drinks, and 7 = 10 or more drinks. One drink means 1 beer, 1 shot of liquor, or one glass of wine. For marijuana, 1 = 1-2 hits, 2 = 3-4 hits... 6 = 17 or more hits. One hit is equal to 1 joint, bong, or pipe hit) and how frequently they used each substance ranging from 1 (once a month or less) to 5 (every day). The product of the average amount and frequency of use was calculated to determine the average amount used (in drinks or hits) per week for both alcohol and marijuana.

2.2.2. Alcohol motives

Alcohol motives were assessed with the Drinking Motives Questionnaire (Cooper, 1994), a 25 item self-report measure that assesses why the respondent drinks alcohol. Items are assessed on a five point scale (1 = almost never/never... 5 = almost always/always). The DMQ has four first order factors, each assessed by 5 items, including enhancement, coping, social, and conformity (Cooper, 1994). The DMQ demonstrated high internal consistency for all four factors ($\alpha s = 0.86-0.95$).

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