Addictive Behaviors 47 (2015) 42–47

Contents lists available at ScienceDirect

Addictive Behaviors

Marijuana use, craving, and academic motivation and performance among college students: An in-the-moment study

Kristina T. Phillips [a,*], Michael M. Phillips [a], Trent L. Lalonde [b], Kayla N. Tormohlen [c]

[a] School of Psychological Sciences, Campus Box 94, University of Northern Colorado, Greeley, CO 80639, United States
[b] Applied Statistics and Research Methods, Campus Box 124, University of Northern Colorado, Greeley, CO 80639, United States
[c] Center for Addictions, Personality, and Emotion Research, Department of Psychology, University of Maryland, College Park, MD 20742, United States

HIGHLIGHTS

- Craving predicted use in college students who frequently use marijuana.
- Craving was negatively associated with academic effort and motivation.
- Average minutes spent smoking marijuana was negatively related to GPA.
- Greater academic self-efficacy positively predicted GPA.

ARTICLE INFO

Available online 27 March 2015

Keywords:
Marijuana
Craving
Ecological momentary assessment
Academics
Motivation
College students

ABSTRACT

Introduction: Marijuana is the most commonly used illicit substance in the U.S., with high rates among young adults in the state of Colorado. Chronic, heavy marijuana use can impact cognitive functioning, which has the potential to influence academic performance of college students. It is possible that craving for marijuana may further contribute to diminished cognitive and affective functioning, thus leading to poor outcomes for students.
Methods: College student marijuana users ($n = 57$) were recruited based on heavy use and completed ecological momentary assessment (EMA) via text-messaging. The association between marijuana use and craving in a college setting was explored, as well as how these variables might relate to academic motivation, effort and success. The participants were sent text messages for two weeks, three times per day at random times.
Results: A temporal association between craving and marijuana use was found, where momentary craving positively predicted greater marijuana use. Similarly, as craving levels increased, the number of minutes spent studying decreased at the next assessment point. A negative association between momentary craving for marijuana and academic motivation was found in the same moment. Greater academic self-efficacy positively predicted cumulative GPA, while average minutes spent smoking marijuana was negatively related.
Conclusions: Using EMA, marijuana craving and use were significantly related. These findings provide further evidence that heavy marijuana use is negatively associated with academic outcomes.

1. Introduction

Marijuana is the most commonly used illicit drug in the U.S., with over 7% of the general population and 19% of 18–25 year olds reporting use of marijuana within the last month (Substance Abuse & Mental Health Services Administration [SAMHSA], 2014). In the state of Colorado, rates of marijuana use are among the highest in the nation, with 25% of 18–25 year olds reporting use within the last month (SAMHSA, 2012). Approximately one-third of college students report use of marijuana annually (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014; Mohler-Kuo, Lee, & Wechsler, 2003) and a significant portion (25%) of past-year cannabis users meet criteria for a cannabis disorder (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008).

Chronic marijuana users experience significant consequences as a result of their use, including a range of cognitive deficits. Acute intoxication effects include deficits in psychomotor functioning (e.g., speed, accuracy), attention (including sustained selective, focused and divided attention problems), pre-attentive sensory memory, and short-term/working memory (problems in verbal learning/memory, immediate and delayed free recall; see Solowij & Pesa, 2010 for a review). When examining long-term deficits, studies have consistently shown problems with attention, inhibition, working memory, executive functioning, verbal memory, and time estimation in heavy, chronic users (Solowij & Pesa, 2010). Of

* Corresponding author. Tel.: +1 970 351 2428.
E-mail addresses: kristina.phillips@unco.edu (K.T. Phillips), michael.phillips@unco.edu (M.M. Phillips), trent.lalonde@unco.edu (T.L. Lalonde), kayla.tormohlen@gmail.com (K.N. Tormohlen).

http://dx.doi.org/10.1016/j.addbeh.2015.03.020
0306-4603/

important note, such deficits appear to persist even after waiting for intoxication effects to diminish. The degree of such problems appears to depend on frequency and duration of use, dose, and age of onset (Solowij & Pesa, 2010).

Many of these cognitive deficits could impact college success, as a number of specific impairments (e.g., attention, inhibition, and executive functioning) are directly connected to self-regulation in a learning environment (Pintrich, 2004; Tangney, Baumeister, & Boone, 2004; Zimmerman, 2008; Zimmerman, Bandura, & Martinez-Pons, 1992). It is possible that academic problems and failure could be impacted not only by the substance use itself, but also other addictive processes. Craving is one such process that is often described as a strong or intense urge or desire to use a particular substance. Tiffany's Cognitive Processing Model offers a way to conceptualize the impact of craving on cognitive and academic skills (Tiffany, 1990; Tiffany & Conklin, 2000). Tiffany (1990) describes addictive behavior as largely an automatic process, whereby behaviors associated with long-term substance use become regulated outside of consciousness, develop with practice and become difficult to control. Craving, on the other hand, is suspected to function more at the non-automatic level, though in parallel with the more automated behaviors of drug use. Because craving is demanding at the cognitive level and requires substantial effort, it can impede other non-automatic processes.

Similar to a self-regulation model for nicotine addiction proposed by Sayette and Griffin (2011), active marijuana users have to maintain some degree of self-control over their use, and at times, must delay using marijuana in circumstances where using is not acceptable (e.g., while at work, when in class). Such delays may lead to increased urge or craving, which has the potential to impact one's attentional control at the non-automatic level (Field, Munafò, & Franken, 2009). Baumeister and colleagues (Baumeister, Heatherton, & Tice, 1994; Baumeister, Vohs, & Tice, 2007; Muraven & Baumeister, 2000) have proposed a self-regulatory strength model whereby individuals are believed to have a limited capacity to engage in self-control, which could influence operations controlled by the cognitive executive system. This leads to a competition for resources and poor performance on subsequent self-regulatory tasks (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, & Baumeister, 1998). As an example of how this may relate to substance use, Muraven, Collins, Shiffman, and Paty (2005) used ecological momentary assessment (EMA) to examine whether daily fluctuations in self-control influenced alcohol consumption with underage drinkers. They found that when participants had greater demands on their self-control, they were more likely to violate their personal alcohol limits.

When considering the academic environment, it is possible that heavy users will struggle to perform at their peak academically if craving impedes their attention and competition for cognitive resources exists. Increased cognitive effort associated with craving may interfere with other cognitively demanding tasks, such as focusing in class, reading comprehension, and managing academic goals. Craving may also lead to greater marijuana use, which could impact the academic performance of college students and interfere with their ability to fully benefit from their academic studies. The association between craving and subsequent marijuana use has not been widely studied. As noted by Tiffany and Wray (2009), studies examining the association between craving and substance use have not always found the two to be related, or if they are, often the association is not particularly strong. Only one study (Buckner, Crosby, Silgado, Wonderlich, & Schmidt, 2012) has examined marijuana use and craving in college students. Though academic variables were not examined, Buckner et al. (2012) assessed 49 college student marijuana users with a 2-week EMA protocol using personal digital assistants (PDAs). When examined temporally, craving tended to increase in the hours before using marijuana and decreased after use. Craving ratings were higher on days when marijuana was used compared to days participants did not use. Further research is needed to explore whether marijuana craving and use are related and how.

No studies have examined the contributions of craving and marijuana use on specific academic factors that lead to college success. Furthermore, although some studies have found associations between marijuana use, academic performance, college completion, and hours spent studying (Arria et al., 2013a,b; Bell, Wechsler, & Johnston, 1997; Buckner, Ecker, & Cohen, 2010; Fergusson, Horwood, & Beautrais, 2003; Horwood et al., 2010), none have assessed a range of other academic components that might influence completion of one's college degree among marijuana users, such as academic motivation and self-efficacy. In the general college student population, these factors are well-known to influence academic performance and retention (see review by Robbins et al., 2004).

The primary aim of this study was to examine the association between marijuana use and craving and how these variables might relate to academic motivation and academic effort when assessed in the moment with college students. A secondary aim focused on exploring associations between academic performance (GPA) and time spent smoking marijuana, time spent studying, academic self-efficacy, and consequences related to marijuana use. It was hypothesized that craving at one instance would predict marijuana use and time spent studying at the next time point and that higher craving would be associated with lower academic motivation in the moment. Finally, it was believed that academic self-efficacy, problems related to marijuana use, time spent studying, and time spent smoking marijuana would predict academic performance (GPA).

2. Methods

2.1. Participants

Participants included 57 college students (63% female) who were recruited through flyers and announcements made in psychology and science courses at a mid-sized university in Colorado. Recruitment flyers advertised a study on marijuana use that specified students would be screened for eligibility by phone or in-person before participating. Potential participants were eligible for the study if they 1) were age 18 or older, 2) were enrolled at the university for a minimum of one prior semester,

Table 1
Demographic and background characteristics.

Measure/variable	*N* (%)	Mean (SD; range)
Age		20.05 (2.60; 18–33)
GPA (cumulative)		2.90 (.72; .80–4.00)
Gender		
Male	21 (37%)	
Female	36 (63%)	
Race/ethnicity		
Caucasian	44 (77%)	
Hispanic/Latino	6 (11%)	
Other	4 (7%)	
African American	2 (4%)	
Asian	1 (2%)	
Living situation		
Off-campus	28 (49%)	
Campus residence hall	26 (46%)	
At home with family	3 (5%)	
Major		
Science/nursing/pre-health	12 (21%)	
Other social sciences	11 (19%)	
Education	9 (16%)	
Business	9 (16%)	
Psychology	7 (12%)	
Other	5 (9%)	
Undeclared	4 (7%)	
University class status		
Freshmen	26 (46%)	
Sophomore	9 (16%)	
Junior	13 (23%)	
Senior	4 (7%)	
Did not respond	5 (9%)	

Note: Totals may not sum to 100% because of rounding.