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Relationships among parental monitoring and sensation seeking on the development of substance use disorder among college students

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Abstract

Substance use disorder is a serious health problem that tends to manifest in late adolescence. Attempting to influence targetable risk and protective factors holds promise for prevention and treatment. Survey data from 1,253 college students (48.5% male, 26.9% non-White) were used to investigate the independent and combined effects of two prominent factors, sensation seeking and parental monitoring, on the probability of alcohol and/or cannabis dependence during the first year of college. In multivariate analyses that controlled for high school use, gender, race, mother's education, and importance of religion, retrospective reports by the student of parental behavior during the last year of high school indicated that higher levels of parental monitoring had a direct effect on reducing risk for alcohol dependence during the first year of college, but not on cannabis dependence. High levels of sensation seeking were associated with increased risk for both alcohol and cannabis dependence. No interaction effects were found. The results extend prior findings by highlighting influences of pre-college parental monitoring and sensation seeking on the probability of alcohol and/or cannabis dependence during the first year of college. The findings also suggest that these two factors are useful in identifying college students at high risk for alcohol and/or cannabis dependence.

Keywords

Alcohol dependence; cannabis dependence; college students; parenting; sensation seeking; substance use disorder

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1. Introduction

Underage drinking and illicit drug use are common and serious health problems among college students (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008; Johnston, O'Malley, Bachman, & Schulenberg, 2011) and are related to a multitude of adverse consequences (Brook, Adams, Balka, & Johnson, 2002; Fergusson, Horwood, & Swain-Campbell, 2002; Ham & Hope, 2003; Miller, Naimi, Brewer, & Jones, 2007; Rey, Martin, & Krabman, 2004). The risk for substance use initiation and subsequent manifestation of substance use disorder (SUD)[1] is high during late adolescence (Bachman, Wadsworth, O'Malley, Johnson, & Schulenberg, 1997; Chen & Kandel, 1995), and vulnerability is highly influenced by macro-level (e.g., availability, drug and alcohol laws, outlet density), intermediate level (e.g., parents, peers, religion, external stressors), and micro-level (e.g., alcohol expectancies, personality traits, genetics) risk and protective factors (Hasin & Katz, 2010).

From an intervention perspective, influencing targetable risk and protective factors holds promise for prevention and treatment alike. To this end, two factors have been widely studied as they relate to the development of SUDs: 1) sensation seeking, a micro-level risk factor; and 2) parental monitoring, an intermediate-level protective factor. Although there is considerable support for the association between sensation seeking and SUD, not all high sensation seekers abuse alcohol and other drugs which implies that there are protective factors that buffer these effects (Newcomb & Felix-Ortiz, 1992; Stephenson & Helme, 2006). High parental monitoring has been linked to less substance use among adolescents (White et al., 2006), however the effects of parental monitoring on sensation-seeking adolescents is an under-researched area that warrants more exploration. Examining the main and interactive effects of sensation seeking and parental monitoring on SUD can lend itself to prevention and intervention programs that target both these factors.

Sensation seeking is the "general need for thrills and excitement, a preference for unpredictable situations and friends, and the need for change and novelty" (Zuckerman, 2002). Sensation-seeking behavior increases significantly between the ages of 10 and 15 (Steinberg et al., 2008) and has been found to predict substance use among adolescents and young adults (Arria, Caldeira, Vincent, O'Grady, & Wish, 2008b; Crawford, Pentz, Chou, Li, & Dwyer, 2003; Donohew et al., 1999; Kopstein, Crum, Celentano, & Martin, 2001; Newcomb & McGee, 1991; Sargent, Tanski, Stoolmiller, & Hanewinkel, 2010; Segal, Huma, & Singer, 1980; Shin, Hong, & Jeon, 2012; Stacy, Newcomb, & Bentler, 1993; Teichman, Barnea, & Ravav, 1989). There is considerable evidence that high sensation seekers are more likely to initiate drug use at an early age and become regular users when compared to their low sensation-seeking counterparts (Bates, White, & Labouvie, 1994; Pedersen, 1991; Zuckerman, 2007). There are various possible explanations for this association (Donohew et al., 1999; Segal et al., 1980).

There are physiological, psychological, and social explanations for the association between substance use and sensation seeking. From a physiological perspective, the same neural structures are involved in the "reward effects" of sensation seeking and substance use (Bardo, Donohew, & Harrington, 1996). There is evidence that an association between sensation seeking behavior and the D4 dopamine receptor gene exists (Benjamin et al., 1996; Cloninger, Adolfsson, & Svrakic, 1996; Ebstein et al., 1996) implicating that assuaging sensation seeking might actually prevent substance use. From a psychological perspective, simply the risk or illegality associated with substance use might provide stimulation for a sensation-seeking adolescent (Donohew et al., 1999). The more widespread

[1]Abbreviations: SUD=Substance use disorder; IRB=Institutional Review Board; DSM-IV=Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition

and socially acceptable a drug is in a certain population, the less likely a relationship is found between that drug and sensation seeking (Crawford et al., 2003). From a sociological perspective, sensation seeking can be considered an individual-level interpersonal trait that interacts with social influences in a "reciprocal and reinforcing" way (Crawford et al., 2003; Donohew et al., 1999); implying that social forces have the potential to influence sensation seeking in ways that can limit negative outcomes. Past research has focused on the influence of peer networks and sensation seeking on substance use with the idea that groups of tightly knit peers have beliefs and attitudes that shape one another's substance use behaviors (Donohew et al., 1999). However, shifting the focus to a protective factor like parental monitoring might prove more useful in intervention efforts. Parents might be in a unique position to influence not only sensation seeking but also subsequent substance use in their children.

Parental monitoring is the degree to which parents keep track of their children's friends, whereabouts, and social plans while growing up (Dishion & McMahon, 1998). Cross-sectional and longitudinal research has consistently linked low parental monitoring, both directly and indirectly, to more alcohol use in adolescent and college samples (Abar & Turrisi, 2008; Arria et al., 2008c; Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006; Beck, Boyle, & Boekeloo, 2004; Walls, Fairlie, & Wood, 2009; White et al., 2006; Wood, Read, Mitchell, & Brand, 2004). Similarly, low parental monitoring is associated with illicit drug initiation and use in childhood and adolescence (Chen, Storr, & Anthony, 2005; Chilcoat & Anthony, 1996; Chilcoat, Dishion, & Anthony, 1995; Martins, Storr, Alexandre, & Chilcoat, 2008). Much of this work posits that low parental monitoring leads to associations with peers involved with health-risk behaviors (Ary, Duncan, Duncan, & Hops, 1999; Pinchevsky et al., 2012) and these peer influences increase risk for substance use (Oetting & Beauvais, 1987).

A less established area of work is whether parenting factors interact with sensation seeking in order to affect risk for and use of substances. One study of 1,461 middle school students examined the main and interactive effects of authoritative parenting and sensation seeking on substance use (Stephenson & Helme, 2006). Authoritative parenting (a parenting style with a balance of discipline, expectations, warmth, monitoring, and autonomy) ameliorated the effect of high sensation seeking and promoted reductions in adolescent substance use attitudes, intentions, and peer influence (Stephenson & Helme, 2006), however, the interaction of the two variables did not have an effect on substance use. It is possible that the absence of an observed relationship in the study might have been due to a lack of variance on drug use in the young population sampled and replication in a more mature substance-using sample would be warranted. Parental monitoring is an important component of authoritative parenting style and it might serve as a possible buffer between sensation seeking and SUD in a college-aged sample. An interaction between sensation seeking and parental monitoring would suggest that parents with high sensation-seeking children might be able to reduce the risk for substance use by closely monitoring their children and by helping them get involved with healthy stimulating activities.

Given the growing body of literature suggesting that the beneficial effects of parental monitoring during early adolescence might extend into emerging adulthood (Abar & Turrisi, 2008; Arria et al., 2008c; Fairlie, Wood, & Laird, 2012) and the support that sensation seeking is a behavior that can be influenced (Conrod, Castellanos, & Mackie, 2008; Crawford et al., 2003), it is possible that through high parental monitoring during high school, parents might discourage risky sensation-seeking behaviors which might have lasting protective effects throughout college. An interactive effect of sensation seeking and parental monitoring could potentially lend itself to tailored assessment and intervention in order to prevent the development of SUD (Brook, Brook, Richter, & Whiteman, 2003). This

study builds on previous work (Arria et al., 2008c) that found the association between parental monitoring and college drinking was mediated by high school drinking. Essentially, parental monitoring had an indirect influence on college drinking through reductions in high school drinking, emphasizing the importance of parental influences on drinking behavior during high school.

The current study focuses on the transitional period between high school and college. The purpose is to assess the independent and combined effects of sensation seeking and parental monitoring during high school on the probability of alcohol and/or cannabis dependence during the first year of college using a large prospective sample of college students. To date, most studies examining sensation seeking and parental monitoring among college students have focused on substance use and related problems, rather than dependence, as outcomes (Abar & Turrisi, 2008; Arria et al., 2008c; Patock-Peckham, King, Morgan-Lopez, Ulloa, & Filson Moses, 2011; Wood et al., 2004), and no studies have examined how the interaction of sensation seeking and parental monitoring may influence substance dependence. Focusing on substance dependence among first year college students is important because many college administrators are interested in identifying early cases of dependence in order to intervene before use escalates. The present study aims to: 1) evaluate the main effects of sensation seeking and parental monitoring during the last year in high school on the probability of alcohol and/or cannabis dependence during the first year of college, holding constant high school use, gender, race, mother's education, and importance of religion; and 2) evaluate possible interactions between sensation seeking and parental monitoring on the probability of alcohol and/or cannabis dependence during the first year of college.

2. Method

2.1. Sample

Data were collected as part of the College Life Study, an ongoing longitudinal prospective investigation of college student health risk behaviors. A two-stage sampling design was utilized. First, 3,401 incoming first-time, first-year students ages 17 to 19 completed a screening survey during new student orientation in the summer prior to entering a large, public university in the mid-Atlantic region of the US (response rate=89%). The initial sample represented 82% of the incoming class, and did not differ significantly from the class with respect to demographic characteristics (Arria et al., 2008a). Second, a stratified random sample of screening participants was selected for longitudinal follow-up (response rate=87%), with oversampling of individuals who used an illicit drug or nonmedically used a prescription drug at least once prior to study entry. The longitudinal sample (n=1,253) was interviewed face-to-face by a trained interviewer during their first year of college (Year 1) and annually thereafter. The sample was 51.5% female with a mean age of 18.21 (SD=.51). Participants self-identified as White (73.1%), Black/African American (9.3%), Asian/Other Pacific Islander (9.2%), Multi-racial (2.8%), and other (5.7%), with 4.7% identifying as Hispanic. The study was reviewed and approved by the university's IRB, a federal Certificate of Confidentiality was acquired, and informed consent was obtained from participants at all stages. Participants were paid $5 for completing the screening survey and $50 for completing the personal interview. Interviews were administered by extensively trained staff who were typically graduate students, recent graduates, or advanced undergraduates. More detail regarding the recruitment, sampling methods, and representativeness of the sample are described elsewhere (Arria et al., 2008a; Vincent et al., 2012).

2.2. Measures

2.2.1. Alcohol and cannabis dependence—Alcohol and cannabis dependence were assessed annually using a series of questions adapted from the National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration, 2003). For the purposes of this study, only Year 1 alcohol and cannabis dependence data were used. Alcohol use behaviors were assessed first, followed by a separate series of questions on cannabis. Responses were then mapped to the corresponding criteria for dependence as defined in the *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition* (DSM-IV; American Psychiatric Association, 1994). Alcohol dependence was defined by endorsing three or more of the seven dependence criteria during the past 12 months: tolerance, withdrawal, using more than intended, being unable to cut down or stop using, spending a lot of time obtaining or using, giving up important activities because of alcohol use, and continuing to use despite problems with physical or mental health. The variable was dichotomized as meeting criteria for alcohol dependence (1) versus not meeting criteria for alcohol dependence (0).

Cannabis dependence was defined and dichotomized similarly, with the exception that withdrawal was not assessed so only six possible criteria were available.

2.2.2. Parental monitoring—Parental monitoring during the last year of high school was measured during the screening survey with an adapted version of the parental monitoring scale (Arria et al., 2008c; Capaldi & Patterson, 1989; Chilcoat et al., 1995). The nine-item scale includes questions on the participant's perception of parental rule-setting, supervision, consequences, and monitoring during high school; each item is scored on a five-point scale. A higher score denotes higher parental monitoring. In the current study, Cronbach's α=.76.

2.2.3. Sensation seeking—Sensation seeking was assessed at Year 1 using the impulsive sensation-seeking subscale from the valid and reliable Zuckerman-Kuhlman Personality Questionnaire-Short Form (ZKPQ-S; Zuckerman, 2002). The seven-item subscale includes questions on the participant's need for excitement, unpredictability, and novelty as well as the tendency to act quickly without thinking. Each item is scored as true (1) or false (0), and summed to compute the scale score. A higher score denotes higher sensation seeking. In the current study, Cronbach's α=.74.

2.2.4. Control variables—Most control variables were collected during the screening survey (alcohol and cannabis use during high school, race, mother's education level, importance of religion). Alcohol use during high school was measured in two items as the number of days used during a typical week (0 to 4) and weekend (0 to 3). Responses were later dichotomized as alcohol use during high school (1) versus no alcohol use during high school (0). Cannabis use during high school was assessed and dichotomized similarly. Gender was coded as observed by the interviewer at Year 1. Race/ethnicity was assessed by the question "How would you describe yourself?" where the respondent could choose multiple racial/ethnic categories and was supplemented with administrative data. Because the majority of the sample self-identified as White with very few students self-identifying as multi-racial, race was dichotomized as White (1) versus non-White (0) for the current analysis. Mother's education was used as a proxy for socioeconomic status and dichotomized as bachelor's or graduate degree (1) versus some college, high school or GED, or less than high school (0). Importance of religion was measured by a single question "How important is religion in your life?" modeled after the *Monitoring the Future* survey (Bachman, Johnston, & O'Malley, 2011) and dichotomized for the current analysis as moderately or extremely important (1) versus slightly or not important (0).

2.3. Statistical analysis

In order to examine bivariate and multivariate associations, logistic regression models were estimated without interactions to evaluate main effects of sensation seeking and parental monitoring during high school on alcohol and cannabis dependence during the first year of college. The two-way interactions were added in a subsequent step. In the absence of a significant interaction, interpretations of the partial effects were based on the coefficients in step one. All analyses were conducted using SPSS 19.0. Due to item-level missingness on some of the variables, the bivariate and multivariate logistic regression models had varying sample sizes. A minimum *p*-value of .05 was used for all analyses.

3. Results

3.1. Sample characteristics

In the sample gender was balanced (48.5% male) and the majority self-identified as White (73.1%; Table 1). A substantial proportion had mothers with a bachelor's degree or higher (73.6%) and half felt religion to be moderately (32.9%) or extremely (20.5%) important to them. In terms of DSM-IV dependence, 14.7% met criteria for alcohol dependence and 6.1% met criteria for cannabis dependence. Sixty-seven percent reported alcohol use during high school and 28.7% reported cannabis use.

3.2. Predictors of alcohol dependence during the first year of college

At the bivariate level, high school alcohol use, higher sensation seeking, and low parental monitoring were significantly related to being alcohol dependent during the first year of college (Table 2; all *p*s<.001). The results of the multivariate model indicate that sensation seeking and parental monitoring remain significant (Table 2; $p<.001$ and $p=.001$, respectively), even holding constant high school alcohol use, gender, race, mother's education, and importance of religion. The interaction between sensation seeking and parental monitoring was not significant (data not shown; $p=.62$).

3.3. Predictors of cannabis dependence during the first year of college

Being male, White, less religious, and higher sensation seeking, in addition to using cannabis during high school and having low parental monitoring were significantly related to cannabis dependence at the bivariate level (Table 3; all *p*s<.001 except race, $p=.02$ and gender, $p=.003$). The multivariate model shows that high school cannabis use ($p<.001$), being male ($p=.02$), and importance of religion ($p=.01$) remained significantly associated with cannabis dependence. Sensation seeking also remained significant ($p=.04$) but parental monitoring did not ($p=.13$) when holding the covariates constant. The interaction between sensation seeking and parental monitoring was not significant (data not shown; $p=.90$).

4. Discussion

The purpose of the current study was to examine the independent and combined effects of sensation seeking and parental monitoring on the probability of alcohol and cannabis dependence among a large college sample where 14.7% met criteria for alcohol dependence and 6.1% met criteria for cannabis dependence. Not surprisingly, substance use during the last year of high school was highly influential on behavior during the first year of college (Arria et al., 2008c): high school drinkers were three times more likely to meet criteria for alcohol dependence during the first year of college than non-drinkers, and high school cannabis users were 13 times more likely than non-users to meet criteria for cannabis dependence.

The beneficial effects of parental monitoring during high school on subsequent alcohol and/or cannabis dependence during the first year of college varied. High parental monitoring during high school significantly reduced the risk for alcohol dependence during the first year of college but did not reduce the risk for cannabis dependence. There are three possibilities why this might be the case. First, high parental monitoring during high school can decrease the extent of an adolescent's affiliation with substance-using peers who can increase substance abuse and dependence five-fold (Fergusson, Boden, & Horwood, 2008). Second, decreasing affiliation with substance-using peers might instill in adolescents the importance of having appropriate non-using friends, beliefs, and skills that could stay with them during the transition into college. If these were the primary operants, however, it should hold for both alcohol and cannabis. Hence, we postulate that there might be a third (unmeasured) possibility for the relationship: continued parental monitoring and communication surrounding alcohol use during college.

Currently, there are parent-based interventions specifically focused on providing parents of incoming college freshmen with information about risky college drinking. These programs encourage parent-college student communication about alcohol, and work to reduce parental permissiveness of drinking (Turrisi, Jaccard, Taki, Dunnam, & Grimes, 2001). Several studies have documented the efficacy of these parent-based interventions in that freshmen students participating in parent-based interventions show better outcomes related to frequency of alcohol use and high-risk drinking (Ichiyama et al., 2009; Turrisi, Abar, Mallett, & Jaccard, 2010; Turrisi et al., 2001). It is quite possible that parents who are highly involved in their children's lives during high school might continue to do so during college and continue to have conversations about negative alcohol-related outcomes such as driving under the influence, alcohol poisoning, and poor grades. However, these types of parent-child interventions do not seem to exist for illicit drug use. This suggests that providing parents with ways to discuss and monitor college cannabis use could extend the benefits of parental monitoring to preventing cannabis dependence during college. Unfortunately, universities would need to publicly acknowledge that illicit drug use could be an issue for college freshmen and encourage parental participation in the intervention. Parents would also need to acknowledge that their children could be using cannabis during college and that there are risks associated with cannabis use. Assessing if and how parents talk to their children about illicit substance use during college and whether universities are attempting to educate parents and students regarding illicit substance use warrants investigation.

Higher sensation seeking was associated with an increased risk for alcohol and cannabis dependence among college students. However, sensation seeking and parental monitoring did not interact to influence alcohol or cannabis dependence during the first year of college. The lack of a buffering effect of parental monitoring was unexpected, but indicates, at least for alcohol dependence, that parental monitoring has a protective effect regardless of sensation seeking level. It is also possible that the timing of our assessments masked the possible interaction of parental monitoring and sensation seeking. If parental monitoring reduced the influence of sensation seeking on alcohol use or experiencing problems related to drinking during high school, then we might not have been able to detect the interaction effect during college. Another possibility is that that parental monitoring was not as active as it needed to be (e.g., monitored verbal adolescent disclosures rather than actively checking-up in person) and that sensation-seeking behavior (e.g., preferring change and excitement, unpredictable friends, acting on impulse without considering consequences) was seen as "typical" adolescent behavior negating the need for active monitoring or redirection. This work would benefit from developing and using measures encompassing a wider spectrum of active parental monitoring behaviors (e.g., soliciting information directly from adolescent and from friends or neighbors; setting rules that require adolescents to give information about where they are going and who they are with; Kerr & Stattin, 2000; Kerr, Stattin, &

Burk, 2010; LaChausse, 2008; Waizenhofer, Buchanan, & Jackson-Newsom, 2004) in that different types of monitoring behaviors might be required for high sensation-seeking youth (e.g., verify whereabouts more often).

4.1. Limitations and directions for future research

Despite the strengths of the current study (e.g., large sample size, inclusion of alcohol and cannabis dependence as outcomes), there are limitations to consider. First, although the dependence items were designed to correspond to DSM-IV criteria, they are not equivalent to a clinical diagnosis, so we are unable to determine how many of the dependence cases might not have met the condition of "clinically significant impairment or distress" if they had received a clinical evaluation for substance dependence (American Psychiatric Association, 1994). Second, because the participants were recruited from one university, the findings might not generalize to other academic institutions or universities with other characteristics, such as small private colleges. Third, in the absence of any information regarding the age of onset of alcohol problems during high school, the results provide no information about whether onset of substance dependence occurred during college. Future studies should assess the predictors of the emergence of dependence over a longer interval (e.g., during the college years) in order to enhance clinical relevance of these findings. Finally, the current study only assessed the association between parental monitoring during high school, sensation seeking, and alcohol and/or cannabis dependence during the first year of college. Future research should incorporate other intermediate (e.g., peers) and micro-level factors (e.g., emotion regulation) that can influence SUD during college. Establishing the association between parental monitoring during high school and alcohol or cannabis dependence during the first year of college is an important first step and the findings support further analysis of SUD throughout subsequent years in college.

Despite the limitations, the present findings have implications for prevention. Parents might be able to reduce the risk for substance use initiation and progression toward problems during college by preventing initiation during high school through monitoring and involvement. Continuing parental monitoring and having conversations about the dangers of alcohol and drug use throughout college might also be needed. Parent-based interventions, which aim to enhance parental support and communication, the parent-child relationship, and specific parent-teen dialogue regarding the risks of college drinking, have shown initial success in reducing the likelihood of transitioning to drinker status during the first year of college (Ichiyama et al., 2009). Consequently, more research should be directed at evaluating parent-based interventions for alcohol, and for ascertaining whether incorporating illicit drug use can impact other drug use problems. Understanding how parental monitoring continues during college, whether it remains consistent, and how the parent-child relationship changes as adolescents transition into young adults also warrants more investigation. Although parental monitoring did not interact with sensation seeking to buffer the risk for dependence, identifying sensation seeking as a way to target adolescents at risk for substance use is still a focus in prevention research (Conrod et al., 2008; Conrod, Stewart, Comeau, & Maclean, 2006; Sargent et al., 2010). More research is needed to demonstrate the value of personality-targeted cognitive behavioral interventions which have been shown to delay the growth of risky drinking (Conrod et al., 2008). If these interventions can be proven effective, they should be made available and accessible for parents and their children. Ultimately, parents should have an active role in identifying risk factors in their children that are associated with increased risk for SUD during the first year of college.

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Table 1

Sample characteristics (*N*=1,253).

	n	%
Gender		
Female	645	51.5
Male	608	48.5
Race		
White	915	73.1
Non-White	337	26.9
Mother's education		
Less than high school	15	1.3
High school or GED	175	15.1
Some college of technical school	116	10.0
Bachelor's degree	439	37.9
Graduate degree	413	35.7
Importance of religion		
Not important	313	25.5
Slightly important	258	21.0
Moderately important	404	32.9
Extremely important	252	20.5
High school alcohol use		
Yes	833	66.9
No	412	33.1
High school cannabis use		
Yes	356	28.7
No	883	71.3
DSM-IV alcohol dependence		
Yes	182	14.7
No	1057	85.3
DSM-IV cannabis dependence		
Yes	75	6.1
No	1151	93.9

Note. Sample sizes range (*n*=1,158 to *n*=1,253) due to item-level missing data.

Table 2

Results of logistic regression analysis predicting the probability of DSM-IV alcohol dependence during the first year of college.

	Bivariate Models					Multivariate Model				
Variable	***B***	***SE***	***p***	***OR***	**95% CI**	***B***	***SE***	***p***	***OR***	**95% CI**
High school alcohol use[a]	1.59	.25	<.001	4.90	[3.00, 8.01]	1.20	.26	<.001	3.31	[1.98, 5.53]
Gender[b]	−.03	.16	.86	.97	[.71, 1.33]	−.08	.18	.67	.93	[.65, 1.31]
Race[c]	.38	.20	.05	1.46	[.99, 2.14]	.21	.22	.33	1.24	[.80, 1.91]
Mother's education[d]	−.03	.19	.86	.97	[.67, 1.40]	−.02	.20	.93	.98	[.66, 1.46]
Importance of religion[e]	−.18	.16	.27	.84	[.61, 1.15]	−.01	.18	.95	.99	[.70, 1.40]
Sensation seeking	.22	.04	<.001	1.25	[1.15, 1.35]	.17	.04	<.001	1.18	[1.08, 1.29]
Parental monitoring	−.07	.013	<.001	.93	[.91, .96]	−.05	.02	.001	.95	[.93, .98]

Note. CI=confidence interval for odds ratio (*OR*). Sample sizes range (n=1,075 to n=1,239) due to item-level missing data.

[a]Alcohol use=1, No alcohol use=0

[b]Male=1, Female=0

[c]White=1, non-White=0

[d]Bachelor's/graduate degree=1, Some college/high school or GED/less than high school=0

[e]Moderately/Extremely important=1, Slightly/Not important=0

Table 3

Results of logistic regression analysis predicting the probability of DSM-IV cannabis dependence during the first year of college.

	Bivariate Models					Multivariate Model				
Variable	***B***	***SE***	***p***	***OR***	**95% CI**	***B***	***SE***	***p***	***OR***	**95% CI**
High school cannabis use[a]	2.48	.30	<.001	11.90	[6.65, 21.30]	2.58	.36	<.001	13.13	[6.44, 26.77]
Gender[b]	.75	.25	.003	2.11	[1.29, 3.44]	.68	.30	.02	1.97	[1.10, 3.52]
Race[c]	.81	.33	.02	2.24	[1.17, 4.31]	.44	.39	.26	1.55	[.73, 3.29]
Mother's education[d]	.44	.32	.16	1.55	[.84, 2.89]	.05	.36	.89	1.05	[.52, 2.12]
Importance of religion[e]	−1.00	.26	<.001	.37	[.22, .61]	−.79	.30	.01	.45	[.25, .82]
Sensation seeking	.28	.06	<.001	1.32	[1.17, 1.49]	.15	.07	.04	1.16	[1.01, 1.33]
Parental monitoring	−.09	.02	<.001	.91	[.88, .95]	−.04	.24	.13	.96	[.92, 1.01]

Note. CI=confidence interval for odds ratio (*OR*). Sample sizes range (n=1,062 to n=1,226) due to item-level missing data.

[a]Cannabis use=1, No cannabis use=0

[b]Male=1, Female=0

[c]White=1, non-White=0

[d]Bachelor's/graduate degree=1, Some college/high school or GED/less than high school=0

[e]Moderately/Extremely important=1, Slightly/Not important=0