Adolescents' Reported Reasons for Alcohol and Marijuana Use as Predictors of Substance Use and Problems in Adulthood*

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ABSTRACT. Objective: The aim of this study was to examine how reasons for substance use at age 18 relate to alcohol and marijuana use at ages 18 and 35 and to symptoms of alcohol use disorder and marijuana use disorder at age 35. **Method:** Bivariate correlation and multivariate regression analyses were conducted to examine the prediction of substance use and misuse by social/recreational, coping with negative affect, compulsive, and drug effect reasons for alcohol and marijuana use. Control variables included gender, race/ethnicity, parent education, and previous substance use (for age 35 outcomes). **Results:** Social/recreational, coping, and drug effect reasons for drinking predicted symptoms of alcohol use disorder 17 years later. Reasons for marijuana use were generally associated only with concurrent marijuana use; an exception was that drug effect reasons predicted marijuana use disorder at age 35. **Conclusions:** The long-term longitudinal predictive power of reasons for alcohol use (and, to a lesser extent, for marijuana use) suggests that adolescents' self-reported reasons, in particular those involving regulating emotions and experiences, may be early risk factors for continued use and misuse of substances into adulthood. (*J. Stud. Alcohol Drugs, 72,* 106-116, 2011)

ALCOHOL AND OTHER DRUG USE during adolescence and early adulthood typically do not transform into long-term substance use problems. Although many adolescents engage in alcohol and other drug use by the end of high school, the majority of adults do not manifest substance use disorders. For example, the 2008 Monitoring the Future national studies indicate that 72% of 12th graders have used alcohol and 43% have used marijuana in their lifetime (Johnston et al., 2009). In the past decade, a large proportion of 12th graders have been shown to engage in heavy substance use, with the prevalence of heavy episodic drinking in the past 2 weeks ranging from 25% to 32%, and the prevalence of marijuana use in the past 30 days ranging from 18% to 23% (Johnston et al., 2009). Yet, according to data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), only 9.4% of adults have experienced any substance use disorder in the past year (8.5% prevalence of alcohol use disorders [AUDs], 1.5% prevalence of marijuana use disorders [MUDs]; Grant et al., 2004). This has led some to posit that substance use and other problem behaviors of adolescence do not typically lead to serious problems in adulthood.

However, there is evidence that early and heavy use predicts later difficulties with substances in adulthood (e.g., Merline et al., 2008; Zucker, 2008). In addition to how frequently adolescents use alcohol and other drugs, it is likely that other characteristics and experiences with substance use contribute to long-term problems. Substance use is multidimensional, encompassing behaviors, attitudes, and motivations; from a developmental perspective, it is essential to examine both manifest behaviors and underlying purposes of those behaviors (Schulenberg and Zarrett, 2006). In particular, self-reported reasons for adolescent substance use may play a role in developing alcohol and substance use disorders by adulthood. In the current study, self-perceived reasons for alcohol and marijuana use reported in late adolescence (age 18) are treated as prospective predictors of substance use that has continued past the normative developmental peak that occurs in the 20s and of symptoms of substance use disorder in adulthood (age 35). The ability to predict substance use and misuse prospectively is a crucial component of a developmental understanding of substance use (Zucker, 2008).

Reasons for alcohol and marijuana use

The self-reported reasons for which people use alcohol and marijuana may be particularly important to understand when explaining the etiology of substance use and misuse as well as when promoting behavior change (Newcomb et al., 1988).

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Four types of alcohol use motivations have been theoretically identified and empirically supported among adolescent and adult populations (Cooper, 1994; Cooper et al., 1992; Cox and Klinger, 1988): social, enhancement, coping, and conformity. Social drinking motives include drinking to have fun with friends and are most commonly endorsed. Enhancement drinking motives include reasons such as getting high or experiencing excitement, and these motivations are associated with frequent heavy alcohol use as well as use of marijuana and other drugs. A minority of adolescents drink to cope (e.g., to forget about problems), and these individuals are most likely to drink alone (Cooper et al., 1992) and to manifest drinking problems or misuse of alcohol (Cooper et al., 1992; Kuntsche et al., 2005). Conformity reasons include drinking to fit in with a peer group and are associated with lower frequency and quantity of alcohol use (Cooper, 1994). These documented associations between alcohol use motivations and behaviors are based almost entirely on cross-sectional research; however, Newcomb and colleagues (1988) showed that both alcohol and marijuana motivations were prospectively related to behavior 1 year later.

Empirical research has not consistently differentiated motivations for use of other substances, such as marijuana. Available evidence suggests reasons for marijuana use are similar to those for alcohol use, including social, enhancement, coping, and conformity reasons (Simons et al., 1998, 2000; Zvolensky et al., 2007). An additional reason for using marijuana has been described as altering perceptions (Lee et al., 2007) or mind expansion (Bonn-Miller et al., 2007; Simons et al., 1998, 2000; Zvolensky et al., 2007). Replicating the pattern described for alcohol motivations and use, Bonn-Miller et al. (2007) found in a cross-sectional study that using marijuana for social, enhancement, coping, and expansion reasons was predictive of marijuana use; conformity reasons were not predictive of use in the presence of covariates. When comparing motivations for alcohol and marijuana use, social motivations were greater for alcohol than for marijuana, enhancement motivations (among women only) and expansion motivations were greater for marijuana than for alcohol, and coping and conformity motivations did not differ across substances (Simons et al., 2000). Boys et al. (2001) also identified facilitating activity (e.g., concentration) and managing the effects of other drugs (e.g., to improve or ease effects of other substances) as additional reasons for substance use. Differentiating substance-specific reasons for use and how they are associated with use and misuse will allow for stricter tests of the importance of underlying reasons for use as markers of risk among adolescents.

Alcohol and marijuana use disorders

One of the clearest indicators of failure to mature out of substance use and continued problems in adulthood is symptoms of substance use disorders, which include dependence (i.e., increased tolerance and continued repeated use despite negative consequences) and abuse (i.e., using in hazardous ways leading to problems with normal functioning). These disorders are associated with a range of morbidity and mortality issues (Compton et al., 2004; Schuckit, 2009) and also incur substantial costs to society (Spoth et al., 2002). The risk of experiencing an AUD in the past year is approximately 10% for adults in developed countries (Schuckit, 2009), and the risk for MUD is about 1.5% among American adults (Compton et al., 2004). Although important advances have been made regarding family-related and psychopathological risk factors for adulthood substance use disorders (Zucker, 2008), research detailing the long-term broad-based prediction of adulthood AUD and MUD remains limited (Schulenberg and Maggs, 2008). Understanding which individuals are most likely to develop AUD and MUD is an important focus for prevention and intervention programs.

Reasons as predictors of later use and misuse

Most research in this area has focused on how motivations are associated with substance use *behaviors* rather than *disorders.* However, motivations for use have been shown to mediate the effect of personality disorders on AUDs (Tragesser et al., 2007). In addition, two reports from the same community-based study document a prospective association between reasons for use and AUDs. In one analysis, drinking to reduce negative affect predicted new alcohol dependence 1 year later (Carpenter and Hasin, 1998). In another, adults with a family history of alcoholism who drank alcohol to reduce negative affect and for social facilitation had a greater risk of alcohol dependence 10 years later (Beseler et al., 2008).

Although very little research on reasons for use has employed longitudinal designs, related research on substance use expectancies has assessed long-term associations with behavior. Expectancies are beliefs about the positive or negative effects of using a substance, which can be formed before initiating substance use and held by lifetime abstainers (e.g., Leigh, 1989). Expectancies are hypothesized to precede the formation of personal motivations, which are the more proximal predictors of use (Cooper et al., 1995), and have indirect effects via motivations on alcohol use (Read et al., 2003). Alcohol expectancies, particularly positive alcohol expectancies, have been shown to predict alcohol outcomes 1 year later among college students (Zamboanga et al., 2006), 3 years later among adolescents (Aas et al., 1998), across 4 years among college students (Sher et al., 1996), across 9 years beginning in adolescence (Stacy et al., 1991), and across 19 years from ages 16 to 35 in a British national study (Patrick et al., 2010). However, these studies had a limited ability to differentiate which types of expectancies were most predictive of alcohol use and problems longitudinally.

Extending this work on alcohol expectancies, the current study focuses on the related constructs of reasons for alcohol and marijuana use as prospective predictors of adulthood substance use and misuse.

Research questions

The current study builds on previous cross-sectional research concerning reasons for drug use as reported in the nationally representative Monitoring the Future study, including descriptions of drug-specific reasons for use (Johnston and O'Malley, 1986) and gender and racial/ethnic differences in reasons (Terry-McElrath et al., 2009). In particular, we examine the long-term connection between reasons for substance use at age 18 and symptoms of AUD and MUD at age 35. Reasons for alcohol and marijuana use reported at age 18 (in 12th grade) are investigated as concurrent and prospective predictors of use and as prospective predictors of symptoms of substance use disorder 17 years later. In addition, interactions with gender are tested, based on previous evidence that antecedents of drinking vary for men and women (e.g., Englund et al., 2008; Pitkänen et al., 2008).

Method

Monitoring the Future is an ongoing study of adolescents and young adults (Johnston et al., 2009). The project has used questionnaires administered in classrooms to survey nationally representative samples of about 16,000 American high school seniors each year since 1975. Approximately 2,400 individuals are randomly selected from each senior-year cohort for biennial follow-up via mailed questionnaires. Drug users are oversampled for follow-up, and the sample is weighted to adjust for the differential probability of selection. More detailed descriptions of the Monitoring the Future study design and procedures can be found in Bachman et al. (2006), in Johnston et al. (2009), and on the Monitoring the Future Web site (www.monitoringthefuture.org).

Participants

The sample used in the present analyses represents cohorts of seniors from the high school classes of 1976 to 1990 who had used the specified substance in the previous 12 months, responded to the reasons items at age 18, and participated in the age 35 follow-up. Multiple questionnaire forms were used to decrease respondent burden; the forms were randomly assigned within classrooms to individuals at the first assessment. Reasons for alcohol and marijuana use central to the present analyses were included on one of five survey forms (or six forms, beginning in 1989). Only those respondents who used the substance in the past 12 months were asked about their reasons for use. For alcohol use reasons, the weighted *n* was 2,311 (54.9% women; 88.5% White, 5.1% African American, 2.4% Hispanic, 4.0% other); for marijuana use reasons, the weighted *n* was 1,015 (52.7% women; 90.8% White, 4.1% African American, 2.2% Hispanic, 2.9% other). Actual numbers of cases are larger than the weighted *n*s shown here. Analyses accounted for the complex multistage sample design, and the data were weighted to adjust for differential selection probabilities.

Of eligible participants who provided data at age 18, 56.6% also provided information on alcohol and/or marijuana use at age 35 and thus could be included in the present analyses. Attrition analyses indicated that participants who remained in the study at age 35 were more likely to be White, to be women, and to report consuming alcohol and marijuana less often at age 18. Additional analyses using all available data at age 18 (not shown) yielded substantively equivalent results, with the only differences being that nonsignificant coefficients reached significance.

Measures

Alcohol use and heavy episodic drinking. During their senior year in high school (modal age 18), participants were asked whether they had any alcoholic beverage to drink in the last 12 months. Individuals who had not were instructed to skip the remaining questions regarding alcohol use and reasons for use. Heavy episodic drinking was assessed at modal ages 18 and 35 with the question, "Think back over the last two weeks. How many times (if any) have you had five or more drinks in a row?" (1 = *none,* 2 = *once,* 3 = *twice,* 4 = *3-5 times,* 5 = *6-9 times,* 6 = *10 or more times*).

Marijuana use. At age 18, participants were asked whether they had used marijuana or hashish in the last 12 months. Individuals who had not were asked to skip the remaining questions regarding marijuana use and reasons for use. Past-30-day marijuana use was measured at modal ages 18 and 35. The question was, "On how many occasions (if any) have you used marijuana (or hashish) … during the last 30 days?" (1 = *0 occasions,* 2 = *1-2 occasions,* 3 = *3-5 occasions,* 4 = *6-9 occasions,* 5 = *10-19 occasions,* 6 = *20-39 occasions,* 7 = *40 or more*).

Reasons for alcohol and marijuana use. At modal age 18, participants who indicated they had used alcohol in the past 12 months were asked, "What have been the most important reasons for your drinking alcoholic beverages? (Mark all that apply.)" Participants who indicated they had used marijuana in the past 12 months were asked, "What have been the most important reasons for your using marijuana or hashish? (Mark all that apply.)" Responses were dichotomous (1 = *marked,* 0 = *unmarked*). There were 13 possible reasons assessed for both alcohol and marijuana use. In accordance with prior research using Monitoring the Future measures (Johnston and O'Malley, 1986; Patrick et al., in press; Terry-McElrath et al., 2009), reasons were conceptually grouped into social/recreational reasons *(to experiment, to get high,*

to have a good time with my friends, to fit in with a group I like, because of boredom), coping with negative affect reasons (*to relax, to get away from my problems, because of anger or frustration*), compulsive use reasons (*to get through the day, because I am hooked*), and drug effect reasons (*to decrease the effects of some other drug[s], to increase the effects of some other drug[s], to seek deeper insights and understanding*).

Alcohol use disorder and marijuana use disorder. At modal age 35, participants were separately asked if they had used any alcohol, marijuana, or any other illicit drugs in the past 5 years. If yes, they were instructed, "Think back over the last five years. Did your use of alcohol, marijuana, or other illicit drugs cause you any of the following problems?" Separate response columns were given for each of the three substance categories, with the following response options for each of the 17 items: 0 = *no,* 1 = *a little,* 2 = *some,* and 3 = *a lot.* Although these measures of symptoms of AUD and MUD do not yield a clinical diagnosis, the items are largely consistent with how alcohol and other drug use disorders have been measured in other large scale surveys (e.g., Harford and Muthén, 2001; Muthén, 1996; Muthén et al., 1993; Nelson et al., 1998) and reflect Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1994), symptoms of abuse and dependence.

Abuse was coded as present if participants reported a little to a lot of two or more of the following four criteria: (a) *caused you financial difficulties;* (b) *caused you to drive unsafely;* (c) *gotten you into trouble with the police;* and (d) any of: *hurt your relationship with your parents; hurt your relationship with your spouse, fiancé(e), or girlfriend/boyfriend; hurt your relationship with your friends;* or *caused you to get into an angry argument.* Dependence was coded as present if participants reported a little to a lot of three or more of the following five criteria: (e) *you found that over time you needed more of the drug to get the same effect;* (f) either: *stopping or reducing your use of the drug made you physically ill or sick;* or *you used the drug to avoid "hangovers" or aftereffects of the drug;* (g) *you wanted to try to stop or cut down, but you found that you could not;* and (h) any of: *caused you to be less stable emotionally; caused your physical health to be bad;* or *you continued to use the drug even though you knew it was harmful to do so;* and (i) *you felt such a strong desire to use the drug that you could not resist it or think of anything else.* For the present analysis, individuals were coded as abstainers (i.e., had not used the substance in the past 5 years), nondisordered users (i.e., used but did not meet criteria for either abuse or dependence), or disordered users (i.e., coded for abuse and/or dependence).

Plan of analysis

To investigate the concurrent and prospective associations between reasons for alcohol and marijuana use and substance use and disorders, bivariate correlation, multivariate linear regression, and univariate and multivariate multinomial logistic regression analyses were conducted using SAS 9.2 software survey procedures (SAS Institute Inc., Cary, NC) that allow for inclusion of cluster and strata variables for complex sample designs. Control variables, including gender, race/ethnicity (i.e., African American and other vs. White [reference group]), parent education (i.e., a proxy for socioeconomic status), and previous substance use (for age 35 outcomes only) were entered first. Next, reasons for using the relevant substance (alcohol or marijuana) were entered simultaneously in models with the control variables. Linear regression models were conducted with the two dependent variables for alcohol reasons (i.e., frequency of heavy episodic drinking at ages 18 and 35) and two dependent variables for marijuana reasons (i.e., frequency of marijuana use at ages 18 and 35). In addition, bivariate and multivariate multinomial logistic regression analyses were conducted to predict alcohol abstention and AUD (vs. nondisordered drinking at age 35), and marijuana abstention and MUD (vs. nondisordered marijuana use at age 35).

Results

Table 1 shows bivariate intercorrelations of the reasons for alcohol use and marijuana use. Tables 2 and 4 present the percentages of past-year users who reported each reason at age 18 and the correlations of reasons for alcohol and marijuana use with frequency of heavy episodic drinking and marijuana use, respectively, in the left-hand columns. Tables 3 and 5 report the results of multinomial logistic models predicting abstention or disordered use at age 35. In the analytic sample of only those who were alcohol users at age 18, 6.1% of participants were past-5-year alcohol abstainers, 74.8% were nondisordered alcohol users, and 19.1% were classified as having AUD symptoms at age 35 (corresponding rates for all age 35 respondents were 11.9%, 71.7%, and 16.4%, respectively). In the analytic sample of only those who were marijuana users at age 18, 62.9% of participants were past-5-year marijuana abstainers, 30.4% were nondisordered alcohol users, and 6.6% were classified as having MUD symptoms at age 35 (corresponding rates for all age 35 respondents were 80.3%, 16.6%, and 3.1%, respectively).

Alcohol use reasons and frequency of heavy episodic drinking

Linear regression equations using only the control variables produced adjusted R^2 values for age 18 frequency = .066 and age 35 frequency = .085. Men reported significantly more frequent heavy episodic drinking at ages 18 and 35. Compared with White participants, African American participants reported less frequent heavy episodic drinking

TABLE 1. Bivariate correlations of reasons for alcohol use (above diagonal) and reasons for marijuana use (below diagonal)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
Social/recreational reasons													
1. Good time with friends		.32***	-.02	.15***	.13***	.10***	.10***	.08***	.03	.00	.09***	.03	.01
2. Get high	.39***		-.03	.19***	.05**	.19***	.20***	.15***	.07***	.07***	.21***	.07***	.07***
3. Experiment	-.03	-.19***		.01	.15***	-.14***	-.02	.01	.00	.00	.02	-.01	.01
4. Boredom	.19***	.21***	-.03		.07***	.13***	.11***	.18***	.10***	.03	.11***	.08***	.04
5. Fit in with group	.09***	-.01	.14***	.07**		-.03	.06**	.04*	.03	.04*	.02	.04	.02
Negative affect reasons													
6. Relax	.20***	.25***	-.15***	.24***	-.04		.30***	.28***	.13***	.05**	.09***	.10***	.06***
7. Get away from problems	.14***	.18***	-.05	.21***	.06*	.39***		.45***	.18***	.09***	.10***	.10***	.06**
8. Anger/frustration	.14***	.17***	-.03	.27***	.06*	.34***	.50***		.16***	.07***	.09***	.13***	.05*
Compulsive reasons													
9. Get through day	.11***	.12***	-.07**	.20***	.08***	.20***	.29***	.25***		.14***	.10***	.09***	.09***
10. Hooked	.07**	.07**	-.07**	.13***	.03	.13***	.13***	.13***	.26***		.14***	.07***	.18***
Drug effect reasons													
11. Increase effect of other drug	.16***	.19***	-.03	.19***	.07**	.20***	.16***	.12***	.29***	.18***		.12***	.22***
12. Seek insight	.14***	.14***	.00	.13***	.06**	.24***	.19***	.20***	.21***	.16***	.18***		.09***
13. Decrease effect of other drug		.05	.05*	-.03	.07**	.05*	.12***	.10***	.09***	.17***	.15***	.24***	.16***

*$p < .05$; **$p < .01$; ***$p < .001$.

at age 18, but all remaining race/ethnicity differences were nonsignificant. High school seniors whose parents were more educated engaged in less heavy episodic drinking, but this effect was no longer significant at age 35. Previous heavy episodic drinking at age 18 was a significant positive predictor of heavy episodic drinking at age 35.

After the control variables were entered, all reasons for drinking were entered simultaneously with control variables (full models shown in Table 2). Total adjusted R^2 values for age 18 frequency = .231 and age 35 frequency = .092. Presentation of results is aided by conceptual groupings of individual items in accordance with previous research; however, we do not consider these groupings to represent separate factors. Social/recreational reasons for drinking significantly predicted frequency of heavy episodic alcohol use. Using alcohol to have a good time with friends, to get high, and for boredom were concurrently associated with more frequent heavy episodic drinking at age 18, whereas using to experiment was associated with a lower frequency. Drinking to get high also predicted heavy episodic drinking frequency 17 years later. Coping with negative affect reasons (i.e., drinking to relax, to get away from problems, and because of anger or frustration) were significantly associated with heavy episodic drinking at age 18. Compulsive reasons for drinking had opposite associations. Drinking because of being hooked was concurrently associated with more frequent heavy episodic drinking at age 18; drinking to get through the day was associated with lower frequency of heavy episodic drinking at age 35 (only in multivariate analyses). Finally, only one drug effect reason for alcohol use (i.e., to increase the effect of other drugs) was significantly associated with frequency of heavy episodic drinking in the presence of other predictors. The magnitudes of the effects for reasons for use are shown in the unstandardized betas presented in Table 2. The greatest effect sizes were for the following: Drinking because of being hooked predicted an increase on the heavy episodic use frequency (1-6) scale of 1.12 units, drinking to increase the effect of other drugs predicted an increase of 0.74 units, and drinking to get high predicted an increase of 0.48 units on the frequency scale. The magnitude of effects for longitudinal prediction was much smaller.

Gender moderation effects were tested as an additional step predicting substance use. A protected alpha level of $p < .001$ was used because of the large number of potential interactions. For alcohol use, there was only one significant interaction (B = -0.30, SE = 0.08), such that drinking to experiment was more strongly negatively associated with heavy episodic drinking for men than for women. For marijuana use, no individual interaction coefficients reached significance.

Reasons predicting alcohol use disorder at age 35

Table 3 presents both bivariate and multivariate results of multinomial logistic regressions predicting abstaining versus nondisordered using and AUD versus nondisordered using in the past 5 years at age 35. Bivariate results represent models in which each variable was entered separately. In multivariate results, first control variables were entered without reasons for drinking. Men were more likely than women to have symptoms of AUD. Compared with White participants, African Americans were more likely to be alcohol abstainers (in bivariate and multivariate analyses) and less likely to have symptoms of AUD (in bivariate analyses only); however, there were no differences between White participants and individuals of other races/ethnicities. There were no differences by parent education for alcohol use. Previous use was a strong predictor. Frequency of heavy episodic drinking at age 18 was associated with a greater likelihood of age 35 AUD symptoms.

TABLE 2. Reasons for alcohol use at age 18 as concurrent and prospective predictors of frequency of heavy episodic drinking at ages 18 and 35

		Age 18 heavy episodic drinking		Age 35 heavy episodic drinking	
M (*SD*)		1.79 (1.08)		1.52 (0.94)	
	% reported	*r*	*B* (*SE*)	*r*	*B* (*SE*)
Control variables in all models					
Male gender		.24***	0.52 (0.04)***	.24***	0.41 (0.04)***
African American[a]		-.09***	-0.23 (0.08)**	-.01	0.10 (0.09)
Other race/ethnicity[a]		-.01	-0.10 (0.10)	.01	0.005 (0.11)
Parent education		-.03	-0.12 (0.04)**	-.02	-0.03 (0.04)
Heavy episodic drinking, age 18		–	–	.23***	0.12 (0.02)***
Reasons for drinking					
Social/recreational reasons					
Good time with friends	72.2	.20***	0.26 (0.04)***	.10***	0.08 (0.04)
Get high	48.7	.31***	0.48 (0.05)***	.13***	0.11 (0.05)*
Experiment	41.4	-.16***	-0.30 (0.04)***	-.05**	-0.03 (0.04)
Boredom	21.3	.14***	0.15 (0.05)**	.07***	0.07 (0.05)
Fit in with group	11.9	.01	-0.08 (0.06)	.02	0.01 (0.06)
Coping with negative affect reasons					
Relax	39.7	.19***	0.17 (0.05)***	.05*	-0.01 (0.04)
Get away from problems	19.2	.16***	0.14 (0.06)*	.04*	-0.03 (0.06)
Anger/frustration	16.7	.14***	0.14 (0.07)*	.07***	0.12 (0.07)
Compulsive reasons					
Get through day	1.8	.09***	0.13 (0.21)	.00	-0.30 (0.13)*
Hooked	0.6	.13***	1.12 (0.33)***	.01	-0.27 (0.20)
Drug effect reasons					
Increase effect of other drug	5.2	.23***	0.74 (0.11)***	.09***	0.15 (0.10)
Seek insight	4.2	.10***	0.15 (0.11)	.06***	0.08 (0.12)
Decrease effect of other drug	0.6	.09***	0.30 (0.32)	.03	0.18 (0.28)

Notes: At age 18, weighted n = 2,311, total R^2 = .23; for age 35 heavy episodic drinking, weighted n = 2,159, total R^2 = .10. r = bivariate correlation; B = unstandardized estimate. [a]Reference group is White.
*p < .05; **p < .01; ***p < .001.

TABLE 3. Multinomial logistic regression of reasons for alcohol use as prospective predictors of alcohol abstention and disorder at age 35

	Bivariate effects			Multivariate effects		
	Wald $\chi^2(2)$	OR abstain[a]	OR AUD[b]	Wald $\chi^2(2)$	OR abstain[a]	OR AUD[b]
Male gender	77.10***	0.95 [0.69, 1.33]	2.38 [1.95, 2.89]***	46.40***	1.08 [0.76, 1.53]	2.10 [1.70, 2.60]***
African American[c]	27.25***	3.13 [1.84, 5.32]***	0.57 [0.34, 0.97]*	13.94***	2.49 [1.39, 4.47]**	0.61 [0.34, 1.12]
Other race/ethnicity[c]	1.08			1.74		
Parent education	4.66			2.07		
Heavy drinking, age 18	84.17***	0.90 [0.78, 1.05]	1.37 [1.28, 1.47]***	10.68**	1.01 [0.85, 1.19]	1.15 [1.06, 1.25]**
Reasons for drinking						
Social/recreational reasons						
Good time with friends	29.33***	0.55 [0.40, 0.77]***	1.58 [1.23, 2.03]***	5.50		
Get high	53.89***	0.61 [0.43, 0.85]**	1.95 [1.59, 2.38]***	11.90**	0.66 [0.44, 1.00]	1.39 [1.09, 1.77]**
Experiment	4.74			0.49		
Boredom	38.45***	0.93 [0.62, 1.39]	1.86 [1.52, 2.28]***	11.37**	0.98 [0.64, 1.50]	1.48 [1.17, 1.87]**
Fit in with group	2.43			0.83		
Coping with negative affect reasons						
Relax	34.15***	0.60 [0.42, 0.84]**	1.59 [1.32, 1.92]***	13.45**	0.60 [0.41, 0.86]**	1.28 [1.02, 1.60]*
Get away from problems	2.56			7.12*	1.41 [0.86, 2.31]	0.72 [0.52, 0.98]*
Anger/frustration	24.80***	1.06 [0.69, 1.64]	1.79 [1.42, 2.25]***	9.40**	1.19 [0.72, 2.00]	1.61 [1.19, 2.18]**
Compulsive reasons						
Get through day	3.74			0.82		
Hooked	5.74			0.16		
Drug effect reasons						
Increase effect of other drug	60.24***	1.31 [0.76, 2.29]	3.17 [2.37, 4.26]***	15.46***	1.82 [0.95, 3.50]	1.92 [1.37, 2.70]***
Seek insight	17.74***	0.95 [0.41, 2.18]	2.30 [1.55, 3.41]***	3.23		
Decrease effect of other drug	2.17			0.99		

Notes: Weighted n = 2,283. [a]OR abstain = odds ratio [confidence interval] of abstainer for the past 5 years versus nondisordered user, presented if significant Wald test difference; [b]OR AUD = odds ratio [confidence interval] of alcohol use disorder versus nondisordered user, presented if significant Wald test difference; [c]reference group is White.
*p < .05; **p < .01; ***p < .001.

Next, reasons for use were added to the models (full model results shown for alcohol use in Table 3). In terms of bivariate relationships, seven reasons for alcohol use were individually associated with AUD symptoms. In multivariate models, social/recreational reasons (i.e., to get high, because of boredom), coping with negative affect reasons (i.e., to relax, because of anger/frustration), and drug effect reasons (i.e., to increase the effect of another drug) all emerged as increasing the likelihood of age 35 AUD symptoms, compared with nondisordered drinking. Odds ratios indicate that individuals with these reasons for use had 28%-92% greater odds of having symptoms of AUD. In addition, drinking to relax was associated with a lower likelihood of abstaining from alcohol, and drinking to get away from problems was associated with a lower likelihood of AUD (only with all other variables in the model).

Marijuana use reasons and frequency of use

Table 4 shows the results for frequency of marijuana use. Control variables yielded adjusted R^2 values for age 18 marijuana use frequency = .008 and age 35 marijuana use frequency = .077. Men reported significantly more frequent marijuana use in the past 30 days at ages 18 and 35. No race/ethnicity or parent education differences were found. Age 18 marijuana use was a significant positive predictor of age 35 use.

With the addition of reasons, total adjusted R^2 values for age 18 frequency = .343 and age 35 frequency = .085. All types of reasons for marijuana use were significantly associated with concurrent marijuana use at age 18. Social/recreational reasons including using marijuana to get high and for boredom concurrently predicted more frequent marijuana use, whereas using to experiment predicted less frequent marijuana use. In addition, using marijuana to fit in at age 18 prospectively predicted less frequent marijuana use in adulthood. Coping with negative affect reasons were significant predictors of concurrent use, with using marijuana to relax predicting more frequent use and using marijuana to get away from problems predicting less frequent use (in multivariate analyses only). Compulsive reasons for marijuana use, including using marijuana to get through the day and because of being hooked, were associated with more frequent marijuana use at age 18. In addition, drug effect reasons for marijuana use (i.e., to increase the effect of other drugs [at age 18] and to seek insight [at ages 18 and 35]) predicted greater marijuana use frequency.

The magnitudes of the effects for the reasons for use are shown in the unstandardized betas presented in Table 4. The greatest effect sizes were as follows: Using because of being

TABLE 4. Reasons for marijuana use at age 18 as concurrent and prospective predictors of frequency of marijuana use in the past 30 days at ages 18 and 35

		Age 18 MJ frequency		Age 35 MJ frequency	
M (*SD*)		2.80 (1.53)		1.52 (1.11)	
	% reported	*r*	*B* (*SE*)	*r*	*B* (*SE*)
Control variables in all models					
Male gender		.08***	0.19 (0.08)*	.12***	0.30 (0.07)***
African American[a]		-.03	-0.17 (0.24)	-.02	0.01 (0.15)
Other race/ethnicity[a]		.03	0.19 (0.24)	.04	0.35 (0.20)
Parent education		-.01	-0.03 (0.08)	.03	0.07 (0.07)
MJ use past 30 days, age 18		–	–	.25***	0.13 (0.02)***
Reasons for marijuana use					
Social/recreational reasons					
Good time with friends	64.8	.21***	0.16 (0.09)	.04	-0.09 (0.09)
Get high	75.4	.32***	0.65 (0.10)***	.11***	0.09 (0.09)
Experiment	65.1	-.33***	-0.96 (0.09)***	-.10***	-0.06 (0.08)
Boredom	25.7	.27***	0.61 (0.11)***	.09***	0.12 (0.10)
Fit in with group	13.9	-.04	-0.18 (0.12)	-.05*	-0.21 (0.08)*
Coping with negative affect reasons					
Relax	42.4	.34***	0.71 (0.10)***	.12***	0.10 (0.09)
Get away from problems	19.4	.14***	-0.27 (0.14)*	.01	-0.22 (0.11)*
Anger/frustration	15.2	.14***	-0.20 (0.14)	.04	0.05 (0.11)
Compulsive reasons					
Get through day	6.6	.27***	0.85 (0.19)***	.10***	0.12 (0.20)
Hooked	2.5	.27***	1.72 (0.30)***	.11***	0.42 (0.29)
Drug effect reasons					
Increase effect of other drug	13.1	.30***	0.72 (0.14)***	.10***	0.02 (0.12)
Seek insight	14.3	.20***	0.37 (0.14)**	.13***	0.29 (0.12)*
Decrease effect of other drug	1.9	.13***	0.01 (0.38)	.07**	0.16 (0.29)

Notes: At age 18, weighted n = 1,015, total R^2 = .35; for age 35 use, weighted n = 973, total R^2 = .09; r = bivariate correlation; MJ = marijuana; B = unstandardized estimate. [a]Reference group is White.
*p < .05; **p < .01; ***p < .001.

TABLE 5. Multinomial logistic regression of reasons for marijuana use as prospective predictors of marijuana abstention and disorder at age 35

	Bivariate effects			Multivariate effects		
	Wald $\chi^2(2)$	OR abstain[a]	OR MUD[b]	Wald $\chi^2(2)$	OR abstain[a]	OR MUD[b]
Male gender	20.20***	0.65 [0.52, 0.83]***	1.37 [0.88, 2.15]	14.64***	0.70 [0.54, 0.91]**	1.49 [0.94, 2.37]
African American[c]	0.11			0.63		
Other race/ethnicity[c]	3.76			2.56		
Parent education	15.72***	0.61 [0.47, 0.79]***	0.87 [0.55, 1.36]	12.86**	0.62 [0.47, 0.82]***	0.93 [0.58, 1.49]
Marijuana use, age 18	106.40***	0.76 [0.72, 0.80]***	1.03 [0.93, 1.15]	45.94***	0.78 [0.73, 0.84]***	0.98 [0.85, 1.12]
Reasons for marijuana use						
Social/recreational reasons						
Good time with friends	12.38**	0.65 [0.51, 0.84]**	1.04 [0.65, 1.68]	1.49		
Get high	17.69***	0.54 [0.40, 0.73]***	1.14 [0.61, 2.14]	1.17		
Experiment	10.99**	1.41 [1.10, 1.80]**	0.84 [0.55, 1.30]	0.90		
Boredom	18.27***	0.71 [0.54, 0.92]*	1.65 [1.06, 2.58]*	4.24		
Fit in with group	7.30*	1.62 [1.13, 2.32]**	1.22 [0.62, 2.42]	7.68*	1.70 [1.15, 2.52]**	1.23 [0.57, 2.68]
Coping with negative affect reasons						
Relax	16.29***	0.65 [0.52, 0.83]***	1.30 [0.84, 2.01]	0.61		
Get away from problems	2.79			2.27		
Anger/frustration	4.72			1.60		
Compulsive reasons						
Get through day	12.50**	0.62 [0.41, 0.92]*	1.59 [0.89, 2.83]	0.61		
Hooked	11.56**	0.45 [0.27, 0.75]**	1.29 [0.60, 2.76]	0.82		
Drug effect reasons						
Increase effect other drug	6.98*	0.70 [0.52, 0.93]	1.04 [0.63, 1.71]	3.04		
Seek insight	21.65***	0.51 [0.37, 0.71]***	1.26 [0.76, 2.10]	5.66		
Decrease effect other drug	16.68***	0.27 [0.13, 0.53]***	0.24 [0.06, 1.00]*	12.93**	0.33 [0.15, 0.72]**	0.16 [0.04, 0.69]*

Notes: Weighted n = 1,003. [a]OR abstain = odds ratio [confidence interval] of abstainer for the past 5 years versus nondisordered user, presented if significant Wald test difference; [b]OR MUD = odds ratio [confidence interval] of marijuana use disorder versus nondisordered user, presented if significant Wald test difference; [c]reference group is White.
*p < .05; **p < .01; ***p < .001.

hooked predicted an increase on the marijuana use frequency (1-7) scale of 1.72 units; using to experiment predicted a decrease of 0.96 units; and using to get high, to relax, to get through the day, and to increase the effect of other drugs predicted an increase of 0.65 to 0.85 units on the frequency scale. Again, the magnitude of effects for longitudinal prediction was much smaller.

Reasons predicting marijuana use disorder at age 35

Table 5 presents bivariate and multivariate results of multinomial logistic regressions predicting abstaining versus nondisordered using and MUD versus nondisordered using in the past 5 years at age 35. Men were less likely than women to be marijuana abstainers. There were no differences by race/ethnicity for marijuana use. Participants whose parents were more highly educated were less likely to be marijuana abstainers. Greater frequency of marijuana use at age 18 was associated with a lower likelihood of being a marijuana abstainer at age 35.

In terms of bivariate relationships for marijuana, nine reasons for use were associated with decreased likelihood of abstaining from marijuana, and two reasons (i.e., to experiment and to fit in) were associated with greater likelihood of abstention. However, with all variables entered together, only two reasons remained associated with MUD outcomes. Using marijuana to fit in at age 18 was associated with 70% greater odds of abstaining from marijuana use at age 35. In addition, using marijuana to decrease the effect of another drug was associated with a lower likelihood of both marijuana abstention and MUD symptoms, suggesting that this is a more stable behavior and may be self-medicating. However, this was the least prevalent reason (2% of marijuana users); therefore, this relatively powerful effect pertains to a very small number of participants.

Discussion

Many of the most important questions in the literature regarding addiction and human development pertain to long-term connections across the life course (Zucker, 2008). Assumptions and conceptualizations about early influence suggest the primacy of long-term connections; however, the complexities of human life suggest that long-term prediction should be minimal, at best. In the present study, we examined the long-term impact of age 18 reasons for substance use on substance use and substance use disorders 17 years later. Although the majority of substance-using adolescents do not develop serious substance use disorders in adulthood, it is important to understand what characteristics of substance use indicate heightened risk of future problems (Schulenberg and Maggs, 2008). We found evidence that

both level of use and reasons for use in 12th grade were predictive of AUD symptoms nearly two decades later. However, the longitudinal prediction was not as clear for marijuana use. There was also little difference by gender in the associations between reasons and alcohol use and outcomes. This finding echoes previous findings that motivational processes seem to be very similar across gender (Cooper et al., 1995).

Social/recreational reasons for use are most common and predicted all substance use outcomes. Drinking to get high at age 18 was associated with heavy episodic drinking and AUD symptoms at age 35. Using alcohol because of boredom at age 18 also was associated with AUD symptoms at age 35. Using marijuana to fit in was prospectively associated with less frequent marijuana use and a greater likelihood of being an abstainer at age 35. Conformity motives for drinking also were associated with less use, which is consistent with previous research (Cooper et al., 1992, 1995). Concurrently, experimentation tends to be associated with less use and fewer marijuana problems compared with the other motivations (Lee et al., 2007), as was the case in this study. Understanding these social and recreational reasons for using alcohol and marijuana may be especially important given their high prevalence and associations with later use.

Other, often less common, types of reasons are also associated with continued use and problems. Extant cross-sectional research suggests that although coping motivations are less prevalent, they tend to be most strongly correlated with drinking problems (Cooper et al., 1992; Kuntsche et al., 2005). In this study, coping with negative affect reasons predicted concurrent heavy episodic drinking and marijuana use and prospective AUD symptoms. In particular, drinking to relax and because of anger or frustration were associated with a greater likelihood of AUD symptoms 17 years later, whereas (in the presence of the other reasons for use) using to get away from problems at age 18 was associated with less frequent marijuana use and a lower likelihood of age 35 AUD symptoms. Compulsive reasons were significantly associated only with more frequent concurrent heavy episodic drinking and marijuana use, with the exception that drinking to get through the day was associated with less frequent heavy episodic drinking at age 35 in multivariate models. Drug effect reasons predicted more frequent concurrent heavy episodic drinking and marijuana use, and using marijuana to seek insight prospectively predicted frequency of marijuana use 17 years later. Drinking to increase the effect of other drugs predicted a higher likelihood of AUD symptoms, whereas using marijuana to decrease the effect of other drugs predicted continued nondisordered marijuana use. As would be expected given the likely complexity of long-term interconnections, these associations between adolescent reasons for use and adult outcomes are complex. Future studies to replicate and extend these findings are needed.

Intervention implications

Overall, the age 18 reasons for alcohol use that were significantly associated with age 35 AUD symptoms included the following: to get high, because of boredom, to relax, because of anger or frustration, and to increase the effect of other drugs. In total, these reasons represent motivations to control feelings or to achieve a particular physiological effect. Learning to regulate emotional experiences is an important developmental task throughout adolescence (Silk et al., 2003; Steinberg, 2005), and interventions focused on improving emotion regulation may also be effective in mitigating negative consequences of adolescent substance use and subsequent adulthood disorders (Simons et al., 2005). In contrast, using alcohol to assist with normative developmental tasks, such as to have fun with friends and to experiment, was not prospectively associated with long-term negative outcomes in multivariate models. In related research on marijuana, ever getting high (i.e., "stoned") was associated with continued use of marijuana, perhaps because the individuals were committed to experiencing the physiological drug effects rather than using in particular social contexts only (Bailey et al., 1992). In our study, after controlling for previous frequency of marijuana use, there were very few reasons with prospective prediction. However, using marijuana to seek insight was associated with more frequent continued use at age 35. These findings suggest the need to increase efforts to understand how adolescents are using alcohol and marijuana—particularly whether they are using alcohol and other drugs for basic emotional and physiological regulatory functions—to identify individuals who may benefit from additional targeted intervention and treatment.

Strengths, limitations, and future directions

Using multicohort, long-term national longitudinal data representative of U.S. high school seniors is an important advantage of this research. The ability to follow individuals over 17 years allows for advances in the understanding of substance use etiology and human development. Limitations of the data include panel attrition, the exclusion of high school dropouts in the sampling frame, and brief questionnaires regarding AUD and MUD symptoms that are descriptive and do not represent clinical diagnoses. Reasons for use were assessed with dichotomous indicators rather than with multidimensional scales, which may explain the low intercorrelations. Measures of AUD and MUD were also not included before age 35. Future research using greater depth of measurement, perhaps including clinical interviews, is warranted. In addition, future research should investigate how associations may change across social role transitions. For example, Perkins (1999) suggests that, after college, stress-related drinking may become more problem-

atic. Future investigations of whether there is continuity in reported reasons for use across adulthood and how reasons for use are changing over time will further elucidate the role of motivations.

Conclusions

Reasons for substance use reported in adolescence were associated with substance use disorders 17 years later, especially for alcohol. Documenting the long-term predictive power of reasons for use to alcohol or marijuana use outcomes is a first step toward understanding which types of reasons are more important and which can serve as red flags to indicate risk of continued use and misuse of substances into adulthood. This prospective prediction emphasizes the need to understand not only *how much* adolescents are using substances but also *why* they are using in order to identify level of risk for future substance use disorders.

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References

Aas, H. N., Leigh, B. C., Anderssen, N., & Jakobsen, R. (1998). Two-year longitudinal study of alcohol expectancies and drinking among Norwegian adolescents. *Addiction, 93,* 373-384.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Bachman, J. G., Johnston, L. D., O'Malley, P. M., & Schulenberg, J. E. (2006). *The Monitoring the Future project after thirty-two years: Design and procedures* (Monitoring the Future Occasional Paper No. 64). Ann Arbor, MI: Institute for Social Research.

Bailey, S. L., Flewelling, R. L., & Rachal, J. V. (1992). Predicting continued use of marijuana among adolescents: The relative influence of drug-specific and social context factors. *Journal of Health and Social Behavior, 33,* 51-65.

Beseler, C. L., Aharonovich, E., Keyes, K. M., & Hasin, D. S. (2008). Adult transition from at-risk drinking to alcohol dependence: The relationship of family history and drinking motives. *Alcoholism: Clinical and Experimental Research, 32,* 607-616.

Bonn-Miller, M. O., Zvolensky, M. J., & Bernstein, A. (2007). Marijuana use motives: Concurrent relations to frequency of past 30-day use and anxiety sensitivity among young adult marijuana smokers. *Addictive Behaviors, 32,* 49-62.

Boys, A., Marsden, J., & Strang, J. (2001). Understanding reasons for drug use among young people: A functional perspective. *Health Education Research, 16,* 457-469.

Carpenter, K. M., & Hasin, D. (1998). A prospective evaluation of the relationship between reasons for drinking and DSM-IV alcohol-use disorders. *Addictive Behaviors, 23,* 41-46.

Compton, W. M., Grant, B. F., Colliver, J. D., Glantz, M. D., & Stinson, F. S. (2004). Prevalence of marijuana use disorders in the United States: 1991-1992 and 2001-2002. *Journal of the American Medical Association, 291,* 2114-2121.

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6,* 117-128.

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality and Social Psychology, 69,* 990-1005.

Cooper, M. L., Russell, M., Skinner, J. B., & Windle, M. (1992). Development and validation of a three-dimensional measure of drinking motives. *Psychological Assessment, 4,* 123-132.

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology, 97,* 168-180.

Englund, M. M., Egeland, B., Oliva, E. M., & Collins, W. A. (2008). Childhood and adolescent predictors of heavy drinking and alcohol use disorders in early adulthood: A longitudinal development analysis. *Addiction, 103* (Suppl. 1), 23-35.

Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, S. P., Dufour, M. C., Compton, W., . . . Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 61,* 807-816.

Harford, T. C., & Muthén, B. O. (2001). The dimensionality of alcohol abuse and dependence: A multivariate analysis of DSM-IV symptom items in the National Longitudinal Survey of Youth. *Journal of Studies on Alcohol, 62,* 150-157.

Johnston, L. D., & O'Malley, P. M. (1986). Why do the nation's students use drugs and alcohol? Self-reported reasons from nine national surveys. *Journal of Drug Issues, 16,* 29-66.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2009). *Monitoring the future national survey results on drug use, 1975-2008: Volume I. Secondary school students* (NIH Publication No. 09-7402). Bethesda, MD: National Institute on Drug Abuse.

Kuntsche, E. N., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review, 25,* 841-861.

Lee, C. M., Neighbors, C., & Woods, B. A. (2007). Marijuana motives: Young adults' reasons for using marijuana. *Addictive Behaviors, 32,* 1384-1394.

Leigh, B. C. (1989). In search of the seven dwarves: Issues of measurement and meaning in alcohol expectancy research. *Psychological Bulletin, 105,* 361-373.

Merline, A. C., Jager, J., & Schulenberg, J. E. (2008). Adolescent risk factors for adult alcohol use and abuse: Stability and change of predictive value across early and middle adulthood. *Addiction, 103* (Suppl. 1), 84-99.

Muthén, B. O. (1996). Psychometric evaluation of diagnostic criteria: Application to a two-dimensional model of alcohol abuse and dependence. *Drug and Alcohol Dependence, 41,* 101-112.

Muthén, B. O., Grant, B., & Hasin, D. (1993). The dimensionality of alcohol abuse and dependence: Factor analysis of DSM-III-R and proposed DSM-IV criteria in the 1988 National Health Interview Survey. *Addiction, 88,* 1079-1090.

Nelson, C. B., Heath, A. C., & Kessler, R. C. (1998). Temporal progression of alcohol dependence symptoms in the U.S. household population: Results from the National Comorbidity Survey. *Journal of Consulting and Clinical Psychology, 66,* 474-483.

Newcomb, M. D., Chou, C., Bentler, P. M., & Huba, G. J. (1988). Cognitive motivations for drug use among adolescents: Longitudinal tests of gender differences and predictors of change in drug use. *Journal of Counseling Psychology, 35,* 426-438.

Patrick, M. E., Schulenberg, J. E., O'Malley, P. M., Maggs, J. L., Kloska, D. D., Johnston, L. D., & Bachman, J. G. (in press). Age-related changes in reasons for using alcohol and marijuana from ages 18 to 30 in a national sample. *Psychology of Addictive Behaviors.*

Patrick, M. E., Wray-Lake, L., Finlay, A. K., & Maggs, J. L. (2010). The long arm of expectancies: Adolescent alcohol expectancies predict adult alcohol use. *Alcohol and Alcoholism, 45,* 17-24.

Perkins, H. W. (1999). Stress-motivated drinking in collegiate and postcollegiate young adulthood: Life course and gender patterns. *Journal of Studies on Alcohol, 60,* 219-227.

Pitkänen, T., Kokko, K., Lyyra, A., & Pulkkinen, L. (2008). A developmental approach to alcohol drinking behaviour in adulthood: A follow-up study from age 8 to age 42. *Addiction, 103* (Suppl. 1), 48-68.

Read, J. P., Wood, M. D., Kahler, C. W., Maddock, J. E., & Palfai, T. P. (2003). Examining the role of drinking motives in college student alcohol use and problems. *Psychology of Addictive Behaviors, 17,* 13-23.

Schuckit, M. A. (2009). Alcohol-use disorders. *Lancet, 373,* 492-501.

Schulenberg, J. E., & Maggs, J. L. (2008). Destiny matters: Distal developmental influences on adult alcohol use and abuse. *Addiction, 103* (Suppl. 1), 1-6.

Schulenberg, J. E., & Zarrett, N. R. (2006). Mental health during emerging adulthood: Continuity and discontinuity in courses, causes, and functions. In J. J. Arnett & J. L. Tanner (Eds.), *Emerging adults in America: Coming of age in the 21st century* (pp. 135-172). Washington, DC: American Psychological Association.

Sher, K. J., Wood, M. D., Wood, P. K., & Raskin, G. (1996). Alcohol outcome expectancies and alcohol use: A latent variable cross-lagged panel study. *Journal of Abnormal Psychology, 105,* 561-574.

Silk, J. S., Steinberg, L., & Sheffield Morris, A. (2003). Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development, 74,* 1869-1880.

Simons, J., Correia, C. J., & Carey, K. B. (2000). A comparison of motives for marijuana and alcohol use among experienced users. *Addictive Behaviors, 25,* 153-160.

Simons, J., Correia, C. J., Carey, K. B., & Borsari, B. E. (1998). Validating a five-factor marijuana motives measure: Relations with use, problems, and alcohol motives. *Journal of Counseling Psychology, 45,* 265-273.

Simons, J. S., Gaher, R. M., Correia, C. J., Hansen, C. L., & Christopher, M. S. (2005). An affective-motivational model of marijuana and alcohol problems among college students. *Psychology of Addictive Behaviors, 19,* 326-334.

Spoth, R. L., Guyll, M., & Day, S. X. (2002). Universal family-focused interventions in alcohol-use disorder prevention: Cost-effectiveness and cost-benefit analyses of two interventions. *Journal of Studies on Alcohol, 63,* 219-228.

Stacy, A. W., Newcomb, M. D., & Bentler, P. M. (1991). Cognitive motivation and drug use: A 9-year longitudinal study. *Journal of Abnormal Psychology, 100,* 502-515.

Steinberg, L. (2005). Cognitive and affective development in adolescence. *TRENDS in Cognitive Sciences, 9,* 69-74.

Terry-McElrath, Y. M., O'Malley, P. M., & Johnston, L. D. (2009). Reasons for drug use among American youth by consumption level, gender, and race/ethnicity: 1976-2005. *Journal of Drug Issues, 39,* 677-714.

Tragesser, S. L., Sher, K. J., Trull, T. J., & Park, A. (2007). Personality disorder symptoms, drinking motives, and alcohol use and consequences: Cross-sectional and prospective mediation. *Experimental and Clinical Psychopharmacology, 15,* 282-292.

Zamboanga, B. L., Horton, N. J., Leitkowski, L. K., & Wang, S. C. (2006). Do good things come to those who drink? A longitudinal investigation of drinking expectancies and hazardous alcohol use in female college athletes. *Journal of Adolescent Health, 39,* 229-236.

Zucker, R. A. (2008). Anticipating problem alcohol use developmentally from childhood into middle adulthood: What have we learned? *Addiction, 103* (Suppl. 1), 100-108.

Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., Bonn-Miller, M. O., Marshall, E. C., & Leyro, T. M. (2007). Marijuana use motives: A confirmatory test and evaluation among young adult marijuana users. *Addictive Behaviors, 32,* 3122-3130.