

The Role of Academic Motivation in High School Students' Current and Lifetime Alcohol Consumption: Adopting a Self-Determination Theory Perspective*

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ABSTRACT. Objective: The current study investigated the relationship between different types of academic motives—specifically, intrinsic motivation, introjected regulation, and external regulation—and high school students' current and lifetime alcohol consumption. **Method:** One thousand sixty-seven high school students completed measures of academic motivation, other school-related factors, and lifetime and current alcohol consumption. **Results:** Using structural equation modeling, different types of motivation and school-related factors were differentially related to student drinking. Specifically, intrinsic motivation was negatively related to lifetime and current alcohol consumption. External regulation, on the other hand, was positively associated with current drinking. Grade point average was the only school-related factor related

to student alcohol use. **Conclusions:** These findings suggest that motivation is an important construct to consider in predicting students' alcohol use, even when other more commonly studied educational variables are considered. In addition, it supports the adoption of a motivation framework that considers different types of motivation in understanding the relationship between academic motivation and alcohol use. Suggestions for incorporating the self-determination model of motivation into studies of alcohol and substance use, as well as potential impacts on intervention efforts, are discussed. In particular, it may be important to foster only certain types of motivation, rather than all types of academically-focused motives, in efforts to deter alcohol use. (*J. Stud. Alcohol Drugs*, 72, 965–974, 2011)

HIGH SCHOOL IS A PERIOD OF SIGNIFICANT biological, psychological, and academic change (Blakemore, 2008). It is also characterized by substantial experimentation with alcohol and illicit substances. As many as 72% of high school seniors report drinking alcohol at some point in their lives, and almost 30% of high school students report problematic alcohol use (Brown et al., 2008; Fox et al., 2010). Drinking behavior is not only prevalent but is also associated with a host of risky behaviors that can have lasting negative consequences, including illicit drug use, unprotected sexual encounters, anorexia or bulimia, and fighting or carrying weapons (Garrison et al., 1993; Johnston et al., 2009; Miller et al., 2007; Oesterle et al., 2004; Strachman et al., 2009). In light of the alarming consequences of drinking at such a crucial developmental transition, it may be important to understand the factors associated with high school students' alcohol consumption.

Familial influences, such as parents' attitudes toward alcohol use, are often cited as important protective factors in intervention research (Koning et al., 2010). However, parents' beliefs have less of an impact as children age and the school environment becomes increasingly important (Duncan

et al., 2007; Van der Vorst et al., 2007). Indeed, both teachers and peers are strong socializing forces for adolescents, who spend large amounts of time in school settings (Johnson, 2008; Kimber and Sandell, 2009; Lynagh et al., 1997; Wentzel, 1997). Because of its sizable influence on adolescents, the educational system may serve as a protective force against alcohol use, even without explicitly addressing students' drinking. A substantial literature highlights academic factors—including performance (Bryant et al., 2000; Henry, 2010; for a review, see Dewey, 1999; Perkins and Borden, 2003), school attachment (Hawkins et al., 1992; Voelkl and Frone, 2000), self-efficacy (Bryant and Zimmerman, 2002), plans to attend college (Bryant and Zimmerman, 2002; Ellickson and Hays, 1992), and school attendance (Ellickson and Hays, 1992; Hope, 1995)—as potential protective factors against drinking.

Students' academic motivation has also been examined as a correlate of adolescent drinking, although the relationship between the two is unclear (Cox et al., 2007). Although some studies have documented a negative relationship between academic motivation and alcohol use (Bryant et al., 2003; Simons-Morton et al., 2001; Webb et al., 2007; Zimmerman and Schmeelk-Cone, 2003), others have actually reported a positive association between the two (Maggs, 1997; Schulenberg et al., 1994). These contradictory findings may stem from the manner in which motivation has been operationalized. Alcohol studies have primarily conceptualized motivation in terms of the total amount of motivation reported but have ignored its characteristics or qualities (Bryant et al., 2003; Vaughan et al., 2009). As detailed in the following,

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different types of academic motives have strikingly different consequences (e.g., Harter et al. 1992; Lepper et al., 2005; Ryan and Deci, 2000; Sansone and Harackiewicz, 2000), and collapsing across them may be problematic. In the present article, therefore, we adopted a framework that assesses different types of academic motivation in relation to drinking behavior.

Self-determination theory (SDT)

SDT may serve as a useful framework when considering motivation and alcohol use (Groshkova, 2010; Mancini, 2008). A prominent motivational framework, SDT suggests that individuals are motivated by qualitatively different factors and that these factors are differentially related to outcomes (Deci and Ryan, 1985). According to SDT, motivation exists along a continuum ranging from behavior that is freely chosen (intrinsic motivation) to behavior governed by forces external to the self (extrinsic motivation). Intrinsic motivation describes behavior that is pleasurable or interesting in its own right; because it is behavior an individual willfully chooses to engage in, intrinsic motivation is thought to be of better quality and therefore is associated with positive outcomes (Deci and Ryan, 2000). In contrast, extrinsic motivation describes behaviors prompted by outside forces; it includes identified regulation (behaviors that support a personally endorsed goal or belief but are not inherently enjoyable), introjected regulation (behaviors prompted by external forces that have been internalized, such as shame or guilt), and external regulation (behaviors spurred wholly by external constraints, such as incentives or punishments). Extrinsic motivation is often associated with negative outcomes, ostensibly because the individual feels forced, to varying degrees, to take a certain course of action. SDT has been used successfully as a framework to study academic motivation and thus may be useful in the current study, which focuses on the relationship between academic motives and drinking behavior.

The few studies that have used SDT to examine motivation in relation to alcohol consumption focus almost uniformly on individuals' general self-determined orientation (Hove et al., 2010; Knee and Neighbors, 2002; Neighbors et al., 2004, 2006). Although this domain-general approach to motivation is important, the present study was interested in motivation specific to the academic domain, given that high school students spend a majority of their waking weekday hours in school. Only one study of alcohol use has used SDT to examine domain-specific motivation (i.e., for participation in sports; Rockafellow and Saules, 2006), and the academic domain has not yet been examined. Consistent with the tenets of SDT, extrinsic motivation has been associated with more negative outcomes, including drinking among student athletes (Rockafellow and Saules, 2006), increased interpersonal violence (Hove et al., 2010), drinking as a result

of peer pressure (Knee and Neighbors, 2002), and greater alcohol-related negative consequences (Neighbors et al., 2004, 2006). Intrinsic motivation, on the other hand, has held a clearly protective role. These prior studies using SDT have conceptualized motivation as either autonomous/intrinsic (collapsing intrinsic and identified regulation) or controlled/extrinsic (collapsing introjected and external regulation), an approach commonly adopted in the literature. Results from these studies indicate important differences between types of domain-general motivation, suggesting that SDT could serve as a fruitful motivational framework for understanding alcohol consumption and its relation to academic-specific motivation.

Current study and hypotheses

Building on past research, the current study focused specifically on how motives to attend school (i.e., academic motives) relate to drinking behavior and, to our knowledge, is the first to use the SDT framework. Previous studies have produced mixed results regarding the relationship between academic motives and drinking (Bryant et al., 2003; Cox et al., 2007; Schulenberg et al., 1994); examining different types of academic motives could help to clarify the relationship. We also sought to expand on past alcohol studies in the SDT tradition, which have focused on college students, by examining students in high school, a critical developmental transition period and a time where alcohol use becomes normative (Brown et al., 2008). For reasons outlined below, intrinsic motivation, introjected regulation, and external regulation were considered separately rather than merged into composite variables of autonomous and controlled motivation. In addition, a distinction was made between lifetime and current drinking. Because different factors are often related to the initiation of drinking versus the intensity of consumption in youth (Anderson et al., 2011; Brown et al., 2008), modeling the independent contribution of individual academic motives to these different aspects of alcohol use is important.

Because of the dearth of research examining qualitatively different types of academic motives in relation to drinking, specific hypotheses were tentative. However, theory and findings from related studies suggest that different types of academic motives would relate differentially to alcohol consumption. Because intrinsic motivation is so robustly associated with well-being (Deci and Ryan, 2000), it could function as a protective factor against both lifetime and current drinking. Indeed, previous alcohol studies using the SDT framework support this assertion, although it is important to recall that this work has not examined academic motives (Hove et al., 2010; Knee and Neighbors, 2002; Neighbors et al., 2004; Rockafellow and Saules, 2006). Several of these prior SDT studies also implicated external regulation as leaving individuals susceptible to actual or perceived peer pres-

sure, which, in a college setting where drinking is relatively normative, will lead to increased alcohol use (Knee and Neighbors, 2002). This same logic may hold true for high school, where many students have consumed alcohol by their senior year. Conversely, individuals characterized by intrinsic motivation will be less susceptible to peer influence and, consequently, less likely to drink alcohol. Such students may also be more likely to associate with classmates who endorse similar types of motivation (Altermatt and Pomerantz, 2003; Ryan, 2001), reinforcing the protective effects of intrinsic motivation against drinking. Of course, one could imagine that intrinsically motivated adolescents would initially try alcohol, given their tendency toward curiosity; extant research, however, suggests that intrinsic motivation may partially mitigate the relationship between curiosity and drinking (O'Connor and Jackson, 2008). In light of this research, we predicted that intrinsic motivation would be associated with lower rates of both lifetime and current drinking.

Extrinsic motivation, in contrast, is often linked with detrimental outcomes (Deci and Ryan, 1985). Students with introjected and external forms of regulation may drink in an effort to establish personal autonomy that they do not experience in school. They may also drink to diminish stress resulting from external academic motives (Beman, 1995; Brunswick and Messeri, 1984; Mantzicopoulos, 1997). In addition, introjected and external regulations were kept separate in the current study, even though they are often collapsed into a single index of controlled motivation; our reasoning behind this is that the two types of motivation have been only weakly correlated in previous research (Boiché et al., 2008; Ratelle et al., 2007; Wormington and Corpus, 2011). We also anticipated that the two types of motivation could display different relationships with drinking. For example, the guilt associated with introjected regulation (Ryan and Deci, 2000) might discourage drinking; in contrast, students with external regulation may only experience a disincentive to the extent they suspect they might be caught and punished. Therefore, we expected external regulation to correlate positively with both lifetime and current drinking behavior. Predictions were less clear for introjected motivation, which could correlate with drinking positively because of its controlling nature or negatively because of the guilt that would be incurred by violating rules imposed by respected authority figures.

Of course, relationships between academic motivation and drinking might simply be because of a shared connection with other important school-related factors. For example, students with high intrinsic motivation could also be more likely to obtain high grades, which serve as protective factors against alcohol use (Dewey, 1999). Such students may also feel connected to the school community, adopt its social mores, and refrain from behaviors like drinking that are considered inappropriate for minors (Anderson et al., 1999; Hoppe et al., 1998). Similarly, students with external

regulation might suffer from school disengagement, which is positively associated with drinking behavior (Crum et al., 1998; Gfroerer et al., 1997; Muthén and Muthén, 2000; Yonezawa et al., 2009). Teacher support may also account for the predicted relationship between students' academic motivation and alcohol use, given that teachers both influence students' motivation and protect them from maladaptive coping behaviors such as drinking (Kimber and Sandell, 2009; Reddy et al., 2003; Wentzel, 1997). Therefore, we measured students' grade point averages, as well as two indicators of school engagement (i.e., school relatedness, teacher support), to determine whether academic motivation remained an important correlate of drinking when other school-related factors were also considered.

In summary, we relied on the extensively used framework of SDT to examine how different types of academic motivation and other school-related variables relate to drinking in high school. Basing our expectations on theory and prior research, we hypothesized that (a) intrinsic motivation would be negatively related to lifetime and current drinking and (b) external regulation would be positively related to both lifetime and current drinking. We made no hypothesis concerning introjected regulation and drinking behavior because both positive and negative relationships between the two seemed equally plausible.

Method

Participants and procedure

Approval for the current research was received from the Reed College Human Subjects Research Committee. Participants were 1,067 students (51% female) attending a parochial high school in the northwestern United States. The sample was primarily White (83.9%), with fairly equal numbers of students from each grade level (310 freshmen, 269 sophomores, 248 juniors, 236 seniors, 4 unspecified). School statistics indicate that approximately 25% of students receive need-based academic scholarships each year, and 75% of students identify as Catholic. That the study was conducted in a religiously affiliated educational institution may affect the generalizability of results. Religion is often posited to play a protective role against drinking behavior. However, recent studies, several using twin and sibling pairs with disparate religious orientations, have suggested that there is no causal relationship between religious involvement and lifetime and current drinking. Instead, religious affiliation may merely be a proxy for other familial and socioeconomic variables that affect alcohol use (Harden, 2010; Kendler and Myers, 2009). These concerns are revisited in the Discussion.

Students were invited to take part in a survey on student health behavior, including alcohol consumption. Ninety-one percent of parents gave consent for the study, and 97% of

students with parental consent participated. During survey administration, one of three proctors delivered a standardized set of instructions to groups of 20–60 students seated in one of the school's computer laboratories. Students were given 45 minutes to complete the survey questions anonymously. Fifteen students were excluded from analyses because of dishonest responding, either through self-reported lack of honesty or endorsing use of a fake drug (i.e., derbisol, a drug that does not exist). This left the sample described above.

Measures

Academic motivation. Questions measuring students' academic motives for attending school were a subset of the Academic Motivation Scale (Vallerand et al., 1993). Participants were asked to rate a list of potential reasons they attend school on a 7-point scale (1 = *not at all true of me*, 7 = *exactly true of me*). Because of school-imposed time constraints, only intrinsic motivation (e.g., "I go to school for the pleasure I experience when I discover new things never seen before"), introjected regulation (e.g., "I go to school because of the fact that when I succeed in school I feel important"), and external regulation (e.g., "I go to school to obtain a more prestigious job later on") were measured by three questions each. These items were combined to create latent variables representing the three types of academic motives. The Academic Motivation Scale has been shown to be reliable and valid in late-adolescent samples (Vallerand et al., 1993).

Academic performance. Given the sensitive nature of the survey material, participants' self-reported grade point average was used to measure academic performance rather than collecting data from school records. This approach is often used in research and is found to correlate highly with actual grades (Dornbusch et al., 1987; Gray and Watson, 2002; Kuncel et al., 2005; Noffle and Robins, 2007).

School engagement. To measure school engagement, participant-reported school relatedness and teacher support were assessed. Items for both constructs were drawn from the Resilience and Youth Development Module of the California Healthy Kids Survey 2002–2009 High School version (Hanson and Austin, 2003). Participants responded to four questions from the Resilience and Youth Development Module School Connectedness section ($\alpha = .86$; e.g., "I feel close to people at this school") on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*) to assess school relatedness. Participants also answered three questions from the Caring Relationships section ($\alpha = .90$; e.g., "There is a teacher or other adult at school who really cares about me") on a 4-point scale (1 = *not at all true*, 4 = *very true*) to assess teacher support.

Lifetime drinking behavior. Student lifetime drinking behavior was measured by a single question drawn from the Monitoring the Future study (Bachman et al., 2008).

Students were asked to indicate on how many days in their lifetime they had consumed at least one alcoholic drink (0 = *0 days*, 7 = *100 or more days*). Lifetime drinking was recoded dichotomously (0/1), with 0 indicating no use during their lifetime and 1 indicating any level of use during their lifetime, to capture initiation in this sample.

Current drinking behavior. Current drinking behavior was also measured by questions from the Monitoring the Future study (Bachman et al., 2008). Students were asked to report the frequency ("During the past 30 days, on how many days did you have at least one drink of alcohol?") and quantity ("On the days you drank, on average, how many drinks did you have?") of their drinking over the past month, as well as their engagement in heavy episodic drinking ("On how many days did you have five or more drinks of alcohol in a row, that is, within a couple of hours?"). These variables were used to create a composite latent variable representing current alcohol use.

Statistical analysis strategy

Structural equation modeling was conducted in Mplus (Muthén and Muthén, 2004) and was used to analyze the relationship between academic motivation, school-related factors, and alcohol use. This statistical technique combines elements of confirmatory factor analysis, regression, and exploratory factor analysis to test the relationship between constructs; it is considered preferable to regression because it factors in measurement error (Kline, 2010; Schreiber et al., 2006). Items used to measure academic motives were combined to form parcels, which were then used as latent variable indicators of each type of motivation. The same technique was applied to create latent variables of school relatedness and teacher support. Grade point average and lifetime drinking were both represented by a single question, whereas current drinking comprised the frequency, quantity, and heavy drinking episodes in the past 30 days. After determining that values were omitted completely at random, missing data were managed using maximum likelihood estimation (Muthén and Muthén, 2004).

A two-step procedure of confirmatory factor analysis, to examine the adequacy of the latent variable operationalizations, followed by structural modeling was used to determine the best fit for the data (Anderson and Gerbing, 1988). Several fit indices (comparative fit index [CFI; Bentler, 1990]; root mean square error of approximation [RMSEA; Marsh et al., 1996]; Tucker–Lewis index [TLI; Hu and Bentler, 1998]) were considered in selecting the optimal models. Using the convention provided by Browne and Cudeck (1993) for RMSEA, close fit was identified by a value of .05, fair fit by a value of .08, and marginal fit by a value of .10. To determine whether background variables (e.g., sex, grade level, ethnicity) related differently to latent variables, a multiple indicator multiple cause (MIMIC) model was run. Spe-

cifically, the MIMIC model was used to determine whether participants of different sexes, grade levels, and ethnicities displayed differential responses on the variables of interest.

For the structural model, a saturated model representing all possible relationships among latent variables was examined. To identify the best-fitting model, nonsignificant pathways were eliminated using a model trimming approach (Anderson and Gerbing, 1998). This approach was adopted partially because hypotheses concerning the relationship between variables were tentative, and thus no strong a priori assumptions as to relationships between variables could be made. We used a stringent $p = .01$ level for evaluating the significance of differences in chi-square for each parameter changed (Ullman, 2001).

Results

Demographic and behavioral characteristics of the sample

Demographic statistics are presented in Table 1. As displayed in the table, 52.2% of the total sample reported lifetime alcohol use, and 24.2% of the sample reported current alcohol use. Although the percentage of current and lifetime use in the sample is below the national average for students in 10th grade (lifetime alcohol use was 51% vs. the national average of 58%, $z = -2.30$, $p = .02$; current alcohol use was 24% vs. the national average of 29%, $z = -1.80$, $p = .04$), it is equivalent to the national average for high school seniors (lifetime alcohol use was 74% vs. the national average of 72%, $z = 0.74$, *n.s.*; current alcohol use was 41% vs. the national average of 43%, $z = -0.67$, *n.s.*; Johnston et al., 2009; Robinson and Anderson, 2010). In general, older students were more likely to engage in alcohol use, $F_s = 9.60-42.11$, $p < .0001$, consistent with literature reporting age differences in alcohol consumption (Fox et al., 2010). No gender differences were found for patterns of alcohol use.

Correlations among all variables are presented in Table 2. According to SDT, intrinsic motivation, introjected

regulation, and external regulation should correlate in a simplex pattern, meaning that variables should be positively correlated to the degree they are situated proximally to one another in the SDT continuum (i.e., introjected and extrinsic regulation should be more positively correlated with one another than with intrinsic motivation). As found in past research, the different types of academic motives did not correlate in the simplex pattern proposed by SDT (Boiché et al., 2008; Ratelle et al., 2007; Ryan and Connell, 1989). Specifically, intrinsic motivation and external regulation were significantly positively correlated ($r = .21$, $p < .0001$) and introjected regulation was more strongly correlated with intrinsic motivation ($r = .76$, $p < .0001$) than with external regulation ($r = .44$, $p < .0001$). Accordingly, it was appropriate to analyze introjected and external regulations separately.

Structural equation modeling

In the first step of data analysis, a confirmatory factor analysis was run to ensure that the latent variables fit the data appropriately. The model displayed a fairly good fit, indicating that individual items mapped well to the latent variables, $\chi^2(94) = 477.03$, $p < .0001$ (CFI = .96; TLI = .95; RMSEA = .06; 95% CI [.06, .07]). To determine whether groups of participants showed different relationships to the variables of interest, a MIMIC model was used to assess the relationship between demographic variables—race, grade level, and gender—and academic variables, $\chi^2(149) = 619.14$, $p < .0001$ (CFI = .96; TLI = .94; RMSEA = .06; 95% CI [.05, .06]). Significant associations were found between gender and all of the variables of interest excluding extrinsic motivation and teacher support; overall, girls reported more intrinsic motivation ($\beta = -.10$, $p = .004$), introjected regulation ($\beta = -.20$, $p < .0001$), and higher grades ($\beta = -.20$, $p < .001$) than boys but lower feelings of school relatedness ($\beta = .06$, $p = .05$). Students in younger grades reported more introjected regulation ($\beta = -.07$, $p = .05$) but lower perceived teacher support ($\beta = .15$, $p < .0001$) than their older schoolmates.

TABLE 1. Demographic and behavioral characteristics of sample

Variable	9th grade ($n = 310$) <i>M (SD) or %</i>	10th grade ($n = 269$) <i>M (SD) or %</i>	11th grade ($n = 248$) <i>M (SD) or %</i>	12th grade ($n = 236$) <i>M (SD) or %</i>	Overall ($n = 1,067$) <i>M (SD) or %</i>
Girls	52.6%	51.7%	50.0%	50.4%	51.3%
Grade point average	3.59 (0.35)	3.60 (0.33)	3.60 (0.33)	3.55 (0.34)	3.59 (0.34)
Lifetime alcohol use	29.2%	50.9%	61.3%	73.7%	52.2%
Current alcohol use	23.6%	26.6%	40.7%	50.0%	24.2%
Current average drinks	0.18 (0.62)	0.69 (1.52)	1.14 (2.16)	1.95 (3.67)	0.66 (1.88)
Current heavy drinking episodes	0.01 (0.13)	0.18 (0.77)	0.36 (1.96)	0.70 (2.08)	0.29 (1.44)
Intrinsic motivation	5.11 (1.39)	4.85 (1.37)	4.82 (1.45)	5.06 (1.51)	4.96 (1.43)
Introjected regulation	5.03 (1.42)	4.79 (1.40)	4.72 (1.42)	4.85 (1.44)	4.85 (1.42)
External regulation	5.95 (1.16)	6.21 (1.02)	5.96 (1.14)	5.85 (1.15)	5.99 (1.13)

Notes: Values are reported for each separate grade level, as well as for the overall sample. Drinking variables are reported as percentage of students who indicated any prior alcohol use. Means and standard deviations for academic motives and current alcohol use indicators are reported.

TABLE 2. Correlations among variables ($n=1,067$)

Variable	1	2	3	4	5	6	7	8
1. Intrinsic motivation	-	.76**	.21**	-.20**	-.15**	.36**	.39**	.30**
2. Introjected regulation		-	.44**	.05	-.07	.30**	.34**	.22**
3. External regulation			-	.04	.12**	.21**	.18**	.06*
4. Lifetime drinking				-	.51**	-.05	-.04	-.13**
5. Current drinking					-	-.10**	.08*	-.13**
6. School relatedness						-	.42**	.13
7. Teacher support							-	.14
8. Grade point average								-

Notes: For lifetime and current drinking: 0 = no use, 1 = any amount of use. Grade point average on a 4-point scale.
 * $p < .01$; ** $p < .0001$.

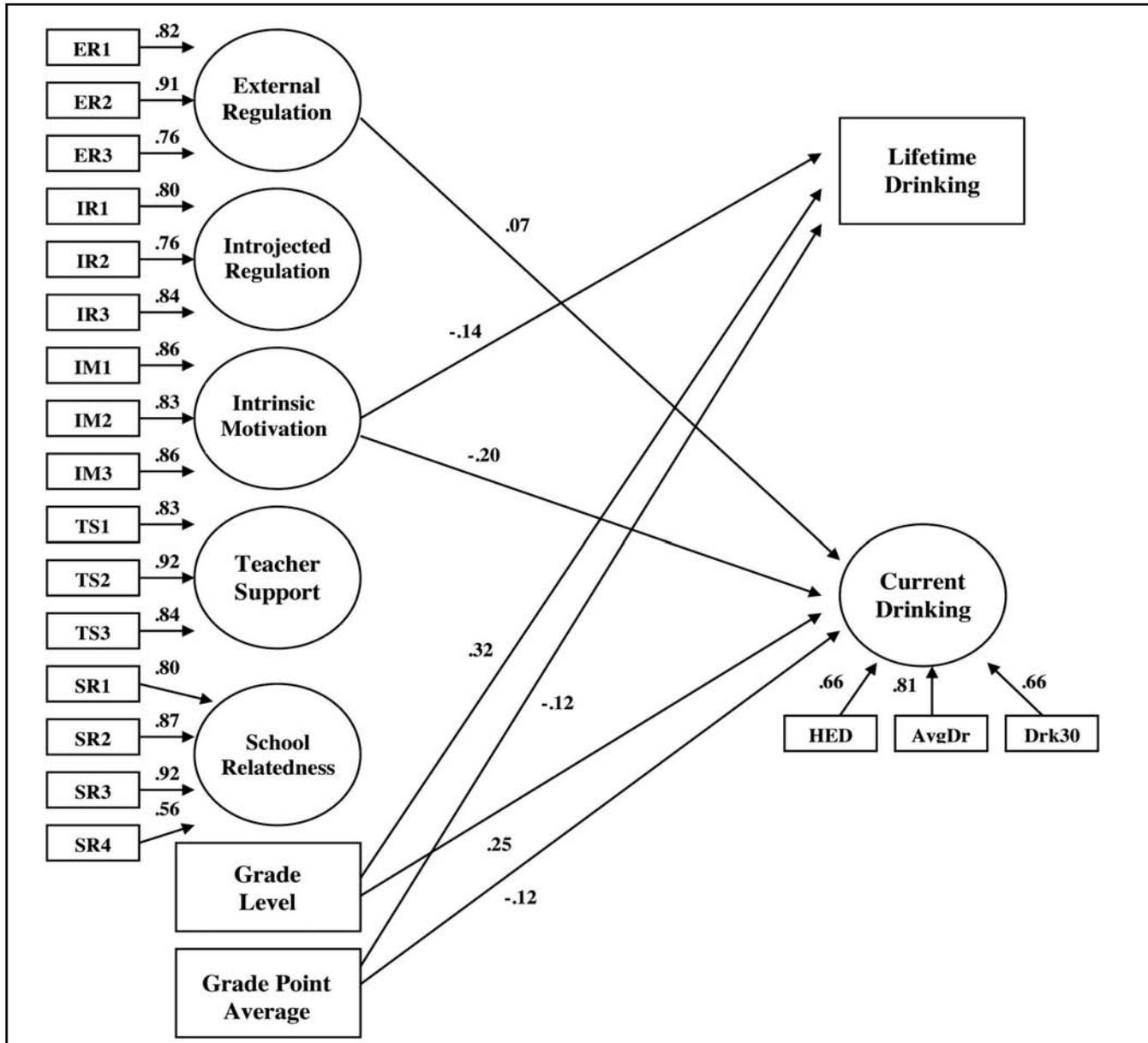


FIGURE 1. Best fitting model for data. ER = external regulation; IR = introjected regulation; IM = intrinsic motivation; TS = teacher support; SR = school relatedness; HED = heavy episodic drinking episodes in past 30 days; AvgDr = average number of drinks in past 30 days; Drk30 = number of drinking episodes in past 30 days. Arrows indicate pathways significant at $p < .01$. Covariation between predictors, disturbances, and errors were modeled but not pictured in the figure.

Finally, students who identified as White reported greater teacher support ($\beta = .09, p = .005$).

The structural model displaying the relationship between academic motives and lifetime and current drinking behaviors is depicted in Figure 1. Because grade level was the only demographic variable that displayed a relationship to alcohol use, it was included as a manifest variable in the structural equation model. The saturated model for all constructs showed an acceptable fit to the data, $\chi^2(138) = 598.38, p < .0001$ (CFI = .96; TLI = .94; RMSEA = .06; 95% CI [.05, .06]). The CFI and TLI indicated a good fit with the data, and the RMSEA indicated a fair fit. Paths were pruned to identify the optimal, most parsimonious structural model for the data. The final best-fitting model demonstrated a fair to good fit to the data, $\chi^2(150) = 628.42, p < .0001$ (CFI = .96; TLI = .95; RMSEA = .06; 95% CI [.05, .06]). As shown in Figure 1, intrinsic motivation had a significant negative relationship with lifetime drinking ($\beta = -.14, p < .0001$) and current drinking ($\beta = -.20, p < .0001$), whereas external regulation displayed a significant positive relationship with current drinking ($\beta = .07, p = .01$). Introjected regulation was not associated with either lifetime or current drinking. As for school-related factors, only grade point average displayed any significant relationship to student drinking, serving as a negative predictor of both lifetime ($\beta = -.12, p < .0001$) and current ($\beta = -.12, p < .0001$) drinking behavior. Finally, grade level displayed a positive relationship with both lifetime ($\beta = .32, p < .0001$) and current ($\beta = .25, p < .0001$) drinking. Overall, the model accounted for 14.8% of the variance in lifetime drinking and 12.5% of the variance in current drinking.

Discussion

In this study, we sought to better understand the link between academic motivation and substance use by considering the types, rather than amount, of motivation that adolescents report. Using the SDT framework, we examined how intrinsic motivation, introjected regulation, and external regulation related to lifetime and current drinking behavior while also considering other school-related factors. We found that intrinsic motivation was a protective factor for both lifetime and current drinking, whereas external regulation was a risk factor for current drinking. It is noteworthy that the motives we studied were specific to the academic realm and did not directly address adolescents' reasons for drinking. Nevertheless, they displayed significant relations to drinking behavior that remained even when other school-related factors were included in the model.

These findings suggest that it is essential to consider the type of motive when studying associations between academic motivation and drinking behavior. Inconsistent findings in past studies may have resulted from the aggregation of qualitatively different types of motivation. Indeed, vari-

ous alcohol researchers have operationalized motivation in manners that are consistent with what could be considered both intrinsic (e.g., positive orientation in school, defined as interest in school; Bègue and Roché, 2009) and extrinsic forms of motivation (e.g., status of academic success in school, defined as the importance placed on good grades; Bryant et al., 2003). Consistent with our findings, extrinsic motivation in past research has been positively associated with increased alcohol use from ages 14 to 20 (Bryant et al., 2003), although more intrinsically characterized forms of motivation have displayed no relationship with drinking (e.g., Bègue and Roché, 2009).

Academic motives may play different roles in terms of adolescent initiation of alcohol use versus intensity of current alcohol consumption. Intrinsic motivation was the only academic motive with a significant link to lifetime drinking. Consistent with our a priori argument for intrinsic motivation as a protective factor, the data suggest that it may deter the initiation of drinking, perhaps because it buffers individuals against the detrimental effects of perceived peer pressure to drink (Knee and Neighbors, 2002). Consistent with the findings of O'Connor and Jackson (2008), the curiosity that is characteristic of intrinsic motivation does not appear to encourage experimentation with alcohol. Counter to what was expected, external regulation did not have a significant relationship with lifetime drinking.

Although identifying a relation between intrinsic motivation and lifetime drinking is illuminating, experimentation with alcohol at some point in high school is, in fact, quite normative (Fox et al., 2010). As a result, examining current drinking—which, in this study, was a composite variable representing the frequency of drinking, quantity of drinks consumed, and number of heavy drinking episodes over the past 30 days—may be of greater theoretical and practical interest. Once again, intrinsic motivation displayed a significant negative relationship with current drinking and introjected regulation was unrelated to drinking. External regulation, however, was positively associated with current drinking. These findings are generally in line with initial hypotheses and suggest that the types of academic motives should be examined separately, rather than using the more broad categorizations of autonomous and controlled motivation. Many studies, including the few existing studies examining SDT-defined motivation and alcohol use, collapse introjected and external motives into a single composite variable. Such an approach would have failed to identify the differential effects of external versus introjected regulation for current drinking found in the present study.

Postulations as to why this pattern of results emerged with respect to current drinking must be tentative because not all possible mechanisms by which academic motives and drinking behavior affect one another were measured, and academic motives accounted for a fairly small amount of variance in drinking variables. As for external regulation

being positively associated with drinking, it is possible that students with high external motives are oriented toward others and thus are particularly vulnerable to coercion from classmates to drink (Knee and Neighbors, 2002). Similarly, those with extrinsic motivation may possess high contingent self-esteem, leading to increased drinking motives and subsequently greater drinking and related problems (Neighbors et al., 2004, 2006). Conversely, those with intrinsic motivation may be immune to such pressure. It is equally likely that students who choose to drink subsequently disengage from school, resulting in less autonomous forms of motivation. Once again, all proposed explanations must be made tentatively because they were not directly measured in the current study.

Several aspects of the present study limit the generalizability of results, notably the use of a religiously affiliated sample. As mentioned earlier, studies suggest that religion may not be as protective a factor against drinking as commonly believed (Harden, 2010; Kendler and Myers, 2009). Although levels of drinking reported by high school seniors in the present study were on par with national averages, caution should be exercised in generalizing results to populations in nonreligious institutions. In addition, all data were collected at a single time point via a cross-sectional design. Accordingly, no claims can be made concerning the causality of the relationship between academic motivation and drinking. It is entirely possible that a third variable may drive both academic motivation and alcohol use in the sample, making the relationship between the two variables spurious. For example, sociodemographic variables (e.g., socioeconomic status, parenting behaviors) or expectations arising from either the self or important others (e.g., parents, teachers) might simultaneously drive school motivation and drinking. Future studies using longitudinal designs, as well as intervention and experimental research encouraging a more intrinsic orientation toward school, will be instrumental in further elucidating this relationship.

Finally, as with many studies of adolescent alcohol use, self-report measures were used to assess motivation, school-related factors, and drinking behavior. In an attempt to solicit honest responses, the survey was entirely anonymous. The survey also contained items designed to identify dishonest responding by either directly reporting honesty in responding or endorsing the use of a nonexistent drug to remove participants from the sample before analysis. Nevertheless, there is always a concern that students will not accurately report substance use. Literature comparing self-reported drug use to actual use as tested with urine or blood analysis has produced mixed results (Delaney-Black et al., 2010; Hser, 1997; Johnston and O'Malley, 1997). Accordingly, caution must be exercised in considering the accuracy of results.

Adolescent drinking is clearly an issue that demands attention. Prevention efforts must draw on research examining protective and risk factors for drinking to effectively combat

continued alcohol use. The current study illuminated the role that different academic motives might have in promoting or deterring drinking, resolving ambiguities from past research, and introducing potential directions for future study. Specifically, results from the current study suggest that prevention efforts should focus on fostering certain types of motives for attending school rather than simply increasing the overall amount of academic motivation. It may, in fact, be detrimental to promote external regulation for school with respect to students' likelihood to engage in regular alcohol use. This relationship between academic motivation and alcohol use is likely an indirect one, but motivation may be a more malleable target than other factors influencing drinking behavior. With knowledge from the current study, researchers and educators may be able to more effectively combat problematic drinking behaviors in high school students.

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