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Alcohol-induced blackouts, subjective intoxication, and motivation to decrease drinking: Prospective examination of the transition out of college

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Abstract

Objective—We prospectively examined whether subjective intoxication serves as a risk factor for experiencing alcohol-induced blackouts. We then examined whether subjective intoxication and/or blackouts predicted motivation to decrease their drinking, and whether this motivation to change would promote future changes in drinking behavior.

Method—Participants (N = 1,854, 62.1% female, 53.2% Caucasian, M_{age} = 21.8) were recruited the summer prior to matriculating into a large, public university to complete a 6-year longitudinal study. Self-reported motivation to decrease their drinking behavior, their frequency of blackouts, quantity of alcohol consumption, and subjective intoxication (i.e., feeling drunk) were assessed annually during the transition out of college (Years 4–6).

Results—In a cross-lagged model, subjective intoxication (i.e., feeling drunk) prospectively predicted experiencing blackouts ($p < .001$). Controlling for both objective (e.g., quantity) and subjective intoxication, blackouts at Year 4 predicted greater motivation to decrease drinking behavior at Year 5 ($p < .01$), but this motivation did not predict less quantity of alcohol use by Year 6 ($p = .076$).

Conclusions—Subjective intoxication is a robust predictor of blackouts across time. Additionally, blackouts are modest, developmentally-limited predictors of motivation to change drinking behavior, but blackouts do not predict future behavior change.

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Contributors

Elise N. Marino, B.A. contributed the conceptualization of this project, performed the statistical analyses, and wrote the most substantial portions of the manuscript.

Kim Fromme, Ph.D. designed the original longitudinal study, obtained funding for the research, was responsible for collection of all data used in this report, and contributed to the writing of the manuscript.

Both authors collaborated on the interpretation of the findings.

Conflict of interest

All authors report no conflict of interest.

Keywords

alcohol; blackouts; motivation to change; behavior change; emerging adulthood

1. Introduction

Ages 18–25 represent a unique developmental period known as emerging adulthood (Arnett, 2000), with this period recently being extended to age 29 (Arnett, Žukauskienė, & Sugimura, 2014). Throughout emerging adulthood, individuals begin to accept responsibility for themselves, make independent decisions, and become financially independent (Arnett, 2001, 2003). Emerging adulthood is a period of exploration in self-identity (e.g., worldviews, love, work). There is often experimentation as a way to gain life experiences, which leads to postponement of marriage and parenthood before settling into adult roles. Behavioral risk-taking, including alcohol use, peaks in emerging adulthood (Substance Abuse and Mental Health Services Administration, 2017), which Arnett (2000) proposed stemmed from this period of unrestricted exploration before entering adult roles.

Although heavy drinking is common among emerging adults, especially college students, some students preparing to graduate reduce their drinking, a phenomenon known as “maturing out” (Jochman & Fromme, 2010; Patrick & Schulenberg, 2011; Sher, Bartholow, & Nanda, 2001). Some suggest that this may result from decreases in quantity rather than frequency of alcohol use (Arria et al., 2016). Among many, alcohol consumption decreases as those who are transitioning out of college are tasked with conforming to adult roles (e.g., marriage, parenthood, employment) (Staff et al., 2010).

In fact, conforming to these new roles reflects emerging adults’ concern for others (Arnett, 2003), and as such, role transitions during this time can influence their alcohol use. Accordingly, intrapersonal factors (e.g., conscientiousness) become more influential during emerging adulthood, which can lead to role adoption and later reductions in problematic drinking (Lee, Ellingson, & Sher, 2015). Because emerging adults are afforded freedom to define their lives (Arnett, 2000), emerging adulthood is a unique transitional period marked by role changes and increases and subsequent decreases in alcohol consumption (Boyd, Corbin, & Fromme, 2014).

Consequently, the importance of this transition can increase motivation to decrease one’s drinking because experiencing alcohol-related consequences becomes more salient and disruptive to conforming with adult roles. Indeed, college students who experienced physical and psychological consequences, including alcohol-induced blackouts, expressed that the particular drinking episode was not worth doing (Fairlie, Ramirez, Patrick, & Lee, 2016), suggesting a recognition that their drinking was problematic and may not be worth the associated consequences. Additionally, Diulio and colleagues (2014) found that personal consequences were associated with motivation to change when social problems were low, an effect that disappeared when social problems increased. Further, abuse/dependence symptoms were associated with motivation to change; however, those with the most abuse/dependence symptoms were less motivated. Nevertheless, others have also found that abuse/dependence symptoms predicted problem recognition and motivation to change (Cellucci,

Krogh, & Vik, 2006; Vik, Culbertson, & Sellers, 2000). Despite emerging adulthood being a time of experimentation with alcohol, experiencing consequences has a considerable effect on producing motivation to change.

Although the relationship between many alcohol-related consequences and motivation to change among emerging adults is documented, the relationship between blackouts, one significant consequence, and motivation to change has largely gone unexamined. Whereas Fairlie and colleagues (2016) found that blackouts predicted a belief that the drinking episode was not worth doing, it is unknown whether blackouts predict motivation to decrease drinking, a possible result of expressing this regret. Examining the relationship between blackouts and motivation to decrease drinking during the transition out of college is important because for those graduating and entering marriage, parenthood, or the workforce, it may no longer be socially or professionally normative to engage in a pattern of heavy drinking that can lead to blackouts as it previously was (Substance Abuse and Mental Health Services Administration, 2017). Blacking out can also interfere with adopting new roles because it is incongruent with their emerging self-identity. In fact, blackouts have a considerable psychological impact as some drinkers describe their blackouts as frightening and emotionally stressful (Buelow & Koeppel, 1995; White, Signer, Kraus, & Swartzwelder, 2004). Ultimately, blackouts warrant further exploration if we are to expand how we identify catalysts for expressing motivation to decrease drinking across developmental periods.

Specifically, blackouts are periods of amnesia for events occurring while drinking that result from information not being transferred from short-term into long-term memory (White, 2003). Risk factors for blackouts include: being female (Marino & Fromme, 2015, 2016; Schuckit, Smith, Goncalves, & Anthenelli, 2016; White, Jamieson-Drake, & Swartzwelder, 2002), Caucasian (Jennison & Johnson, 1994; Schuckit, Smith, Goncalves, et al., 2016), having an early onset of drinking (Jennison & Johnson, 1994; Marino & Fromme, 2016), or a family history of problematic drinking (Jennison & Johnson, 1994; LaBrie, Hummer, Kenney, Lac, & Pedersen, 2011; Marino & Fromme, 2015). Rapidly drinking large amounts of alcohol and high blood alcohol concentrations (BAC) are also risk factors (Jennison & Johnson, 1994; Perry et al., 2006; White, 2003; White et al., 2004), but blackouts can occur at BACs below .08 (Hartzler & Fromme, 2003a). Yet, only half of drinkers experience blackouts (White et al., 2002).

Subjective responses to alcohol are additional risk factors for blackouts. Indeed, having a low level of response (LLR; e.g., needing more drinks to feel the effects during the first 5 times ever drinking) was associated with experiencing blackouts, controlling for maximum BAC (Schuckit, Smith, Goncalves, et al., 2016). The LLR likely contributes to blackouts because those individuals are drinking more to feel the effects. Yet, feeling greater stimulating and sedating effects of alcohol during a heavy drinking occasion was also associated with blackouts, relationships that were not mediated by estimated BAC (Wetherill & Fromme, 2009). This finding is likely operating through different mechanisms. Individuals who feel more stimulating effects are more likely to continue drinking. Additionally, drinking heavily can produce feelings of sedation once their BAC declines. Because these findings were not explained by BAC, they raise the question of whether sensitivity to subjective experiences of drinking might better explain risk for blacking out

than the actual amount of alcohol consumed. Expanding upon this, other proxies for sensitivity to alcohol's effects, specifically subjective intoxication (i.e., feeling drunk), may also be a better predictor of blackouts than quantity of drinking.

Furthering our understanding of blackouts is crucial because they are prospectively associated with other significant alcohol-related consequences after controlling for alcohol consumption. These include: future alcohol-related injuries (Hingson, Zha, Simons-Morton, & White, 2016; Mundt, Zakletskaia, Brown, & Fleming, 2012), social and emotional consequences (Wilhite & Fromme, 2015), overdosing, hangovers, school/work problems, engaging in illegal activities, and legal trouble (Hingson et al., 2016). Thus, blackouts are markers of problematic drinking, which may indicate the need for behavioral changes.

Studying blackouts and subjective intoxication is particularly relevant during emerging adulthood because although this period includes experimentation with alcohol, problematic drinking can be developmentally limited after adopting adult roles, a hypothesis proposed by Arnett (2005). Thus, identifying factors that predict blackouts (i.e., subjective intoxication) can inform prevention through early identification of individuals at risk (i.e., those experiencing blackouts). Intervening early may produce reductions in problematic drinking and blackouts, which may then reduce the need to make behavioral changes by the transition out of college and into adult roles.

Because blackouts produce fragmented or total memory loss for events occurring while drinking (Hartzler & Fromme, 2003b; Wetherill & Fromme, 2011; White, 2003), experiencing blackouts can be distressing (Buelow & Koeppel, 1995; White et al., 2004). With significant distress serving as a catalyst, some individuals may be motivated to change their drinking to avoid blacking out. With motivation to decrease their drinking, these individuals may make behavioral changes to conform with their new roles. If this motivation leads to behavioral changes, we would expect to see decreases in drinking.

Consequently, we had three a priori hypotheses for the current study. First, we hypothesized that greater subjective intoxication (i.e., more times feeling drunk) would increase likelihood of experiencing blackouts across time, controlling for the quantity of alcohol consumed. Second, we hypothesized that blackouts alone are sufficient to generate motivation to decrease drinking, beyond the influence of objective (quantity of drinking) and subjective intoxication. Third, we hypothesized that this motivation would lead to future decreases in quantity consumed during the transition out of college.

2. Method

2.1 Participants and Procedure

Participants were from a cohort of college freshmen at a large state university in the Southwestern United States. They were recruited the summer before they matriculated and had never previously attended any college or university. The 6-year longitudinal study received Institutional Review Board approval. After providing informed consent, participants were assessed ten times: summer before college, biannually during Years 1–3, and annually during Years 4–6. Participants included in the current analyses (N=1,854)

completed the first survey and must have completed at least one survey during Years 4–6. See Table 1 for demographic information.

2.2 Measures

2.2.1 Demographics—Sex, age, and self-reported race were captured at the first wave of data collection.

2.2.2 Motivation to Change Drinking Behavior—Participants were asked to what extent they agreed/disagreed with the following statement: "I've been thinking that I might want to decrease my alcohol consumption" (DiClemente & Hughes, 1990). Responses were on a 5-point Likert-type scale (1=disagree, 2=slightly disagree, 3=neither, 4=slightly agree, and 5=agree). We used the Likert coding in our analyses.

2.2.3 Alcohol-Induced Blackouts—Participants indicated how often during the past three months they "had difficulty remembering things you said or did, or events that happened, while you were drinking" (Marino & Fromme, 2015, 2016; Wilhite & Fromme, 2015). The response options were on a 5-point Likert-type scale (1=never, 2=some of the time, 3=half of the time, 4=most of the time, and 5=always). We dichotomized blackouts (yes/no) during Years 4–6 in characterizing the differences between those who did and did not report blackouts. For our main analyses, we used the Likert coding.

2.2.4 Subjective Intoxication—Using an item adapted from Jackson and colleagues (2001), we assessed frequency of subjective intoxication. Participants were asked to provide an open-ended numeric response to the following question: "During the last 3 months, how many times did you get drunk (not just a little high) on alcohol?"

2.2.5 Quantity of Alcohol Use—Using the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985), quantity of alcohol use was calculated as the average number of drinks consumed on a drinking day during a typical week over the past three months.

2.3 Statistical Analysis

We tested our hypotheses using data collected during Years 4–6 which is a time when most participants were transitioning out of college and into other social roles, and may be an especially sensitive time to the consequences of heavy drinking. Using SPSS Version 18, we examined the bivariate associations of demographic variables and alcohol use between those who were included versus excluded from our analyses, as well as between those who did and did not report experiencing any blackouts (yes/no) during Years 4–6. We used chi-square tests to analyze categorical variables, and two-tailed *t*-tests to analyze continuous variables.

Next, using Mplus Version 7.2 (Muthén & Muthén, 1998), we ran a cross-lagged model to examine whether subjective intoxication predicted blackouts, whether blackouts at Year 4 predicted motivation to change at Year 5, and whether this motivation predicted less alcohol use by Year 6. This path analysis controls for the associations between variables at each year and tests the predictive power of our constructs across time. We used Maximum Likelihood estimation to account for missing data. We assessed model fit using the following indices:

the chi-square goodness-of-fit test, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean residual (SRMR). Because chi-square is not an especially sensitive index of model fit, CFI and TLI greater than .95, RMSEA less than .08, and SRMR less than .05 are typically used as indices of a well-fitting model (Kline, 2011).

3. Results

3.1 Attrition Analyses

Due to missing data for all three assessments during Years 4–6, 391 participants were excluded. Based on the first survey during the summer before starting college, which all participants completed, there were some differences between those who were included versus excluded from these analyses based on chi-square and two-tailed *t* tests. Compared with those excluded (n=391), those included (n=1,854) were significantly more likely to be women (49.1% vs 62.1%, $p<.001$), report fewer times feeling drunk (2.22 vs 1.60, $p=.012$), and report fewer drinks per drinking day (quantity) (2.4 vs 1.8, $p=.001$) in the past three months at the first assessment. There were no significant differences between the groups in age or race.

3.2 Participant Characteristics

Overall, 10.4% (Year 4), 9.6% (Year 5), and 9.4% (Year 6) of participants agreed or slightly agreed that they were considering decreasing their alcohol consumption. See Table 2 for frequency of motivation to change, subjective intoxication, quantity of alcohol consumption, and alcohol-induced blackouts.

Altogether, 52.0% of participants reported experiencing blackouts during Years 4–6. Those who experienced any blackouts during Years 4–6 were significantly more likely to be Caucasian, express greater motivation to change, and report more times feeling drunk and greater quantity of alcohol consumption during all three years (Table 3).

3.3 Cross-Lagged Model

Finally, using Maximum Likelihood estimation, we ran a cross-lagged model across three years to examine the associations among motivation to change, blackouts, subjective intoxication, and quantity of drinking (Figure 1). Because subjective intoxication and quantity were positively skewed, they were log transformed and afterwards showed no significant skew. Sex was included as a covariate, and blackouts and quantity were regressed on sex at all three years. As expected, women were more likely to report experiencing blackouts ($p=.001$), and men reported greater quantity of alcohol consumption ($p<.001$). All variables within a given year were covaried with one another, and Year 4 variables were covaried with the corresponding variable at Year 6. All covariances among variables were statistically significant (all $ps<.01$). The final model demonstrated adequate fit (chi-square=110.216, df=18, $p<.0001$; RMSEA=.053, 90% CI [.043, .062]; CFI=.988; TLI=.949; SRMR=.030).

3.3.1 Year 4 to Year 5—In testing Hypothesis 1, subjective intoxication at Year 4 prospectively predicted blackouts at Year 5 (β=0.144, 95% CI [0.072, 0.215], p<.001). In testing Hypothesis 2, blackouts at Year 4 significantly predicted motivation to change at Year 5 (β=0.094, 95% CI [0.031, 0.156], p<.01). All constructs demonstrated good stability from Year 4 to Year 5 (all ps<.001).

3.3.2 Year 5 to Year 6—Again testing Hypothesis 1, subjective intoxication at Year 5 prospectively predicted blackouts at Year 6 (β=0.165, 95% CI [0.095, 0.236], p<.001). In testing Hypothesis 3, motivation to change at Year 5 did not significantly predict a decrease in quantity of alcohol consumption by Year 6 (p=.076). Again, all constructs demonstrated good stability from Year 5 to Year 6 (all ps<.001).

3.4 Sensitivity Analyses

In our model, we included all participants who completed assessments during Years 4–6. This included 108 individuals who reported not drinking, but some of whom expressed motivation to change. In testing the power of our findings, we ran sensitivity analyses using only those participants who reported current drinking (n=1,746). All results from the cross-lagged model remained the same.

4. Discussion

Our findings show mixed support for our a priori hypotheses that subjective intoxication would predict blackouts and that experiencing blackouts would predict motivation to decrease drinking, which would then predict reductions in quantity of alcohol use. Indeed, subjective intoxication prospectively predicted blackouts across both time waves, and blackouts also predicted subjective intoxication, highlighting the bidirectional relationship between these constructs. Further, experiencing blackouts prospectively predicted motivation to change from Years 4–5 but not from Years 5–6. This motivation to change, however, did not predict a significant decrease in quantity of alcohol consumed by the third year. Given this, subjective intoxication is a robust risk factor for blackouts, and blackouts are modest, developmentally-limited predictors of motivation to change as this was only true across Years 4–5. Finally, blackouts do not appear to predict behavior change among emerging adults as they transition out of college.

Our findings are consistent with prior work that subjective responses to alcohol are associated with experiencing blackouts (Schuckit, Smith, Goncalves, et al., 2016; Wetherill & Fromme, 2009). Having controlled for the quantity of drinking, our results suggest there is something unique about the sensitivity to feelings of intoxication that increases the likelihood of experiencing blackouts. This would be in line with the findings of Wetherill and Fromme (2009), who indicated that both environmental and genetic influences likely contribute to the effect of subjective responses to alcohol on blackouts. For instance, an environment that encourages drinking to the point of intoxication may promote a rapid rate of drinking, which produces stronger feelings of intoxication, and increases the likelihood of blacking out (Jennison & Johnson, 1994; Perry et al., 2006; White, 2003; White et al., 2004). Additionally, those with lower tolerance to alcohol will experience stronger feelings of intoxication with the same quantity of drinking, thus increasing the likelihood of blacking

out. Our finding that subjective intoxication confers risk for blackouts confirms our first a priori hypothesis.

Additionally, our second hypothesis that blackouts alone are sufficient to produce motivation to decrease drinking showed mixed findings. This effect was only found from Years 4–5, but not from Years 5–6. Even though some drinkers are distressed by their blackouts, which led some to monitor their drinking for weeks after experiencing a blackout (Buelow & Koeppel, 1995; White et al., 2004), this appears to be a time-limited phenomenon. We did not find an effect of blackouts in Year 5 on motivation to change in Year 6, perhaps because these participants had already "matured out" of heavy drinking (Wilhite & Fromme, 2015) and transitioned into adult roles. This change would reduce both the likelihood of experiencing blackouts and the motivation to further reduce their drinking. Conversely, Years 4–5 represent the preparation and early stages of entering adult roles (Boyd et al., 2014), whereas during years 5–6 those changes may have solidified. This also fits with the idea of role socialization in that during the transition out of college, individuals are first initiating changes to socialize into what is expected of them in their new roles. After that period, they may have already socialized into roles that are associated with decreased drinking.

Although results failed to support our third a priori hypothesis that motivation to change would lead to reductions in quantity, this is consistent with previous findings that college students who engage in self-change behaviors are often unsuccessful (Caldeira et al., 2009). Interestingly, some have found that in the short-term, expressing motivation to change predicted less drinking and fewer consequences one week later (Merrill, Wardell, & Read, 2015). Because our assessments were yearly, it is possible that we missed short-term reductions in quantity of drinking among those who expressed motivation to change. It is also possible that motivation to decrease drinking was not strong enough for us to expect significant changes in drinking behavior.

4.1 Strengths and Limitations

The prospective nature of our analyses allowed us to examine blackouts, subjective intoxication, and motivation to change over time and how that influenced future drinking using robust path analyses in a large sample. Nevertheless, our sample consisted of college students, limiting the generalizability of our findings to other populations. Because our analyses focus on emerging adulthood, findings may differ in other age groups. Despite this, the highest rates of alcohol-related problems occur in this age group, making this an important developmental phase to study. We also used single items to assess blackouts, subjective intoxication, and motivation to change; however, single items have been used previously for blackouts (Schuckit et al., 2015; Schuckit, Smith, Shafir, et al., 2016; Schuckit, Smith, Goncalves, et al., 2016), subjective intoxication (Quinn & Fromme, 2012), and motivation to change (Chung, Pajtek, & Clark, 2013; Morgenstern et al., 2016). Finally, our model only allowed us to examine three years of data because our expanded definition of blackouts was not added until the Year 4 survey. Because we are looking at predicting change over time, examining additional timepoints may have strengthened our analyses.

4.2 Conclusions and Clinical Implications

This work highlights subjective intoxication as a robust risk factor for blackouts, which may be due to environmental and individual difference factors that influence individuals' sensitivity to subjective feelings of intoxication. Further, we identified blackouts as a modest predictor of motivation to decrease drinking, beyond the effects of objective and subjective intoxication, during the initial transition out of college but not from Years 5–6. This may be because participants may have assimilated into their roles by Years 5–6, thereby reducing their need to change; whereas, Years 4–5 represent the time to socialize into new roles when making changes is more important. Thus, this effect appears to be developmentally specific. By expressing a motivation to decrease their drinking, some individuals may have recognized that their drinking had been leading to problems, especially blackouts, which is incongruent with their efforts to conform to new adult roles. Yet, changes in drinking behavior were not identified by common markers of successful behavior change (i.e., reductions in quantity of drinking). Despite this, our work highlights the need to augment prevention programs aimed at reducing problematic alcohol use with education about blackouts and strategies for reducing their frequency.

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Highlights

- Subjective intoxication is a risk factor for alcohol-induced blackouts
- Blackouts are modest, developmentally-limited predictors of motivation to change
- Motivation to decrease drinking did not predict changes in future drinking

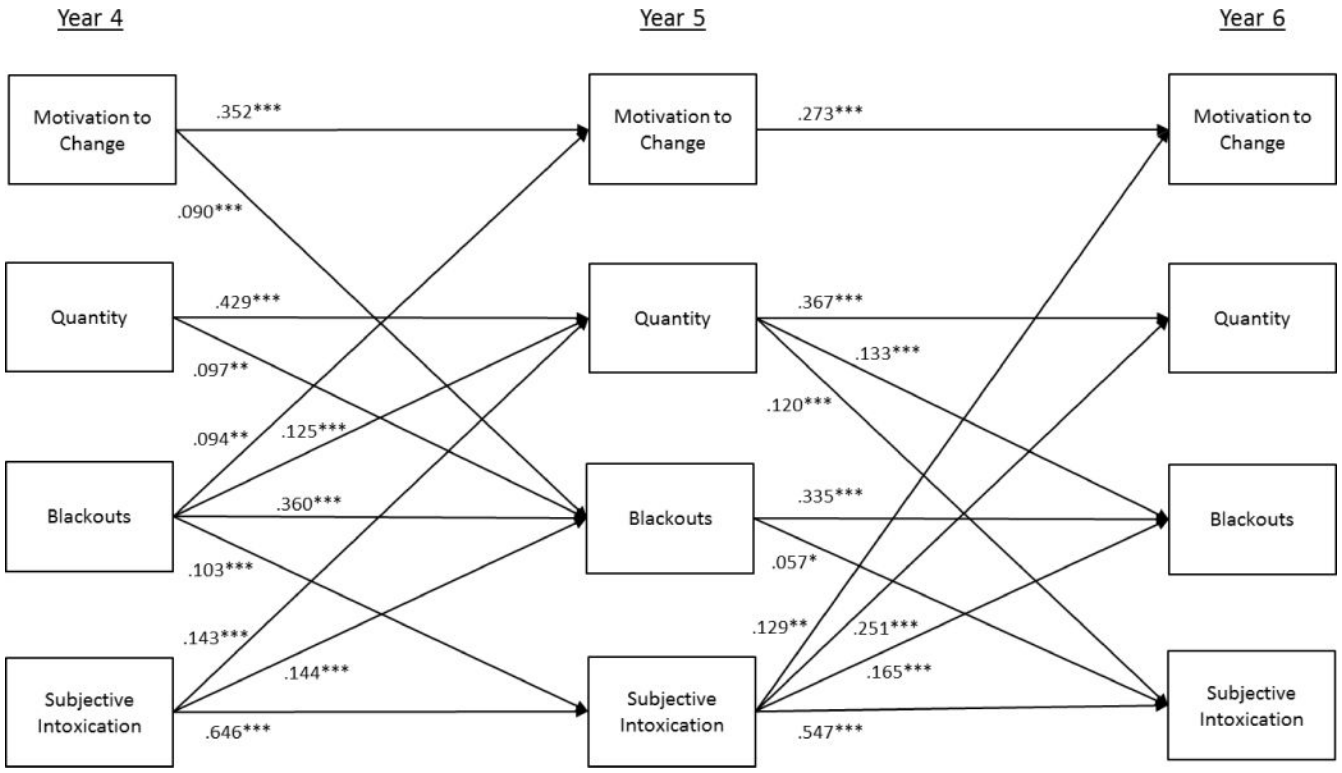

Figure 1.

Cross-lagged model for motivation to change drinking behavior, blackouts, subjective intoxication, and quantity of alcohol consumption

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$. Only statistically significant paths are shown. Path coefficients are standardized estimates. Sex was included as a covariate, and alcohol-induced blackouts and quantity were regressed on sex at all three years.

Table 1

Participant demographic characteristics

Demographic Characteristics (N = 1,854)	Mean (SD) or n (%)
Age at Year 4	21.8 (0.4)
Female	1,152 (62.1%)
Caucasian	986 (53.2%)
Asian	360 (19.4%)
Black	75 (4.0%)
Hispanic	277 (14.9%)
Other ethnicities	156 (8.4%)

Notes: Demographic characteristics are consistent with the overall sample from which these data are drawn.

Table 2

Alcohol use characteristics for all participants

Participant Characteristics (N = 1,854)	Mean (SD)
Year 4 motivation to change	1.9 (1.2)
Year 5 motivation to change	1.8 (1.2)
Year 6 motivation to change	1.8 (1.2)
Year 4 frequency feeling drunk	3.5 (6.6)
Year 5 frequency feeling drunk	2.9 (5.5)
Year 6 frequency feeling drunk	2.9 (6.3)
Year 4 quantity of alcohol consumption	2.7 (2.4)
Year 5 quantity of alcohol consumption	2.5 (2.2)
Year 6 quantity of alcohol consumption	2.4 (2.6)
Year 4 blackouts	1.5 (0.7)
Year 5 blackouts	1.5 (0.7)
Year 6 blackouts	1.5 (0.7)

Notes: Frequency of motivation to change, feeling drunk, quantity (i.e., drinks per drinking day), and blackouts were calculated for the previous three months at each assessment.

Table 3

Bivariate analyses of demographic and alcohol use characteristics by any reported blackouts during Years 4–6

Participant Characteristics (N = 1,854)	Blackouts Yes (n = 965)	Blackouts No (n = 889)	*p* value
Demographics			
Female	619 (64.1%)	533 (60.0%)	.063
Age at Year 4	21.8 (0.3)	21.8 (0.4)	.578
Caucasian	613 (63.5%)	472 (53.1%)	< .001
Alcohol Use			
Year 4 motivation to change	2.0 (1.3)	1.7 (1.1)	< .001
Year 5 motivation to change	2.0 (1.4)	1.6 (1.0)	< .001
Year 6 motivation to change	2.0 (1.3)	1.6 (1.0)	< .001
Year 4 frequency feeling drunk	5.6 (7.8)	1.1 (3.4)	< .001
Year 5 frequency feeling drunk	4.7 (6.7)	0.7 (1.9)	< .001
Year 6 frequency feeling drunk	4.7 (7.8)	0.8 (2.5)	< .001
Year 4 quantity of alcohol consumption	3.7 (2.4)	1.6 (1.9)	< .001
Year 5 quantity of alcohol consumption	3.4 (2.4)	1.5 (1.5)	< .001
Year 6 quantity of alcohol consumption	3.1 (3.1)	1.5 (1.6)	< .001

Notes: n (%) or mean (SD). Frequency of motivation to change, feeling drunk, and quantity (i.e., drinks per drinking day) were calculated for the previous three months at each assessment.