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Are Co-Users of Alcohol and Marijuana More Willing to Experience Consequences from Drinking? A Longitudinal Examination among First-Year College Students

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Abstract

Background: Alcohol and marijuana co-users are at heightened vulnerability for experiencing a variety of negative alcohol use outcomes including heavier alcohol use and driving under the influence. The current study explored willingness to experience negative consequences as a potential factor underlying the association between co-user status and negative consequences in an effort to guide future intervention work. From a longitudinal study of first-year college students, we examined willingness to experience consequences at Time 2 as a mediator of co-user status at Time 1 and experience of negative consequences at Time 3.

Methods: First-year college student drinkers ($n = 1,914$) at a large university completed surveys in the fall and spring of their freshman year and the fall of their sophomore year.

Results: Alcohol and marijuana co-users reported higher willingness to experience consequences than alcohol-only users. Willingness to experience consequences partially explained the association between alcohol and marijuana co-use and consequences.

Conclusions: The current study was the first to compare co-users of alcohol and marijuana to alcohol-only users on willingness to experience consequences, and examine the role of willingness as a mediator between co-user status and consequences experienced. Co-users were more willing to experience adverse effects from drinking, in turn predicting more consequences. Intervention work targeting consequences may be less effective for co-users, thus additional work is needed to identify other potential mechanisms for change for this at-risk group.

Keywords

alcohol; marijuana; willingness; consequences; longitudinal

Alcohol and marijuana are the two most commonly used substances, with prevalence rates peaking during normative college ages (Center for Behavioral Health Statistics and Quality, 2016). Given the rapidly changing legislature surrounding medical and recreational marijuana use and steadily high rates of heavy alcohol use (Center for Behavioral Health Statistics and Quality, 2016), there is growing concern regarding the co-use of these substances in this age group (see Yurasek et al., 2017 for a review). Co-users of alcohol and marijuana include individuals who report concurrent use (use of alcohol and marijuana, but not at the same time) or simultaneous use (use of alcohol and marijuana at the same time so that their effects overlap). Co-users are consistently shown to be at heightened vulnerability for experiencing a wider range of negative health outcomes than alcohol-only users, including heavier alcohol use (Midanik et al., 2007; Terry-McElrath et al., 2013) and harms such as drunk driving (Subbaraman and Kerr, 2015), academic problems (Brière et al., 2011), and alcohol use disorder symptoms (Midanik et al., 2007). Within-person, occasions involving alcohol and marijuana use also were associated with significantly more harms than occasions involving alcohol alone (Mallett et al., 2017).

While intervention work has been developed for helping college students reduce heavy drinking (e.g., Brief Alcohol Screening and Intervention for College Students [BASICS]; Dimeff et al., 1999), limited work has specifically targeted alcohol *and* marijuana use. While brief motivational interventions (BMIs) focused on marijuana use have shown promising effects in reducing use among adolescents and young adults (e.g., Bernstein et al., 2009; Lee et al., 2013; Martin et al., 2005), BMIs have been found to have modest effects on reducing alcohol use and reducing marijuana use (Hides et al., 2013; Magill et al., 2009; Woolard et al., 2013). A meta-analysis of BMIs targeting heavy drinking among college students indicated that BMIs did not also reduce marijuana use at short- or long-term follow-ups (White et al., 2015). Moreover, a recent BMI developed for heavy drinking young adults who also use marijuana was unsuccessful in reducing heavy drinking, marijuana use, or co-use days relative to the control condition (Stein et al., 2018). These modest to null effects in reducing co-use of alcohol and marijuana highlight the need for identifying potential mechanisms uniquely associated with co-use that may shed light on the difficulty in reducing co-use.

Willingness to experience negative consequences from alcohol use may be one factor to consider in developing maximally efficacious interventions. The dual-pathway prototype-willingness model (Gibbons et al., 2003) suggests that behavior can be influenced by reasoned action (*intentions*) and social reaction (*willingness*). Beyond one's plans or intentions, under certain situations some individuals may display openness or willingness to engage in behavior, such as risky drinking, despite known risks (Gerrard et al., 2008; Gibbons et al., 1998). Under the prototype-willingness model, previous behavior is modeled as an antecedent to willingness, which in turn predicts risky behavior (Gerrard et al., 2008). Behavior has been modeled as an antecedent to willingness in previous work, such as e-cigarette use predicting willingness to smoke (Wills et al., 2016) and driver experience predicting willingness to engage in risky driving behavior (Harbeck and Glendon, 2018). Recent research studying college students has focused on willingness to experience consequences, finding that students' willingness to experience physical, cognitive, and social consequences was associated with amount of drinking (Mallett et al., 2015) and actual

consequences, even after adjusting for drinking level (Mallett et al., 2011). Individuals who have experienced a consequence from drinking also report being more willing to experience it in the future (Wicki et al., 2018), suggesting that some perceive the benefits of drinking outweigh the potential for experiencing consequences. Recent work also suggests that these pathways operate in similar ways when examining willingness and marijuana use and consequences (Lewis et al., 2018). Prospectively, behavioral willingness was found to be associated with greater likelihood of marijuana use, more frequent marijuana use, and more marijuana-related consequences. Willingness to experience consequences may be an especially salient factor to consider when developing interventions targeting alcohol and marijuana co-use, in light of unique reasons for (Patrick et al., 2018) and subjective effects when (Lee et al., 2017) co-using these substances. In other words, as young adults continue to engage in co-use despite reporting more adverse effects (e.g., clumsy, confused, dizzy) when using alcohol and marijuana together than when using either substance alone (Lee et al., 2017), co-users may be particularly more willing to experience harms from drinking to achieve perceived benefits of co-use.

The current study aimed to elucidate the relationship between co-use and willingness to experience negative alcohol-related consequences. Consistent with other work on this topic (e.g., Mallett et al., 2011), our study solely examined willingness rather than intentions as willingness is more strongly tied to high-risk drinking behaviors than intentions (e.g., Litt et al., 2014). We focused on college students in their first year of college, a high-risk developmental period for heavy and frequent substance use and substance-related problems (e.g., Mallett et al., 2011). Specifically, many increase or initiate drinking and consequences during the transition from high school to their first year in college (Baer, 2002; Sher and Rutledge, 2007). Understanding longitudinal outcomes associated with alcohol and marijuana co-use, specifically, will help inform preventive interventions for high-risk individuals during this critical time window. Consequently, from a longitudinal study of first-year college students, we sought to (1) compare co-users of alcohol and marijuana to alcohol-only users at Time 1 on later willingness to experience negative consequences at Time 2 and (2) determine whether willingness to experience consequences mediated the association between co-user status and experience of negative consequences at Time 3. Willingness was also included as a covariate at Time 1, and consequences was included as a covariate at Time 1 and Time 2. We compared alcohol-only users ("ALC-only") to alcohol and marijuana co-users ("ALC + MJ"). We hypothesized that co-users would be more willing to experience consequences and that this willingness would, in turn, be associated with experiencing more negative consequences.

Materials and Methods

Participant Recruitment and Retention

Four thousand freshmen in their first semester were randomly selected from the university registrar's database at a large, public northeastern university. Participants received a pre-notification letter and email invitation describing the study and inviting their participation. All recruitment materials (the pre-notification letter, an invitation email, and up to seven reminder emails) included a URL and a personal identification number (PIN) for accessing

the survey. Informed consent information was presented upon students' login to the initial survey. The current study utilized data from the fall of participants' freshman year (T1) and two follow-up surveys, occurring in the spring of freshman year (T2) and fall of sophomore year (T3). Fall surveys were open for completion from mid-October to mid-November, while the spring survey was completed between late March and late April. Participants were paid \$25 per survey in the first year of the study (T1 and T2) and \$30 for the T3 survey. They also had the opportunity to earn a \$5 rapid completion bonus for each survey completed within 5 days of invitation. Thus, participants could earn up to \$95. All study procedures were reviewed and approved by the university's Institutional Review Board.

During the recruitment phase, 67.3% ($n = 2,690$) of invited participants opted to participate, which is comparable to response rates reported in other studies using similar web-based recruitment and data collection methods (e.g., Turrise et al., 2009; Turrise et al., 2013). The goal of the study was to assess drinking-related consequences and associated constructs. Therefore, only those who reported current alcohol use (either consuming 1+ drink on a typical week or having 1+ drink on their peaking drinking episode in the month prior to T1) were invited to complete follow-up surveys ($n = 2024$; 75.2%). Of these, 92.0% ($n = 1,863$) completed T2 and 87.4% ($n = 1,768$) completed T3. Participants who only completed the T1 survey ($n = 103$; 5.1%) or did not provide data on marijuana use ($n = 2$; 0.0%) or willingness to experience consequences ($n = 5$; 0.2%) at T1 were omitted from analyses, resulting in a final analytic sample of 1,914 participants. Individuals who completed at least one follow-up survey consumed fewer drinks per week at T1 ($M = 10.73$, $SD = 8.58$) than those who did not continue in the study ($M = 13.04$, $SD = 9.84$), $t(109.32) = -2.33$, $p = .02$. Participants did not differ on any demographic variables (e.g., sex, race, ethnicity).

The analytic sample's mean age at T1 was 18.18 ($SD = .39$) years old. The majority identified as female (56.4%), Caucasian (87.3%), and heterosexual (98.0%). Other ethnic/racial groups represented in the sample included Hispanic (5.1%), Asian (4.7%), African American (3.3%), and multi-racial (3.0%). Rates of involvement in athletics and Greek organizations (fraternities or sororities) were 40.7% and 15.8%, respectively. These demographics are representative of the general student population at the university of study.

Measures

The T1 survey assessed participants' alcohol use, marijuana use, demographic information, and personality traits. Participants reported their willingness to experience negative drinking-related consequences at both T2 (mediator) and T1 (control). The number of times these consequences were experienced was assessed at T3 (outcome) and both T1 and T2 (controls). All measures used in the current study are described below. Descriptive statistics and alphas for continuous measures by the full sample and for each group are presented in Table 1. Intercorrelations among study variables are presented in Table 2.

T1 quantity of drinking.—Typical weekly drinking was assessed using the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). Participants indicated how many drinks they consumed on each day of a typical week during the current semester. A standard drink

was defined as 12 oz of beer or wine cooler, 8.5 oz of malt liquor, 4 oz of wine, 3.5 oz of fortified wine, or 1.5 oz of hard liquor (NIAAA, 2016).

T1 co-user status.—Participants were asked to report how often they used marijuana during the current semester. Response options included *Never*, *Once or twice*, *Monthly*, *Weekly*, and *Daily or almost daily*. Given wide distribution of marijuana use frequency, we dichotomized use to indicate whether participants used marijuana during the current semester (0 = did not use marijuana, 1 = used marijuana). Participants who did not indicate marijuana use during the current semester were assigned to the alcohol-only group (ALC-only; $n = 1175$; 61.4%). Marijuana users were assigned to the alcohol/marijuana co-use group (ALC+ MJ; $n = 739$; 38.6%). Co-users reported using marijuana once or twice (47.1%), monthly (22.7%), weekly (19.9%), and daily or almost daily (10.3%). Rates of recent alcohol use and marijuana use within this sample are comparable to those of the campus at large.

T2 and T1 willingness to experience consequences.—For each of the 12 consequence items, participants were asked to indicate their level of agreement with the following statement, “In the next few months, I am willing to experience [consequence] as a result of my drinking.” Response options were on a 7-point scale ranging from *strongly disagree* (−3) to *strongly agree* (3). Consequences included vomiting; hangover; blacking out; passing out; rude, obnoxious, or insulting behavior; instigating a serious argument or fight; problems with loved ones; missing class, poor academic performance; regretted sexual situations; being pressured or forced to have sex; and making inappropriate sexual advances. Responses were averaged to create a composite index of willingness to experience consequences.

T3, T2, and T1 consequences.—Consistent with some prior work (e.g., Mallett et al., 2015), consequences were assessed using 9 items adapted from the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read et al., 2006) and 3 items adapted from the Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut and Sher, 1992; Larimer et al., 1999). Participants were asked to indicate how many times they experienced each of the 12 consequences listed above as a result of drinking during the current semester (at T1, T2, and T3). Response options ranged from *Never* (0) to *40 or more times* (8). Responses were summed to obtain a composite score.

T1 personality traits.—Six items from prior literature were used to assess the personality traits of sensation seeking, risk-taking, and impulsivity (see Mastroleo et al., 2013; Zuckerman, 1994; 1996). Items included: (1) “I like wild, uninhibited parties”, (2) “I generally seek new and exciting experiences and sensations”, (3) “I enjoy taking risks”, (4) “I welcome new and exciting experiences and sensations even if they are a little frightening”, (5) “I am an impulsive person”, and (6) “I often get into trouble because I do things without thinking.” Participants were asked to indicate their level of agreement with each statement. Response options ranged from *strongly disagree* (−2) to *strongly agree* (2). Responses were averaged to create a composite score of personality.

Analytic Strategy

In the final study sample, data were complete except for T3 consequences (8.0% missing), T2 consequences (3.0% missing), and T2 willingness to experience consequences (3.2% missing). Missing data were handled using full information maximum likelihood estimation (FIML) in Mplus (version 6.1; Muthén and Muthén, 2008). For consequences and quantity of drinking, outliers were adjusted to within 3.29 standard deviations of the mean (Tabachnick and Fidell, 2012). There were 25 outliers on T3 consequences, 36 outliers on T2 consequences, 27 outliers on T1 consequences, and 16 outliers on quantity of drinking.

A path model was conducted to test willingness to experience consequences as a mediator of the association between co-user status (ALC-only or ALC + MJ) and experience of negative consequences. The ALC-only group was coded as 0 and the ALC+ MJ co-user group was coded as 1. As shown in Figure 1, consequences (measured at T3) were regressed onto willingness to experience consequences (measured at T2), which in turn was regressed onto co-user status, quantity of drinking, and willingness to experience consequences (measured at T1). The model controlled for the effects of prior consequences (measured at T2 and T1), birth sex, and personality traits (measured at T1).

Mediation was assessed using the joint significance test (MacKinnon et al., 2002). The joint significance test provides evidence of mediation when an α pathway (i.e., path from predictor to mediator) and β pathway (i.e., path from mediator to outcome) are both significant at the $p < .05$ level. The mediated effect is the product of $\alpha \times \beta$. Models were estimated using bootstrapped samples ($N = 2000$) to derive asymmetrical 95% confidence intervals (CIs) to address any non-normality in the distribution of the outcome. Effects were considered statistically significant when CIs did not contain 0.

Results

Path model results are shown in Table 3. Regarding the effect of co-user status on willingness to experience consequences (α path), students who used ALC+ MJ reported higher willingness to experience consequences than ALC-only individuals. The association between willingness and consequences (β path) was positive and significant, indicating that students who reported greater willingness to experience consequences also reported experiencing more consequences. Finally, examination of the joint product path ($\alpha\beta$) suggested willingness mediated the association between co-user status and consequences after controlling for quantity of drinking, T1 willingness, T1 and T2 consequences, sex, and personality traits. Taken together, model result findings indicate that ALC+ MJ co-users tended to report greater willingness to experience consequences, which in turn was associated with experiencing more consequences.

Supplementary Analyses

Two additional models were tested to further explore the associations between co-user status, quantity of drinking, and frequency of marijuana use. First, we tested the effect of co-user status by alcohol use quantity on willingness to experience negative consequences by adding an interaction term at T1 predicting willingness at T2. This interaction term was non-

significant, $B = 0.00$, $SE = 0.01$, $p = .94$. Second, in a separate model, we omitted the co-user status variable and instead included main effects of alcohol use quantity at T1, marijuana use frequency at T1, and the interaction effect of alcohol use quantity by marijuana use frequency at T1, all predicting willingness at T2. While both the main effect of alcohol quantity, $B = 0.02$, $SE = 0.00$, $p < .001$ and main effect of marijuana use frequency, $B = 0.09$, $SE = 0.03$, $p = .004$ were significantly and uniquely associated with T2 willingness, the interaction effect at T1 on T2 willingness was non-significant, $B = -0.002$, $SE = 0.00$, $p = .360$.

Discussion

The current study extended prior work examining alcohol use and willingness to experience negative consequences (e.g., Mallett et al., 2015) by considering co-use of alcohol and marijuana. We sought to examine whether co-user status (i.e., ALC + MJ vs. ALC-only) would associate with willingness to experience consequences from drinking, and in turn, associate with experiencing harms. Findings revealed that the ALC + MJ group indicated significantly more willingness to experience consequences than the ALC-only group. Moreover, willingness to experience consequences significantly mediated the association between co-user status and consequences. In other words, relative to ALC-only individuals, willingness to experience consequences partially explained the association between ALC + MJ use and consequences. Further, these differences remained significant after controlling for the effects of quantity of drinking, sex, and personality traits.

When examining co-use of alcohol and marijuana, there are several important caveats to consider. Our supplementary findings suggest that the association between co-user status and willingness to experience consequences is not moderated by typical quantity of alcohol consumed, and that the association between quantity of alcohol consumed and willingness is not moderated by frequency of marijuana used. Because co-users of alcohol and marijuana (with marijuana use treated dichotomously) as a whole report greater willingness to experience negative consequences, our findings may imply that *whether* drinkers also use marijuana is more influential on willingness than how *frequently* they use marijuana. However, an important caveat is that quantity of marijuana use was not measured in the current study. As co-users drink more heavily and experience more consequences than alcohol-only users, quantity of alcohol use may be driving the association between co-user status and willingness – however the role of cannabis use quantity remains unclear. Recent work suggests there are distinct profiles of alcohol and marijuana co-users based on their level of use and whether they use both substances simultaneously (Patrick et al., 2018). Further parsing out the association between types of co-users (based on a variety of characteristics of their use patterns) and willingness to experience negative consequences would be an important future contribution in better understanding which co-users are most at risk for harms.

Our findings may have important intervention implications for targeting co-use of alcohol and marijuana in light of findings that BMIs designed to reduce heavy drinking did not also reduce marijuana use (White et al., 2015) and attempts to reduce co-use of alcohol and marijuana have not been efficacious (Stein et al., 2018). Specifically, many empirically-

supported BMIs target risky drinking behavior by discussing potential acute and severe negative consequences that can occur when engaging in heavy drinking as a means of motivating individuals to drink less. Our findings suggest that co-users of alcohol and marijuana are significantly more willing to experience these consequences, potentially to achieve desirable effects or because they do not perceive some consequences to be negative (Mallett et al., 2008; Merrill et al., 2013). As a result, focusing on consequences in BMIs may be a less viable strategy for reducing co-use or consequences within the most high-risk substance use groups.

As co-users represent an at-risk population for experiencing a wide range of negative health behaviors (e.g., Brière et al., 2011; Midanik et al., 2007; Subbarman and Kerr, 2015; Terry-McElrath et al., 2013), future work is needed to identify alternative mechanisms to target in prevention, intervention, or clinical work. For example, greater education on the severity of consequences, such as blacking out from drinking or experiencing withdrawal symptoms, may be needed for co-users who may not perceive certain consequences as adverse. Also, higher willingness to experience consequences despite expressed adverse effects associated with co-use (Lee et al., 2017) may suggest that co-users have especially strong – and potentially unique (Patrick et al., 2018) motivations or expectancies (Barnwell and Earleywine, 2006) for co-using alcohol and marijuana. Focusing on reasons for use may be a critical target for future interventions focused on co-use.

Another future direction concerns exploring alternative theoretical frameworks for studying co-use. Our path models used the prototype-willingness model (Gerrard et al., 2003; Gerrard et al., 2008) as our theoretical orientation, which considers previous behavior (i.e., co-user status) an antecedent to willingness, which in turn predicts risky behavior (i.e., negative consequences). There are, however, alternative theoretical frameworks that warrant consideration such as the theory of planned behavior (Ajzen, 1991) and the theory of reasoned action (Fishbein and Ajzen, 1975). For example, under the theory of reasoned action, norms and attitudes may serve as predictors of intentions or willingness rather than previous behavior. As researchers continue to better understand factors underlying problematic alcohol and marijuana co-use, exploring the role of norms, attitudes, and decision-making attributed to co-use and associated consequences may be a valuable first step.

There are several limitations that should be noted. First, the current study is limited to a single, large university in the northeastern region of the U.S.; findings may not be generalizable to other regions or types of institutions. Second, our study relied on self-reports of substance use behavior and willingness to engage in consequences. These measures may be impacted by recall biases or social desirability concerns. Third, our measurement of marijuana use was based on frequency of marijuana use and was treated dichotomously. Future work would benefit from incorporating a measure of marijuana use quantity. In light of state-by-state changes in recreational and medicinal marijuana legislature, it is becoming increasingly important to identify best practices for measuring marijuana use quantity. There are many challenges to assessing marijuana use quantity given overestimations in self-reported use (Prince et al., 2018) and differences in level of high achieved with different routes of administration (Cooper and Haney, 2009; Spindle et al.,

2018), thus more work is needed in this area. Fourth, our study did not measure simultaneous use of alcohol and marijuana. Though most individuals who report alcohol and marijuana use report using both at the same time so that their effects overlap (e.g., Subbaraman and Kerr, 2015), our study cannot tease apart differences between individuals who use both simultaneously (“simultaneous users”) and individuals who use both but not at the same time (“concurrent users”). As simultaneous users are shown to exhibit more risk than concurrent users (Subbaraman and Kerr, 2015), additional work is needed to examine willingness to experience consequences in simultaneous users specifically. It would be especially useful to examine such behavioral predictors and outcomes at the event-level *when* both substances are being used simultaneously. When examining effects simultaneously, it is also important for future work to consider the amount of alcohol *and* marijuana being used.

The current study was the first to compare co-users of alcohol and marijuana to alcohol-only users on willingness to experience consequences, and the role of willingness as a mediator between co-user status and consequences experienced. Our findings demonstrate that, relative to alcohol-only users, co-users appear to be more willing to experience adverse effects from drinking, in turn predicting more consequences. Intervention work targeting consequences may be less effective for co-users. Additional research is needed to identify other potential mechanisms for change in at-risk alcohol and marijuana co-users.

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Figure 1.

Willingness to experience consequences as a mediator between co-user status (ALC-only vs. ALC + MJ) and consequences. T1 = Time 1; T2 = Time 2; T3 = Time 3.

Table 1:

Descriptive Statistics and Alphas for Continuous Measures

	Alpha	Overall <i>M</i> (<i>SD</i>)	ALC-only <i>M</i> (<i>SD</i>)	ALC + MJ <i>M</i> (<i>SD</i>)
T3				
Negative alcohol-related consequences	0.88	7.11 (8.00)	5.58 (6.87)	9.54 (9.01)
T2				
Willingness to experience consequences	0.92	-2.19 (0.88)	-2.35 (0.80)	-1.94 (0.94)
Negative alcohol-related consequences	0.88	7.03 (8.26)	5.33 (6.91)	9.72 (9.44)
T1				
Quantity of drinking	0.73	10.73 (8.60)	8.17 (7.17)	14.81 (9.09)
Willingness to experience consequences	0.90	-2.31 (0.80)	-2.46 (0.74)	-2.08 (0.84)
Negative alcohol-related consequences	0.87	6.77 (7.78)	4.75 (6.42)	9.98 (8.64)
Personality	0.84	-0.07 (0.84)	-0.29 (0.80)	0.27 (0.77)

Table 2:

Intercorrelations among Study Variables

	1	2	3	4	5	6	7	8	9
1. Co-user status	--								
2. Quantity of drinking	0.38 [*]	--							
3. Willingness (T1)	0.23 [*]	0.43 [*]	--						
4. Willingness (T2)	0.23 [*]	0.39 [*]	0.52 [*]	--					
5. Consequences (T1)	0.33 [*]	0.60 [*]	0.47 [*]	0.34 [*]	--				
6. Consequences (T2)	0.26 [*]	0.49 [*]	0.38 [*]	0.44 [*]	0.62 [*]	--			
7. Consequences (T3)	0.24 [*]	0.45 [*]	0.36 [*]	0.40 [*]	0.56 [*]	0.70 [*]	--		
8. Birth sex	-0.14 [*]	-0.24 [*]	-0.24 [*]	-0.24 [*]	-0.03	-0.01	-0.05	--	
9. Personality	0.33 [*]	0.38 [*]	0.29 [*]	0.31 [*]	0.35 [*]	0.33 [*]	0.33 [*]	-0.13 [*]	--

Note:

^{*}
 $p < .01$.

Co-user status was coded as 0 = ALC-only and 1 = ALC+MJ.

Birth sex was coded as 0 = male and 1 = female.

Table 3:

Path Models Examining Willingness to Experience Negative Consequences as a Mediator between Co-User Status and Negative Consequences Experienced

Predictor	Predictor effect on T2 willingness (α , paths) <i>b</i> (SE)	95% CI	T2 willingness effect on T3 consequences (β path) <i>b</i> (SE)	95% CI	Mediated effect ($\alpha\beta$) <i>b</i> (SE)	95% CI
Co-user status	0.11 (0.04)	[0.03, 0.19]**	0.78 (0.24)	[0.33, 1.23]**	0.09 (0.04)	[0.02, 0.18]*
Quantity of drinking	0.02 (0.00)	[0.02, 0.03]***	0.78 (0.24)	[0.33, 1.23]**	0.02 (0.01)	[0.01, 0.03]**
T1 willingness	0.47 (0.03)	[0.41, 0.54]***	0.78 (0.24)	[0.33, 1.23]**	0.37 (0.12)	[0.15, 0.60]**
Control variable	Control variable effect on consequences					
	<i>b</i> (SE)	95% CI				
T1 consequences	0.66 (0.03)	[0.61, 0.72]***				
T2 consequences	0.64 (0.03)	[0.58, 0.69]***				
Birth sex	-0.30 (0.29)	[-0.86, 0.29]				
Personality	0.90 (0.20)	[0.50, 1.28]***				

Note.

T1 consequences predicted T2 consequences. All other control variables predicted T3 consequences. Co-user status was coded as 0 = ALC-only and 1 = ALC + MJ. Birth sex was coded as 0 = male and 1 = female.

 $p < .001$.

**
 $p < .01$.

*
 $p < .05$.