

# Florida State University Libraries

---

## Determining The Pathways To Alcohol Use Consequences: A Chained Mediation Approach

Jesus Chavarria, Chelsea Ennis, Allison Moltisanti, Nicholas P. Allan and Jeanette Taylor

The publisher's version of record is available at <https://doi.org/10.1007/s11469-020-00272-6>



## **Determining the Pathways to Alcohol Use Consequences: A Chained Mediation Approach**

Jesus Chavarria<sup>1\*</sup>

Chelsea Ennis<sup>2,3</sup>

Allison Moltisanti<sup>4</sup>

Nicholas P. Allan<sup>5</sup>

Jeanette Taylor<sup>6</sup>

<sup>1</sup>Instititue for Mental Health Policy Research, Centre for Addiction and Mental Health, Toronto,  
ON Canada

<sup>2</sup>Southeast Louisiana Veterans Health Care System, New Orleans, LA 70119

<sup>3</sup>South Central Mental Illness Research, Education and Clinical Center (MIRECC), New  
Orleans, LA 70119

<sup>4</sup>Department of Psychiatry and Behavioral Sciences, University of Kansas Medical Center,  
Wichita, KS USA

<sup>5</sup>Department of Psychology, Ohio University, Athens, OH USA

<sup>6</sup>Department of Psychology, Florida State University, Tallahassee, FL USA

### Author Notes

\*Correspondence concerning this article should be addressed to Jesus Chavarria, Centre for  
Addiction and Mental Health, 100 Collip Cir. Suite 200, London ON, Canada N6G 4X8. Phone:  
519-661-2111 ext. 22004; Email: [jesus\\_chavarria@camh.ca](mailto:jesus_chavarria@camh.ca)

Running Head: Emotion regulation, impulsivity, and drinking

## **Abstract**

Research has attempted to explain how emotion dysregulation and impulsivity relate to alcohol use problems. This study extended the literature by testing different pathways to problem alcohol use. We hypothesized that approach impulsivity/disinhibition and alcohol use frequency would mediate the relationship between emotion dysregulation and negative alcohol use consequences. We also hypothesized that alcohol use frequency would mediate the relationship between sensation seeking/reward sensitivity and negative alcohol use consequences. A cross-sectional chained mediation effects model was tested using data from 508 Amazon Mechanical Turk workers who resided in the U.S. (mean age = 33.66, standard deviation = 11.70, 59.6% female). Significant simple mediation effects were found from emotion dysregulation to alcohol use consequences through approach impulsivity/disinhibition, and from sensation seeking/reward sensitivity to alcohol use consequences through alcohol use frequency. No chained mediation effects were found. Two distinct pathways to alcohol use consequences are identified: One from emotion dysregulation through approach impulsivity/disinhibition, and another from sensation seeking/reward sensitivity through alcohol use frequency. This study highlights the importance of understanding the different pathways to problem drinking, as it can be crucial for developing refined treatment techniques.

**Keywords:** Alcohol Use, Emotion Dysregulation, Impulsivity, Sensation Seeking.

## Introduction

Problematic alcohol use is a major public health concern. In the United States alone, alcohol misuse is the fourth leading preventable cause of death, resulting in approximately 88,000 deaths annually (National Institute on Alcohol Abuse and Alcoholism, 2016). According to the National Institute on Alcohol Abuse and Alcoholism (2016), 26.45% of adults reported that they engaged in binge drinking in the past month, and 5.8% of adults had a diagnosis of alcohol use disorder (AUD) during the past year. In addition to being a major cause of death and disability, alcohol misuse costs the United States an estimated \$249 billion annually (Sacks et al., 2015). As such, identifying factors that decrease problematic alcohol use, and the connection between these factors, is especially important.

One such factor associated with problematic alcohol use is emotion regulation. Several etiological models and a large body of literature highlight the role of emotion regulation in the development of substance use disorders, including AUD (Cooper et al., 1995; Cox & Klinger, 2004; Kassel et al., 2010; McCarthy et al., 2010). Individuals with emotion regulation deficits, also known as emotional dysregulation, have difficulty understanding and accepting their emotions, lack the ability to regulate their emotional responses, and have poor impulse control when experiencing negative emotions (Gratz and Roemer, 2004; Salovey et al., 1995). These individuals may use alcohol in an attempt to attenuate their negative emotional states; and indeed, research shows that emotion regulation or ‘coping’ is one of the most common and consequential motives for drinking (Cooper et al., 1995; Kassel et al., 2000; Merrill and Read, 2010; Tripp et al., 2015). Notably, emotional dysregulation has been consistently linked to alcohol use problems, as individuals with an AUD report higher levels of emotion dysregulation than social drinkers (Fox et al., 2008). Among those seeking AUD treatment, individuals with

poorer emotion regulation skills experienced worse treatment outcomes than those with a better ability to regulate their emotions (Berking et al., 2011). These findings indicate that emotion dysregulation may play a vital role in problematic alcohol use and the development of AUDs.

A second related factor involved in problematic alcohol use is impulsivity (Gratz and Roemer, 2004; Lejuez et al., 2010; Littlefield et al., 2010; Magid et al., 2007; Shin et al., 2012; Whiteside and Lynam, 2003). Impulsivity is broadly defined as the tendency to respond immediately to external or internal stimuli without concern for future ramifications (Moeller et al., 2001) and is believed to consist of an approach impulsivity/disinhibition dimension (e.g., rash impulsiveness) and a sensation seeking/reward sensitivity dimension (Gray, 1987). Similar to the broad definition, approach impulsivity/disinhibition is conceptualized as the pursuit of an activity or object with no considerations for potential consequences; whereas sensation seeking/reward sensitivity is a goal-directed drive for highly rewarding stimuli (Dawe, Gullo, & Loxton, 2004). Research highlights their unique contributions to alcohol use and abuse, (Castellanos-Ryan et al., 2011; Coskunpinar et al., 2013; Franken and Muris, 2006; Johnson et al., 2003; Puente et al., 2008) with approach impulsivity/disinhibition leading to alcohol related problems through its association with alcohol use consequences and other risky behaviors such as poly-substance use (Castellanos-Ryan et al., 2011; Quinn and Harden, 2013). Alternatively, sensation seeking/reward sensitivity may contribute to alcohol use initiation and drinking frequency given its association with more frequent and larger quantities of alcohol consumption (Castellanos-Ryan et al., 2011; Coskunpinar et al., 2013; Franken and Muris, 2006; Johnson et al., 2003; Puente et al., 2008).

Emotional dysregulation and impulsivity are both linked to alcohol use problems, and research indicates that the interplay between these two factors likely further heightens

problematic drinking. Specifically, individuals who experience heightened emotional dysregulation may act rashly or impulsively by engaging in maladaptive coping strategies (e.g., alcohol use) in order to regulate negative emotions. Research has highlighted that emotion dysregulation can affect impulsivity, and that targeted interventions to improve emotion regulation result in a reduction of impulsive behaviors (Jacob et al., 2010; Tragesser and Robinson, 2009). Additionally, a number of studies have demonstrated that impulsivity mediates the relationship between emotion dysregulation and alcohol use problems across a number of different samples, including undergraduates, psychiatric patients, and community individuals (Emery, Simons, Clarke & Gaher, 2014; Garofalo & Velotti, 2015). Interestingly, research suggests that this interplay is between emotion dysregulation and approach impulsivity/disinhibition, as emotion dysregulation and sensation seeking/reward sensitivity appear to be unrelated (Jacob et al., 2010; Tragesser & Robinson, 2009).

Frequent alcohol use may play a vital role in the relationships between emotion dysregulation, impulsivity, and alcohol use problems. For instance, more frequent alcohol use is positively associated with experiencing alcohol-related consequences (Park & Grant, 2005; Wescher et al., 1998), with research showing that more frequent alcohol use mediates the relationship between approach impulsivity/disinhibition and alcohol use problems (Simons, 2003). However, to our knowledge, no studies have examined whether alcohol use frequency is a necessary link in the chain from emotion dysregulation to impulsivity and alcohol use problems. As such, the current study sought to test if impulsivity and frequent alcohol use would mediate the relationship between emotion dysregulation and alcohol use problems. We expected to find a significant mediation effect from emotion dysregulation to alcohol use problems through approach impulsivity/disinhibition and alcohol use frequency. We then tested the same paths

with sensation seeking/reward sensitivity. Given the lack of association between emotion dysregulation and sensation seeking (Jacob et al., 2010; Tragesser & Robinson, 2009), we did not expect to find a significant mediation effect from emotion dysregulation to alcohol use problems involving sensation seeking/reward sensitivity. Finally, we hypothesized that more frequent alcohol use would mediate the relationship between sensation seeking/reward sensitivity and alcohol use problems.

## **Method**

### ***Participants and Procedures***

Participants were recruited using Amazon's Mechanical Turk (MTurk), which is an online labor market. The study was accessible only to individuals who reside in the U.S. and had a Human Intelligence Task rating of over 90%, which was an indicator of good past work quality. Upon accessing the survey, participants provided informed consent and completed a battery of questionnaires that lasted approximately one hour. Participants were compensated for their time. All subjects voluntarily participated in this research and provided informed consent. The current study was approved by the Internal Review Board at Florida State University.

The survey was completed by 580 individuals. Two validity check items were included in the survey (e.g., "Are you reading this questionnaire?"), and 49 participants were excluded for answering at least one of these two items incorrectly. As part of the larger study protocol, the survey also contained the Multidimensional Personality Questionnaire (MPQ; Patrick et al., 2002), which includes a scale that assesses invalidity of responses. Twenty-three participants were excluded from the present sample for elevating the invalidity scale of the MPQ. The final sample consisted of 508 individuals (59.6% female) age 18 to 70 years ( $M = 33.66$ ,  $SD = 11.70$ ).

Racial composition of the sample was 81.1% Caucasian, 8.3% African American, 6.1% Asian, and 4.5% mixed race or other.

### ***Measures***

#### *Difficulties in Emotion Regulation Scale (DERS)*

The DERS (Gratz and Roemer, 2004) is a 36-item Likert-type (1 “almost never” to 5 “almost always”) questionnaire that measures facets of emotion dysregulation, including accessibility to effective emotion regulation strategies when distressed (Strategies; range = 8 - 40), difficulties engaging in goal directed behavior when distressed (Goals; range = 5 - 25), denial of negative emotions (Nonacceptance; range = 6 - 30), impulse control difficulties (Impulse; range = 6 - 30), lack of emotional awareness (Awareness; range = 6 - 30) and lack of emotional clarity (Clarity; range = 5 - 25). The current study used the total DERS score (36-180), which assessed the overall ability to regulate emotions, with higher scores indicative of poorer emotion regulation capabilities. Internal consistency in the present sample was high for both the total DERS ( $\alpha = .96$ ) and the subscales ( $\alpha = .85$  to  $.93$ ).

#### *UPPS Impulsive Behavior Scale (UPPS)*

The UPPS (Whiteside and Lynam, 2003) is 45-item Likert-type (1 “agree strongly” to 4 “disagree strongly”) questionnaire that measures four facets of impulsivity, including (lack of) Perseverance (range = 10 – 32), (lack of) Premeditation (range = 11 – 34), Urgency (range = 12 – 47), and Sensation Seeking (range = 12 – 48). We utilized the (lack of) Perseverance, (lack of) Premeditation, and Urgency scales to assess approach impulsivity/disinhibition and the sensation seeking scale to assess sensation seeking/reward sensitivity (Gullo et al., 2014). Higher scores indicated more impulsivity and each scale of the UPPS demonstrated good internal consistency ( $\alpha = .88$  to  $.89$ ).



### *Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ)*

The B-YAACQ (Kahler et al., 2008) is a 24-item dichotomous (0 = “no”, 1 = “yes”) questionnaire that measures the occurrence of negative alcohol-related consequences in the past year. A sum score (0-24) was used to assess alcohol-related consequences with higher scores indicative of more alcohol-related problems. The B-YAACQ displayed strong internal consistency in the present sample ( $\alpha = .94$ ).

### *Alcohol Use Frequency and Quantity*

Participants completed a questionnaire that assessed alcohol use behaviors over the past year. Alcohol use frequency was assessed by the item “how frequently did you drink alcohol during the past year?” The response options were as follows: 1) Never, 2) Once or twice during the year, 3) 3 to 6 times per year, 4) 7 to 10 times per year, 5) About once a month, 6) 2 to 3 times per month, 7) Once or twice a month, 8) 3 or 4 times a week, 9) 5 or more times per week. A second item assessed typical quantity of alcohol consumed (“On occasions when you drink, about how many drinks do you typically consume?”) with the following response options: 1= none. I don’t drink; 2 = 1 drink; 3 = 2 drinks; 4 = 3 drinks; 5 = 4 drinks; 6 = 5 drinks; 7 = 6-8 drinks; 8 = 9-12 drinks; 9 = 13-16 drinks; 10 = 17 drinks. The participants were told one drink approximated one 12 oz. bottle or can of beer, six-ounce glass of wine, or 1.5 ounces of hard alcohol.

### *Data Analytic Strategy*

Descriptive statistics and correlations were computed and reported for all variables. Next, structural equation modeling (SEM) using the robust weighted least squares (WLSMV) estimator was used to test the chained indirect effects models (Mplus version 8 (Muthen and Muthen, 1998-2017)). Model fit was assessed using the  $\chi^2$  statistic and related fit statistics. A non-

significant  $\chi^2$  value indicated excellent model fit to the data and a comparative fit index (CFI) and a Tucker-Lewis Index (TLI) greater than .90 and a root mean square error of approximation (RMSEA) value less than .08 indicated adequate fit to the data (Bentler, 1990; Bentler and Bonett, 1980; Hu and Bentler, 1999; Kenny and McCoach, 2003; Moshagen, 2012; Steiger, 1990; Tucker and Lewis, 1973).

The Emotion Dysregulation factor comprised the nonacceptance, goals, strategies, and clarity subscales of the DERS. The awareness subscale of the DERS was dropped from the models as research suggests that it does not accurately measure the same construct as the other DERS subscales (Bardeen et al., 2012). The Impulse subscale of the DERS was also dropped due to a relatively high correlation with the Urgency subscale of the UPPS ( $r = .66$ ). The Approach Impulsivity/Disinhibition and Sensation Seeking/Reward Sensitivity factors were modeled as a correlated two-factor model with the Approach Impulsivity/Disinhibition factor comprising the (lack of) perseverance, (lack of) premeditation, and urgency subscales. The Sensation Seeking/Reward Sensitivity factor was treated as a single-indicator latent variable comprising the sensation seeking UPPS subscale. The measurement error from the sensation seeking subscale was controlled by subtracting one from the reliability of the sensation seeking scale ( $\alpha = .89$ ) and multiplying the total by the sample variance of the UPPS sensation seeking scale ( $S^2 = 54.39$ ) (Kline, 2015). For identification purposes, the error variance of the Sensation Seeking/Reward Sensitivity factor was fixed to one. Negative Alcohol Use Consequences was modeled using item-level data as a first-order factor comprising 24 indicators, and a manifest variable was used for alcohol use frequency.

A SEM was used to simultaneously examine the relationships between emotion dysregulation, impulsivity, alcohol use frequency, and alcohol use consequences. Six indirect

effects pathways (see Figure 1) were also examined using bias-corrected bootstrapped confidence intervals (CIs) with 1,000 samples (Preacher and Hayes, 2008). This method was chosen to measure significant parameter estimates as it demonstrates an optimal balance between power and Type I error (Cheung and Lau, 2008; MacKinnon et al., 2004). As no fit indices are provided when calculating bias-corrected bootstrapped CIs with the WLSMV estimator, the model was run a second time without CI estimation to produce fit indices. Indirect effects (e.g., mediation) analyses were conducted with the impulsivity factors (Approach Impulsivity/Disinhibition and Sensation Seeking/Reward Sensitivity) included as the first chain of the pathway and alcohol use frequency as the second chain of the pathway (through the paths labeled  $B_{1a}$ ,  $B_{2a}$ , and  $B_3$ , and  $B_{1b}$ ,  $B_{2b}$ , and  $B_3$  in Figure 1). Single indirect effects pathways were examined from Emotion Dysregulation to Negative Alcohol Use Consequences through each impulsivity dimension (through  $B_{1a}$  and  $B_{5a}$ , and  $B_{1b}$  and  $B_{5b}$ ). Single mediator pathways from the impulsivity dimensions to Negative Alcohol Use Consequences through alcohol use frequency (through  $B_{2a}$  and  $B_3$ , and  $B_{2b}$  and  $B_3$ ) were also examined. Finally, a direct pathway from Emotion Dysregulation to Negative Alcohol Use Consequences was included ( $B_6$ ). Gender, age, and alcohol use quantity were included as covariates with paths to each impulsivity dimension, alcohol use frequency, and Negative Alcohol Use Consequences.

## Results

### *Descriptive Statistics*

Descriptive statistics and correlations for all variables are provided in Table 1. Although latent variables were used in the analyses, scale score means were reported to provide sample statistics comparable to other studies. The average participant in the study drank slightly less than once per month and consumed approximately two alcoholic beverages during typical

drinking situations, indicating they were low-risk drinkers. However, 41.3% of the sample reported drinking between one time per month and five or more times per week, with 29.4% of men and 25.8% of women being high risk drinkers (i.e., consumed at least four or five alcoholic beverages during a single session for women and men, respectively (Stein and Cyr, 1997; Wechsler et al., 1995)). Lastly, participants experienced an average of five to six different alcohol related consequences (B-YAACQ) over the past year ( $M = 5.73$ ,  $SD = 6.50$ ), which is comparable to previous literature regarding alcohol use consequences among college students (Pearson and Henson, 2013; Wei et al., 2010), student drinkers with a university alcohol violation (Kahler et al., 2008), and young adults (Lahat et al., 2012).

### ***Chained Mediation Model between Emotion Dysregulation and Negative Alcohol Use Consequences***

The chained mediation model provided adequate fit to the data ( $\chi^2 [df] = 1059.98 [546]$ ,  $p < .001$ ; CFI = .97; TLI = .97; RMSEA [90% CI] = .04 [.04, .05]). Emotion Dysregulation was significantly associated with more Approach Impulsivity/Disinhibition ( $B = 0.986$ , 95% CI [0.799, 1.176]), but was not associated with Sensation Seeking/Reward Sensitivity ( $B = -0.236$ , 95% CI [-0.935, 0.512]) or alcohol use frequency ( $B = 0.289$ , 95% CI [-0.079, 0.669]). Approach Impulsivity/Disinhibition was associated with more Negative Alcohol Use Consequences ( $B = 0.157$ , 95% CI [0.024, 0.287]), but not alcohol use frequency ( $B = 0.077$ , 95% CI [-0.217, 0.356]). Sensation Seeking/Reward Sensitivity was significantly associated with more frequent alcohol use ( $B = 0.054$ , 95% CI [0.018, 0.085]) and more Negative Alcohol Use Consequences ( $B = 0.020$ , 95% CI [0.002, 0.036]). More frequent alcohol use was significantly associated with more Negative Alcohol Use Consequences ( $B = 0.191$ , 95% CI [0.136, 0.242]). Approach Impulsivity/Disinhibition mediated the relationship between Emotion Dysregulation and

Negative Alcohol Use Consequences ( $B = 0.155$ , 95% CI [0.021, 0.276]), and alcohol use frequency mediated the relationship between Sensation Seeking/Reward Sensitivity and Negative Alcohol Use Consequences ( $B = 0.010$ , 95% CI [0.004, 0.017]). There were no chained mediation effects in the model (see Table 2 for all mediation results).

## Discussion

Understanding the pathways to problematic alcohol use is vital for preventing and tailoring treatments for AUDs. The current study sought to determine the effects of emotion dysregulation, approach impulsivity/disinhibition, sensation seeking/reward sensitivity, and alcohol use frequency on experiencing negative alcohol use consequences. Inconsistent with our hypothesis, there was no chained mediation effect from emotion dysregulation to negative alcohol use consequences through approach impulsivity/disinhibition and alcohol use frequency. However, we did find a simple mediation effect from emotion dysregulation to negative alcohol use consequences through increased approach impulsivity/disinhibition. Furthermore, and as expected, we found a simple mediation effect from sensation seeking/reward sensitivity to negative alcohol use consequences through greater alcohol use frequency. These results highlight two distinct pathways to problematic alcohol use.

Consistent with previous research (Castellanos-Ryan et al., 2011; Cooper, 1994; Dvorak et al., 2014; Emery et al., 2014; Garofalo and Velotti, 2015; Quinn and Harden, 2013; Tripp et al., 2015), this study found that greater approach impulsivity/disinhibition drove the relationship between emotion dysregulation and negative alcohol use consequences. This suggests that individuals with poor emotion regulation may become so overwhelmed by their emotions that they react by participating in an impulsive, distracting behavior, such as alcohol use. Interestingly, it is not the act of drinking more frequently that relates to consequential drinking,

but the impulsive use of alcohol as a means to manage emotions that is related to negative alcohol use consequences. These findings highlight the importance of poor emotional control in understanding risky drinking and suggest that treatments focused on distress tolerance may be more beneficial than self-monitoring among individuals who have difficulty regulating their emotions.

The current study also found that more frequent alcohol use partially accounts for the relationship between sensation seeking/reward sensitivity and negative alcohol use consequences, which is consistent with previous research (Castellanos-Ryan et al., 2011; Coskunpinar et al., 2013; Puente et al., 2008; Saha et al., 2007). More specifically, these results suggest that individuals with high levels of sensation seeking/reward sensitivity may use alcohol more frequently, and this more frequent alcohol use then leads to the development alcohol-related problems. This highlights a second distinct pathway to problem drinking that does not involve emotion regulation or approach impulsivity/disinhibition. These individuals may benefit from treatments focused on self-monitoring, which have been shown to reduce problematic behaviors including drinking (Michie et al., 2012; Romanczyk, 1974).

The current study had several strengths including a large sample size that allowed for simultaneous testing of multiple pathways to alcohol use consequences, a sample that included individuals from many locations throughout the U.S., and the use of latent variables, which reduced error variance in the models tested. Limitations must also be noted. First, this study used an online labor market sample, which may reduce the generalizability of the results. However, research shows MTurk samples to be diverse and to yield data of comparable quality to that of traditional data collection methods (Berinsky et al., 2012; Buhrmester et al., 2011). Furthermore, research has found higher rates of psychopathology among MTurk responders, suggesting the

importance of studying these samples (Arditte et al., 2016). Next, although we used a young-adult-specific measure of negative alcohol use consequences, we are confident in the results as research shows the B-YAACQ and other non-age-specific alcohol use consequences measures (i.e., Alcohol Use Disorders Identification Test, Rutgers Alcohol Problems Index) to be highly correlated (Kahler et al., 2008; Pearson et al., 2012; Verster et al., 2009). Last, causality was not established as the current-study used a cross-sectional design. However, these results replicate and are consistent with previous research on this subject (Castellanos-Ryan et al., 2011; Cooper, 1994; Coskunpinar et al., 2013; Dvorak et al., 2014; Emery et al., 2014; Garofalo & Velotti, 2015; Puente et al., 2008; Quinn & Harden, 2013; Saha et al., 2007; Tripp et al., 2015). Future research should utilize prospective study designs to illuminate the directionality of this association.

The current study found two distinct pathways to developing problem alcohol use: one from emotion dysregulation and approach impulsivity/disinhibition, and the second from sensation seeking/reward sensitivity and more frequent drinking. Future studies should continue investigating the different pathways for developing alcohol use problems, as it is only through a more thorough understanding of how and why individuals experience alcohol related consequences that interventions may be further refined to more effectively treat those with AUD.

Author Declarations:

Jesus Chavarria, Chelsea Ennis, Allison Moltisanti, Nicholas Allan, and Jeanette Taylor declare that they have no conflict of interest.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.



## Referece

- Arditte, K.A., Çek, D., Shaw, A.M., Timpano, K.R., 2016. The importance of assessing clinical phenomena in Mechanical Turk research. *Psychological Assessment* 28, 684-691.
- Bardeen, J.R., Fergus, T.A., Orcutt, H.K., 2012. An Examination of the Latent Structure of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment* 34, 382-392.
- Bentler, P.M., 1990. Comparative fit indexes in structural models. *Psychological Bulletin* 107, 238-246.
- Bentler, P.M., Bonett, D.G., 1980. Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin* 88, 588-606.
- Berinsky, A.J., Huber, G.A., Lenz, G.S., 2012. Evaluating Online Labor Markets for Experimental Research: Amazon.com's Mechanical Turk. *Political Analysis* 20, 351-368.
- Berking, M., Margraf, M., Ebert, D., Wupperman, P., Hofmann, S.G., Junghanns, K., 2011. Deficits in emotion-regulation skills predict alcohol use during and after cognitive-behavioral therapy for alcohol dependence. *Journal of Consulting and Clinical Psychology* 79, 307-318.
- Buhrmester, M., Kwang, T., Gosling, S.D., 2011. Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? *Perspectives on Psychological Science* 6, 3-5.
- Castellanos-Ryan, N., Rubia, K., Conrod, P.J., 2011. Response Inhibition and Reward Response Bias Mediate the Predictive Relationships Between Impulsivity and Sensation Seeking and Common and Unique Variance in Conduct Disorder and Substance Misuse. *Alcoholism: Clinical and Experimental Research* 35, 140-155.

- Cheung, G.W., Lau, R.S., 2008. Testing Mediation and Suppression Effects of Latent Variables: Bootstrapping With Structural Equation Models. *Organizational Research Methods* 11, 296-325.
- Cooper, M.L., 1994. Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment* 6, 117.
- Cooper, M.L., Frone, M.R., Russell, M., Mudar, P., 1995. Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality and Social Psychology* 69, 990-1005.
- Coskunpinar, A., Dir, A.L., Cyders, M.A., 2013. Multidimensionality in Impulsivity and Alcohol Use: A Meta-Analysis Using the UPPS Model of Impulsivity. *Alcoholism: Clinical and Experimental Research* 37, 1441-1450.
- Cox, W. M., & Klinger, E. (2004). A motivational model of alcohol use: Determinants of use and change. In W. M. Cox & E. Klinger (Eds.), *Handbook of motivational counseling: Concepts, approaches, and assessment* (pp. 121– 138). New York: John Wiley & Sons Ltd.
- Dawe, S., Gullo, M. J., & Loxton, N. J. (2004). Reward drive and rash impulsiveness as dimensions of impulsivity: implications for substance misuse. *Addictive Behaviors*, 29(7), 1389-1405.
- Duckworth, A.L., Kern, M.L., 2011. A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality* 45, 259-268.
- Dvorak, R.D., Sargent, E.M., Kilwein, T.M., Stevenson, B.L., Kuvaas, N.J., Williams, T.J., 2014. Alcohol use and alcohol-related consequences: Associations with emotion regulation difficulties. *The American Journal of Drug and Alcohol Abuse* 40, 125-130.

- Emery, N. N., Simons, J. S., Clarke, C. J., & Gaher, R. M. (2014). Emotion differentiation and alcohol-related problems: The mediating role of urgency. *Addictive Behaviors, 39*(10), 1459-1463.
- Fischer, S., Smith, G.T., 2008. Binge eating, problem drinking, and pathological gambling: Linking behavior to shared traits and social learning. *Personality and Individual Differences 44*, 789-800.
- Fox, H.C., Hong, K.A., Sinha, R., 2008. Difficulties in emotion regulation and impulse control in recently abstinent alcoholics compared with social drinkers. *Addictive Behaviors 33*, 388-394.
- Franken, I.H.A., Muris, P., 2006. Gray's impulsivity dimension: A distinction between Reward Sensitivity versus Rash Impulsiveness. *Personality and Individual Differences 40*, 1337-1347.
- Garofalo, C., Velotti, P., 2015. Alcohol misuse in psychiatric patients and nonclinical individuals: The role of emotion dysregulation and impulsivity. *Addiction Research & Theory 23*, 294-300.
- Gratz, K.L., Roemer, L., 2004. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment 26*, 41-54.
- Grau, E., Ortet, G., 1999. Personality traits and alcohol consumption in a sample of non-alcoholic women. *Personality and Individual Differences 27*, 1057-1066.
- Gray, J.A., 1987. The psychology of fear and stress. CUP Archive.

- Gullo, M.J., Loxton, N.J., Dawe, S., 2014. Impulsivity: Four ways five factors are not basic to addiction. *Addictive Behaviors* 39, 1547-1556.
- Howell, A.N., Leyro, T.M., Hogan, J., Buckner, J.D., Zvolensky, M.J., 2010. Anxiety sensitivity, distress tolerance, and discomfort intolerance in relation to coping and conformity motives for alcohol use and alcohol use problems among young adult drinkers. *Addictive Behaviors* 35, 1144-1147.
- Hu, L.t., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal* 6, 1-55.
- Jacob, G.A., Gutz, L., Bader, K., Lieb, K., Tüscher, O., Stahl, C., 2010. Impulsivity in Borderline Personality Disorder: Impairment in Self-Report Measures, but Not Behavioral Inhibition. *Psychopathology* 43, 180-188.
- Johnson, S.L., Turner, R.J., Iwata, N., 2003. BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of Psychopathology and Behavioral Assessment* 25, 25-36.
- Kahler, C.W., Hustad, J., Barnett, N.P., Strong, D.R., Borsari, B., 2008. Validation of the 30-Day Version of the Brief Young Adult Alcohol Consequences Questionnaire for Use in Longitudinal Studies. *Journal of Studies on Alcohol and Drugs* 69, 611-615.
- Kassel, J.D.; Hussong, A.M.; Wardle, M.C.; Veilleux, J.C.; Heinz, A.; Greenstein, J.E.; Evatt, D.P. Affective influences in drug use etiology. In: Scheier, L., editor. *Handbook of drug use etiology: Theory, methods, and empirical findings*. Washington, DC US: American Psychological Association; 2010. p. 183-205.

- Kassel, J.D., Jackson, S.I., Unrod, M., 2000. Generalized expectancies for negative mood regulation and problem drinking among college students. *Journal of Studies on Alcohol* 61, 332-340.
- Kenny, D.A., McCoach, D.B., 2003. Effect of the Number of Variables on Measures of Fit in Structural Equation Modeling. *Structural Equation Modeling: A Multidisciplinary Journal* 10, 333-351.
- Khantzian, E.J., 1997. The Self-Medication Hypothesis of Substance Use Disorders: A Reconsideration and Recent Applications. *Harvard Review of Psychiatry* 4, 231-244.
- Kim, H.S., Hodgins, D.C., 2017. Reliability and validity of data obtained from alcohol, cannabis, and gambling populations on Amazon's Mechanical Turk. *Psychology of Addictive Behaviors* 31, 85-94.
- Kline, R.B., 2015. Principles and practice of structural equation modeling. Guilford publications, New York, NY.
- Lahat, A., Pérez-Edgar, K., Degnan, K.A., Guyer, A.E., Lejuez, C.W., Ernst, M., Pine, D.S., Fox, N.A., 2012. Early childhood temperament predicts substance use in young adults. *Translational Psychiatry* 2, e157.
- Lawrence, K.A., Allen, J.S., Chanen, A.M., 2010. Impulsivity in Borderline Personality Disorder: Reward-Based Decision-Making and its Relationship to Emotional Distress. *Journal of Personality Disorders* 24, 785-799.
- Lejuez, C.W., Magidson, J.F., Mitchell, S.H., Sinha, R., Stevens, M.C., De Wit, H., 2010. Behavioral and Biological Indicators of Impulsivity in the Development of Alcohol Use, Problems, and Disorders. *Alcoholism: Clinical and Experimental Research* 34, 1334-1345.

- Levenson, R.W., Sher, K.J., Grossman, L.M., Newman, J., Newlin, D.B., 1980. Alcohol and stress response dampening: Pharmacological effects, expectancy, and tension reduction. *Journal of Abnormal Psychology* 89, 528-538.
- Littlefield, A.K., Sher, K.J., Steinley, D., 2010. Developmental Trajectories of Impulsivity and Their Association With Alcohol Use and Related Outcomes During Emerging and Young Adulthood I. *Alcoholism: Clinical and Experimental Research* 34, 1409-1416.
- MacKinnon, D.P., Lockwood, C.M., Williams, J., 2004. Confidence Limits for the Indirect Effect: Distribution of the Product and Resampling Methods. *Multivariate Behavioral Research* 39, 99-128.
- Magid, V., MacLean, M.G., Colder, C.R., 2007. Differentiating between sensation seeking and impulsivity through their mediated relations with alcohol use and problems. *Addictive Behaviors* 32, 2046-2061.
- McCarthy, DE.; Curtin, JJ.; Piper, ME.; Baker, TB. Negative reinforcement: Possible clinical implications of an integrative model. In: Kassel, JD., editor. Substance abuse and emotion. Washington, DC US: American Psychological Association; 2010. p. 15-42.
- Merrill, J.E., Read, J.P., 2010. Motivational pathways to unique types of alcohol consequences. *Psychology of Addictive Behaviors* 24, 705.
- Michie, S., Whittington, C., Hamoudi, Z., Zarnani, F., Tober, G., West, R., 2012. Identification of behaviour change techniques to reduce excessive alcohol consumption. *Addiction* 107, 1431-1440.
- Moeller, F.G., Barratt, E.S., Dougherty, D.M., Schmitz, J.M., Swann, A.C., 2001. Psychiatric aspects of impulsivity. *American Journal of Psychiatry* 158, 1783-1793.

- Moshagen, M., 2012. The Model Size Effect in SEM: Inflated Goodness-of-Fit Statistics Are Due to the Size of the Covariance Matrix. *Structural Equation Modeling: A Multidisciplinary Journal* 19, 86-98.
- Muthen, L.K., Muthen, B.O., 1998-2017. Mplus, 8 ed. Muthen & Muthen, Los Angeles, CA.
- National Institute on Alcohol Abuse and Alcoholism. Alcohol Facts and Statistics. 2016.
- Park, C. L., & Grant, C. (2005). Determinants of positive and negative consequences of alcohol consumption in college students: Alcohol use, gender, and psychological characteristics. *Addictive behaviors*, 30(4), 755-765.
- Patrick, C.J., Curtin, J.J., Tellegen, A., 2002. Development and validation of a brief form of the Multidimensional Personality Questionnaire. *Psychological Assessment* 14, 150-163.
- Pearson, M.R., Henson, J.M., 2013. Unplanned drinking and alcohol-related problems: A preliminary test of the model of unplanned drinking behavior. *Psychology of Addictive Behaviors* 27, 584-595.
- Pearson, M.R., Kite, B.A., Henson, J.M., 2012. Unique Direct and Indirect Effects of Impulsivity-Like Traits on Alcohol-Related Outcomes via Protective Behavioral Strategies. *Journal of Drug Education* 42, 425-446.
- Preacher, K.J., Hayes, A.F., 2008. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods* 40, 879-891.
- Puente, C.P., González Gutiérrez, J.L., Abellán, I.C., López, A.L., 2008. Sensation Seeking, Attitudes Toward Drug Use, and Actual Use Among Adolescents: Testing a Model for Alcohol and Ecstasy Use. *Substance Use & Misuse* 43, 1615-1627.

- Quinn, P.D., Harden, K.P., 2013. Differential changes in impulsivity and sensation seeking and the escalation of substance use from adolescence to early adulthood. *Development and Psychopathology* 25, 223-239.
- Romanczyk, R.G., 1974. Self-monitoring in the treatment of obesity: Parameters of reactivity. *Behavior Therapy* 5, 531-540.
- Sacks, J. J., Gonzales, K. R., Bouchery, E. E., Tomedi, L. E., & Brewer, R. D. (2015). 2010 national and state costs of excessive alcohol consumption. *American Journal of Preventive Medicine*, 49(5), e73-e79.
- Saha, T.D., Stinson, F.S., Grant, B.F., 2007. The role of alcohol consumption in future classifications of alcohol use disorders. *Drug and Alcohol Dependence* 89, 82-92.
- Salovey, P., Mayer, J.D., Goldman, S.L., Turvey, C., Palfai, T.P., 1995. Emotional attention, clarity, and repair: Exploring emotional intelligence using the Trait Meta-Mood Scale, Emotion, disclosure, & health. American Psychological Association, Washington, DC, US, pp. 125-154.
- Shin, S.H., Hong, H.G., Jeon, S.-M., 2012. Personality and alcohol use: The role of impulsivity. *Addictive Behaviors* 37, 102-107.
- Simons JS (2003) Differential prediction of alcohol use and problems: the role of biopsychological and social-environmental variables. *American Journal of Drug Abuse*, 29, 861–880.
- Simons, J.S., Carey, K.B., Gaher, R.M., 2004. Liability and Impulsivity Synergistically Increase Risk for Alcohol-Related Problems. *The American Journal of Drug and Alcohol Abuse* 30, 685-694.



- Simons, J.S., Carey, K.B., Wills, T.A., 2009. Alcohol abuse and dependence symptoms: A multidimensional model of common and specific etiology. *Psychology of Addictive Behaviors* 23, 415-427.
- Simons, J.S., Gaher, R.M., Correia, C.J., Hansen, C.L., Christopher, M.S., 2005. An affective-motivational model of marijuana and alcohol problems among college students. *Psychology of Addictive Behaviors* 19, 326-334.
- Steiger, J.H., 1990. Structural Model Evaluation and Modification: An Interval Estimation Approach. *Multivariate Behavioral Research* 25, 173-180.
- Stein, M.D., Cyr, M.G., 1997. Women and Substance Abuse. *Medical Clinics of North America* 81, 979-998.
- Stewart, S.H., Zvolensky, M.J., Eifert, G.H., 2001. Negative-reinforcement drinking motives mediate the relation between anxiety sensitivity and increased drinking behavior. *Personality and Individual Differences* 31, 157-171.
- Tice, D.M., Bratslavsky, E., Baumeister, R.F., 2001. Emotional distress regulation takes precedence over impulse control: If you feel bad, do it! *Journal of Personality and Social Psychology* 80, 53.
- Tragesser, S.L., Robinson, R.J., 2009. The Role of Affective Instability and UPPS Impulsivity in Borderline Personality Disorder Features. *Journal of Personality Disorders* 23, 370-383.
- Tripp, J.C., McDevitt-Murphy, M.E., Avery, M.L., Bracken, K.L., 2015. PTSD Symptoms, Emotion Dysregulation, and Alcohol-Related Consequences Among College Students With a Trauma History. *Journal of Dual Diagnosis* 11, 107-117.
- Tucker, L.R., Lewis, C., 1973. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika* 38, 1-10.

- Verster, J.C., Herwijnen, J.v., Olivier, B., Kahler, C.W., 2009. Validation of the Dutch version of the brief young adult alcohol consequences questionnaire (B-YAACQ). *Addictive Behaviors* 34, 411-414.
- Wechsler, H., Dowdall, G.W., Davenport, A., Rimm, E.B., 1995. A gender-specific measure of binge drinking among college students. *American Journal of Public Health* 85, 982-985.
- Wechsler, H., Dowdall, G.W., Maenner, G., Gledhill-Hoyt, J., & Lee, H. (1998). Changes in binge drinking and related problems among American college students between 1993 and 1997. *Journal of American College Health*, 47, 57 – 68.
- Wei, J., Barnett, N.P., Clark, M., 2010. Attendance at alcohol-free and alcohol-service parties and alcohol consumption among college students. *Addictive Behaviors* 35, 572-579.
- Weiss, N.H., Tull, M.T., Viana, A.G., Anestis, M.D., Gratz, K.L., 2012. Impulsive behaviors as an emotion regulation strategy: Examining associations between PTSD, emotion dysregulation, and impulsive behaviors among substance dependent inpatients. *Journal of Anxiety Disorders* 26, 453-458.
- Whiteside, S.P., Lynam, D.R., 2003. Understanding the role of impulsivity and externalizing psychopathology in alcohol abuse: Application of the UPPS Impulsive Behavior Scale. *Experimental and Clinical Psychopharmacology* 11, 210-217.

Table 1

*Means and Correlations for Emotion Dysregulation, Impulsivity, and Negative Alcohol Use Consequences*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. DERS total	-															
2. Goals	.73*	-														
3. Nonacceptance	.78*	.45*	-													
4. Impulse	.83*	.61*	.56*	-												
5. Awareness	.46*	.06	.21*	.22*	-											
6. Strategies	.91*	.70*	.65*	.78*	.24*	-										
7. Clarity	.79*	.43*	.54*	.57*	.24*	.60*	-									
8. (lack of) Premeditation	.26*	.16*	.08	.32*	.25*	.17*	.27*	-								
9. (lack of) Perseverance	.47*	.41*	.29*	.36*	.32*	.38*	.44*	.52*	-							
10. Urgency	.66*	.55*	.43*	.63*	.29*	.58*	.52*	.44*	.46*	-						
11. Sensation Seeking	.06	.02	.06	.10 <sup>†</sup>	.05	-.02	.11 <sup>†</sup>	.24*	-.02	.27*	-					
12. B-YAACQ	.79*	.20*	.22*	.30*	.11 <sup>†</sup>	.25*	.24*	.18*	.15*	.37*	.25*	-				
13. Frequency	.15*	.17*	.12*	.14*	.02	.13*	.09	.11 <sup>†</sup>	.11 <sup>†</sup>	.16*	.19*	.45*	-			
14. Quantity	.23*	.16*	.19*	.20*	.10 <sup>†</sup>	.20*	.22*	.11 <sup>†</sup>	.12*	.29*	.24*	.64*	.53*	-		
15. Age	-.29*	-.16*	-.27*	-.25*	-.12*	-.23*	-.28*	-.05	-.12*	-.21*	-.31*	-.17*	-.14*	-.23*	-	
16. Gender (% male)	.02	.10*	.04	.04	-.19*	.07	-.05	-.06	-.07	-.05	-.26*	-.17*	-.06	-.13*	.02	-
Mean or %	82.82	14.04	14.07	11.96	14.29	18.18	10.27	20.22	18.64	28.83	30.45	5.73	4.52	3.69	33.66	40.43
SD	25.76	5.26	6.46	5.23	4.87	7.97	3.88	5.47	5.23	7.36	8.04	6.50	2.58	2.09	11.70	

*Note.* DERS total = Difficulties in Emotion Regulation Scale total score. Goals = Goals subscale of DERS. Nonacceptance = Nonacceptance subscale of DERS. Impulse = Impulse subscale of DERS. Awareness = Awareness subscale of DERS. Strategies = Strategies subscale of DERS. Clarity = Clarity subscale of DERS. (lack of) Premeditation = (lack of) Premeditation subscale of UPPS. (lack of) Perseverance = (lack of) Perseverance subscale of UPPS. Urgency = Urgency subscale of UPPS. Sensation Seeking = Sensation Seeking subscale of UPPS. B-YAACQ = Brief Young Adult Alcohol Consequences Questionnaire. Frequency = Alcohol Use Frequency. Quantity = Alcohol Use Quantity. Gender coded as 1 = male 2 = female. <sup>†</sup> $p < .05$ , \* $p < .01$ .

Table 2

*Mediation Models of Emotion Dysregulation, Impulsivity Facets, and Alcohol Use Frequency on Negative Alcohol Use Consequences*

	Approach Impulsivity/Disinhibition			Sensation Seeking/Reward Sensitivity		
	<i>B</i>	<i>LL</i>	<i>UL</i>	<i>B</i>	<i>LL</i>	<i>UL</i>
ED-IMP Med.	<b>0.155</b>	<b>0.021</b>	<b>0.276</b>	-0.005	-0.029	0.009
IMP-ALC med.	0.015	-0.043	0.071	<b>0.010</b>	<b>0.004</b>	<b>0.017</b>
Chained Med.	0.014	-0.045	0.072	-0.002	-0.013	0.006

*Note:* These models were run simultaneously, but were separated for clarity. Approach Impulsivity/Disinhibition = chained indirect effects model with Approach Impulsivity/Disinhibition as the impulsivity factor. Sensation Seeking/Reward Sensitivity = chained indirect effects model with Sensation Seeking/Reward Sensitivity as the impulsivity factor. *LL* = lower limit of 95% confidence interval. *UL* = upper limit of 95% confidence interval. ED = emotion dysregulation. IMP = impulsivity factor. ED-IMP Ind. = indirect effect pathway from Emotion Dysregulation to Negative Alcohol Use Consequences through impulsivity factor. IMP-ALC Ind. = indirect effect pathway from impulsivity factor to Negative alcohol Use Consequences through alcohol use frequency. Chained Med. = chained indirect effect pathway from ED to Negative Alcohol Use Consequences through impulsivity factor and then alcohol use frequency. Significant effects are shown in bold type. Covariates included age, gender, and alcohol use quantity.

Figure 1. *Mediation Model of Emotion Dysregulation, Impulsivity, and Alcohol Use Frequency on Negative Alcohol Use Consequences*

Note: indicator variables not shown for Emotion Dysregulation, Approach Impulsivity/Disinhibition, Sensation Seeking/Reward Sensitivity, and Alcohol Use Consequences. Covariates of age, gender, and alcohol use quantity not shown.

Figure 1.

