Higher Emotion Dysregulation and Coping Motives in Alcohol and Marijuana Users

Heather R. Lucke, MS*, Colin R. Harbke, PhD, Eugene W. Mathes, PhD,

and Jonathan J. Hammersley, PhD

Western Illinois University

This article has been accepted for publication in Substance Use & Misuse, published by Taylor & Francis.

Correspondence should be addressed to Heather Lucke, who is now at the University of North Texas (heatherlucke@my.unt.edu)

Disclosure statement: The authors report no conflicts of interest.

Abstract

Background: Prior research indicates that difficulties in emotion regulation may contribute to the use of substances (e.g., alcohol and marijuana) to alleviate negative affect. Therefore, we hypothesized that coping motives for alcohol and marijuana use would serve as an intermediary in the relationship between emotion dysregulation and alcohol/marijuana-related outcomes. *Methods*: The sample comprised 241 college students who used both alcohol and marijuana and 378 college students who used alcohol only. Parallel indirect effects models were estimated to test the hypothesis that emotion dysregulation is associated with alcohol and marijuana use/problems through alcohol and marijuana coping motives. *Results*: Coping motives were consistently identified as the driving intermediary when it came to alcohol and marijuana problems, as well as marijuana consumption. Enhancement motives were only implicated in the relationship between emotion dysregulation and alcohol consumption among the alcohol-only group. *Conclusion*: Overall, the pattern of results suggests that, as hypothesized, alcohol and/or marijuana users higher in emotion dysregulation are more likely to use alcohol or marijuana to alleviate negative affect. Although further research is warranted, individuals who use substances for coping purposes may benefit from interventions designed to improve emotion regulation skills.

Keywords: alcohol; marijuana; emotion dysregulation; substance use motives

Alcohol and marijuana are used extensively among college-age students. A 2018 nationwide study found 18.8 million emerging adults (between the ages of 18 and 25 years) were current alcohol users and 11.8 million (or 34.8% of) emerging adults were current marijuana users (Substance Abuse and Mental Health Services Administration, 2019). Alcohol consumption may interfere with academic performance and to contribute to risky behaviors and relationship problems (Dvorak et al., 2014). In women, alcohol use is also associated with heightened risk for sexual victimization and physical injury (Messman-Moore & Ward, 2014). Marijuana consumption may similarly interfere with academic performance (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2015), as well as result in increased risk for vehicle accidents and medical illnesses (e.g., chronic bronchitis, pneumonia, stroke, and heart attack; Bonn-Miller, Vujanovic, & Zvolensky, 2008; Volkow, Baler, Compton, & Weiss, 2014).

Given such potential negative consequences of alcohol and marijuana use and efforts to curb their use, why do individuals persist in the use of these substances? In addition to long-term physiological effects of substance use that result in persistent desire for use (i.e., addiction), adults may use alcohol and marijuana to self-medicate, that is, to help them cope with negative emotions. Prior research indicates that difficulties in emotion regulation may contribute to coping-oriented alcohol use (Messman-Moore & Ward, 2014; Watkins et al., 2015) and marijuana use (Bonn-Miller, Vujanovic, & Zvolensky, 2008). However, does coping-oriented alcohol and marijuana use mediate the relationship between difficulties in emotional regulation and alcohol and marijuana use, respectively? And, does the relationship between emotion dysregulation, coping motives, and use differ between those who use alcohol only and those who use both alcohol and marijuana?

Emotion Dysregulation

Emotion regulation has been conceptualized as involving the identification, awareness, understanding, and acceptance of emotions; the ability to maintain goal-directed behavior and inhibit impulsive behaviors during the experience of negative emotions; and the ability to engage in flexible use of emotion regulation strategies to appropriately modulate emotional responses (Gratz & Roemer, 2004). Emotion dysregulation, therefore, is characterized by difficulties or absences in one or more of these abilities. Emotion regulation difficulties have been established as a transdiagnostic factor underlying substance use (Weiss, Sullivan, & Tull, 2015; Weiss, Forkus, Contractor, & Schick, 2018) and a variety of psychological disorders (Aldao, Gee, De Los Reyes, & Seager, 2016; Berking & Wupperman, 2012), including but not limited to: borderline personality disorder (Linehan, 1993; Trull, Sher, Minks-Brown, Durbin, & Burr, 2000), generalized anxiety disorder (Mennin et al., 2005), social anxiety disorder (Mennin, McLaughlin, & Flanagan, 2009), post-traumatic stress disorder (Weiss, Tull, Viana, Anestis, & Gratz, 2012), depression (Joormann & Vanderlind, 2014), and bipolar disorder (Green, Cahill, & Malhi, 2007).

Emotion Dysregulation and Substance Use

Prior research suggests that individuals are most likely to engage in risky or impulsive behaviors (e.g., substance use, binge eating, unprotected sex) when experiencing intense negative emotions or stress (Hyman & Sinha, 2009; Weiss et al., 2015). Further, those with greater difficulties in emotion regulation may be more likely to engage in these behaviors to alleviate or distract themselves from their strong negative emotions (Schreiber, Grant, & Odlaug, 2012; Weiss et al., 2015). Because these risky behaviors reduce distress and/or elicit temporary

pleasure, they immediately reinforce the behavior, increasing the likelihood of future engagement in these behaviors. This is consistent with self-medication models of substance use (Khantzian, 1997), which suggests that people engage in coping-oriented substance use (e.g., drinking to alleviate emotional distress) and do so in the absence of other coping strategies. However, long-term use of these maladaptive emotion regulation strategies can exacerbate distress (Hyman & Sinha, 2009; Weiss et al., 2015), and reliance on alcohol for coping purposes can develop into substance use disorders (Cooper, 1994; Watkins, Franz, DiLillo, Gratz, & Messman-Moore, 2015).

Motives for Alcohol and Marijuana Use

Individuals who are otherwise unable to regulate their emotions may use alcohol and marijuana to eliminate negative emotions (*coping motives)*, and to enhance positive emotions (*enhancement motives)*. This is consistent with motivational models of substance use (e.g., Cox & Klinger, 1988), which suggest that substances are used to decrease negative affect and increase positive affect. Previous studies have found that coping motives for alcohol use are associated with more problematic outcomes in comparison to social or enhancement motives for drinking (Messman-Moore & Ward, 2014) and that coping is the strongest predictor of problematic drinking behavior (i.e., heavy alcohol use and/or high levels of alcohol-related consequences; Ham & Hope, 2003) in college students and non-college adults (Veilleux, Skinner, Reese, & Shaver, 2014). Cooper (1994) found that both coping and enhancement motives positively predicted heavy drinking and drinking problems, but enhancement was a stronger predictor of heavy drinking and coping was a stronger predictor of problematic drinking.

As with alcohol use, coping motives are also associated with heavy marijuana use (Bonn-Miller et al., 2008; Simons, Gaher, Correia, Hansen, & Christopher, 2005) and marijuana-related problems (Lee, Neighbors, & Woods, 2007). In a study by Moitra and colleagues (2015), coping-motivated marijuana use was associated with marijuana problem severity, meeting *DSM-5* criteria for cannabis use disorder, and cannabis use disorder severity. Similarly, recent meta-analytic findings identified coping as the only marijuana motive (out of 5) that positively predicted both marijuana consumption frequency and related problems (Bresin & Mekawi, 2019).

Coping as a Mediator of the Association between Emotion Dysregulation and Substance Use and Related Problems

Prior research suggests that difficulties in emotion regulation may contribute to the use of substances during experiences of negative affect (Aurora & Klanecky, 2016; Bonn-Miller et al., 2008; Messman-Moore & Ward, 2014; Watkins et al., 2015). Bonn-Miller and colleagues (2008) evaluated the relationship between individual differences in emotion dysregulation and motives for marijuana use. They found that emotion dysregulation was a significant predictor of coping-related marijuana use, but not other motives, once individual differences in substance use quantity (tobacco, alcohol, and marijuana), negative affectivity, and anxiety sensitivity were controlled. Furthermore, Bonn-Miller et al. found that coping motives mediated the relationship between emotion dysregulation and marijuana use, indicating a significant relationship between emotion dysregulation and coping motives for marijuana use, but not other motives such as enhancement or conformity. Therefore, among marijuana users, those higher in emotion

dysregulation are more likely to use marijuana to alleviate negative affect (Bonn-Miller et al., 2008).

Similarly, coping and enhancement motives also mediated the relationship between emotion dysregulation and alcohol use in both cross-sectional (Aurora & Klanecky, 2016; Messman-Moore & Ward, 2014) and longitudinal studies (Watkins et al., 2015). In a 2016 study, Aurora and Klanecky examined four drinking motives (e.g., coping, enhancement, social, and conformity) as parallel mediators of the association between emotion dysregulation and hazardous drinking. They found that emotion dysregulation was associated with hazardous drinking through coping and enhancement motives. When they broke hazardous drinking into consumption and problems, emotion dysregulation was associated with alcohol consumption through all four motives, but emotion dysregulation was only associated with alcohol problems through coping and enhancement motives. However, since these associations were tested with a sample of college student drinkers, other substance use was not examined.

The Current Study

The goal of the current study was to replicate and extend prior research on emotion dysregulation, coping and enhancement motives, and the consumption of alcohol and marijuana by examining these relationships among college students who reported alcohol use only and college students who reported both alcohol and marijuana use (i.e., dual users). We included the internal motives, coping and enhancement, and not the external motives, social and conformity, because the focus of our study was internal affective processes, not external processes. Further, although these relationships have been examined among alcohol users and marijuana users separately, to our knowledge, no study has directly compared these motives among alcohol users

to dual users, despite the increased risk of substance use-related problems associated with general consumption of both drugs (Hayaki, Anderson, and Stein, 2016; Yurasek, Aston, & Metrik, 2017).

Based on prior research (Aurora & Klanecky, 2016; Bonn-Miller et al., 2008; Messman-Moore & Ward, 2014; Watkins et al., 2015), we hypothesized that a significant portion of the relationship between emotion dysregulation and alcohol and marijuana use would be indirect through coping motives. We also hypothesized that both enhancement and coping motives would be associated with alcohol/marijuana consumption and that coping motives would be more strongly correlated with alcohol/marijuana problems than enhancement motives. These hypotheses were evaluated by estimating the magnitude and significance of the relationship between emotion dysregulation and substance use that is also explained (i.e., indirect effect) through parallel pathways through coping and enhancement motives (see Figure 1). As both alcohol and marijuana use were explored in the present studies, these models were estimated separately for alcohol and marijuana use and motives and then reproduced across those who reported use of alcohol (but not marijuana) and the dual user group.

Method

Procedure

Participants were recruited indirectly via a departmental participant pool or via an e-mail invitation that was sent to all currently enrolled students at a midwestern state university in the United States. Before beginning the survey, participants were presented with a written statement (i.e., cover letter) that included the required elements of consent. Participants were informed that proceeding to complete the questionnaire signified consent. The last page of the survey included

a link to a separate survey page on which participants were given the option to provide an email address to be entered for a chance to win a $25 Walmart gift card. Treatment of participants was approved by the local Institutional Review Board.

Participants

The initial sample was comprised of 785 participants. Of these, 75 did not complete the questionnaire in its entirety and were excluded from data analysis due to missing data. Two additional participants were excluded for reporting an age under 18. Because 20 participants who reported exclusive use of marijuana (i.e., no-concurrent alcohol use) were insufficient to estimate the hypothesized parallel mediation model, this group of respondents was excluded from subsequent analyses. Sixty-nine additional participants who did not endorse either alcohol or marijuana use were also excluded from subsequent analyses. The final sample consisted of 619 participants (78.85% of initial sample). These participants were coded as "Alcohol Users Only" if they endorsed using alcohol but not marijuana (n = 378), or as "Dual Users" if they endorsed using both substances (n = 241). Demographic information for these groups can be found in Table 1.

Measures

Participants completed questionnaires covering demographic characteristics, emotion dysregulation, alcohol consumption and problems, marijuana consumption and problems, and alcohol and marijuana motives.

Difficulties in Emotion Regulation. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) consists of 36 items used to evaluate emotion dysregulation across six dimensions: *Nonacceptance* (e.g., "When I'm upset, I become angry with myself for

feeling that way"), *Goals* (e.g., "When I'm upset, I have difficulty getting work done"), *Impulse* (e.g., "When I'm upset, I have difficulty controlling my behaviors"), *Awareness* (e.g., "When I'm upset, I acknowledge my emotions"), *Strategies* (e.g., "When I'm upset, I believe that there is nothing I can do to make myself feel better"), and *Clarity* (e.g., "I have difficulty making sense out of my feelings"). Responses were made on a five-point scale ranging from 1 (*almost never*) to 5 (*almost always*) and then summed to make a total score. Gratz and Roemer (2004) estimated the internal consistency of the DERS total score to be $\alpha = .93$, and the internal consistency reliability of each subscale to exceed .80. The DERS had adequate internal consistency ($\alpha = .95$ in both subsamples; coefficient alphas for all measures across both subsamples are reported in Tables 2 and 3 on the diagonal). Additional validity evidence comes from scores on the DERS loading with the Negative Mood Regulation Scale (NMR; Catanzaro & Mearns, 1990), which is a similar measure of emotion regulation (Gratz & Roemer, 2004).

Alcohol Consumption and Problems. The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is a screening tool for hazardous drinking behavior that includes three items to measure alcohol consumption and seven items to assess consequences experienced in the past year. The first item from the consumption subscale, for example, states: "How often do you have a drink containing alcohol?" and the first item of the problem subscale states, "How often during the last year have you found that you were not able to stop drinking once you had started?" Responses were made on a 0-4 Likert-type scale, where 0 indicates lower frequency and 4 indicates higher frequency. Evidence across diverse samples supports the two-factor structure (e.g., consumption and problems) for the AUDIT (Doyle, Donovan, & Kivlahan, 2007; Peng, Wilsnack, Kristjanson, Benson, & Wilsnack,

2012). Internal consistency estimates for the AUDIT in the present study (see Table 2) were similar to those reported by Saunders et al. (1993), $\alpha = .93$ for drinking behavior and $\alpha = .81$ for alcohol-related problems.

Coping and Enhancement Motives for Alcohol Use. The coping and enhancement subscales of the Drinking Motives Questionnaire – Revised **(**DMQ-R; Cooper, 1994) were used to evaluate the extent to which a participant's alcohol consumption is motivated by either enhancement or coping. The first item from the Coping subscale, for example, states: "How often do you drink alcohol to forget your worries?" and the first item from the Enhancement subscale states: "How often do you drink alcohol because you like the feeling?" Participants responded to each subscale on a five-point Likert-type scale ranging from 1 (*almost never or never*) to 5 (*almost always or always*). Coping and enhancement motive scores for alcohol use were computed by calculating the mean for each DMQ-R subscale. Cooper (1994) estimated the internal consistency of the coping subscale to be $\alpha = .84$ and $\alpha = .88$ for the enhancement subscale.

Marijuana Consumption and Problems. The Cannabis Use Disorder Identification Test – Revised (CUDIT-R; Adamson et al., 2010) was used to assess marijuana consumption and related problems within the past 6 months. Question 1, for example, asks participants to indicate how often they use cannabis, and Question 3 asks, "How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?" Responses were made on a 0-4 Likert-type scale, where 0 indicates lower frequency and 4 indicates higher frequency. Adamson et al. (2010) estimated the internal consistency of the CUDIT-R to be $\alpha = .91$. Although there is evidence that CUDIT-R scores reflect a single underlying factor (Adamson et

al., 2010), we computed marijuana consumption (first two items) and problems scores (last six items) separately to mirror scoring and interpretation of the AUDIT.

Coping and Enhancement Motives for Marijuana Use. The Marijuana Motives Measure (MMM; Simons, Correia, Carey, & Borsari, 1998) was used to evaluate the extent to which a participant's marijuana consumption was motivated by either enhancement or coping. The MMM was designed to mirror the reasons for drinking as tapped by the DMQ-R. The first item from the Coping subscale, for example, states: "How often do you consume marijuana to forget your worries?" and the first item from the Enhancement subscale states: "How often do you consume marijuana because you like the feeling?" Participants responded to these items on a five-point Likert-type scale ranging from 1 (*almost never or never*) to 5 (*almost always or always*). As for the DMQ-R, the MMM coping and enhancement motive scores were computed by calculating the mean for each subscale. Simons et al. (1998) estimated the internal consistency of the Coping subscale to be $\alpha = .89$ and $\alpha = .92$ for the Enhancement subscale.

Data Analysis

Prior to evaluating the hypothesized indirect effects, zero-order correlations between the key variables of interest were inspected in three combinations: 1) alcohol use motives among the alcohol-only subsample, 2) alcohol use motives among the dual user subsample, and 3) marijuana use motives among the dual user subsample. Next, the hypothesized indirect effects of emotion dysregulation on alcohol use through coping and enhancement motives was tested using a parallel mediation model. As the AUDIT scale is divided into consumption and problems subscales, this model was estimated separately for each criterion variable. Next, the two alcohol-use, parallel-mediation models were then replicated with the subsample of dual users (*n*

= 241). This analytical approach provided a replication opportunity of the pattern of relationships between emotion dysregulation and alcohol use with an independent sample. Lastly, analogous parallel mediation models were estimated to decompose the relationship between emotion dysregulation and marijuana use, through coping and enhancement motives, among the subsample of dual users. As previously described, the subset of participants who reported only marijuana use was too small (n = 20) to provide reliable estimates. All models were estimated using PROCESS v3.2 (Hayes, 2017) and significance of the indirect effects was evaluated using bias-corrected bootstrapped 95% confidence intervals based on 10,000 random samples. The data associated with this manuscript are available via the Center for Open Science at https://osf.io/p8evm/.

Results

Emotion Dysregulation, Coping and Enhancement Motives, and Alcohol Consumption and Problems

Table 2 displays descriptive and correlational statistics for the subsample of students who reported consuming alcohol only (n = 307). Emotion regulation dysfunction was significantly related to coping and enhancement motives and to alcohol-related problems ($.14 < r < .36$), as expected. Emotion dysregulation was not related to alcohol consumption (r = .03), however. Alcohol consumption and problems were strongly related to each other (r = .45), and the interrelations between coping and enhancement motives for drinking alcohol and alcohol use and problems were also strong, $.53 < r < .58$.

Table 3 displays the descriptive statistics and correlations between emotion dysregulation and the key alcohol and marijuana variables among the subsample of dual users (n = 241). A

similar pattern of drinking related correlations was observed for the subsample of dual users as was observed for the alcohol-only subsample. Emotion dysregulation was related to alcohol coping and enhancement motives, as well as alcohol problems, but not alcohol consumption (r = -.01). In addition, emotion dysregulation was related to marijuana coping and enhancement motives, but not marijuana consumption or problems. As for the alcohol-use only subsample, alcohol consumption and problems were moderately-to-strongly related to each other (r = .43) and the interrelations between alcohol motives were of similar magnitude, .39 < r .59 (see Table 3).

Indirect Effects of Emotion Dysregulation on Alcohol Consumption and Problems

The upper-half of Figure 1 displays the standardized path coefficients for the relationship between emotion dysregulation and alcohol consumption, through coping and enhancement alcohol use motives (in-text coefficients are unstandardized). Tests of direct, total, and indirect effects confirmed that emotion dysregulation was related to alcohol consumption through its relationship with alcohol enhancement motives. The bootstrapped 95% *CI* indicated that the indirect effect through alcohol enhancement motives (a_2b_2 = 0.092), was entirely above zero (95% *CLs* of 0.013 & 0.191). In contrast, the indirect effect through alcohol coping motives (a_1b_1 = -0.023) was not different from zero (95% *CLs* of -0.113 & 0.060). Nonetheless, those with higher levels of emotion dysregulation endorsed more alcohol coping motives (a_1 = 0.010, p < .001). The direct effect of emotion dysregulation on alcohol consumption was not significant (c' = -0.003, p = .477) after accounting for coping and enhancement motives. In total, emotion dysregulation and the two alcohol use motives explained 34.4% of the variance in alcohol consumption, and the pattern of relations was consistent with coping and enhancement motives

fully mediating the relationship between emotion dysregulation and alcohol consumption, with enhancement motives being the driver of the indirect effect.

The lower portion of Figure 1 displays the decomposed standardized effects between emotion dysregulation and alcohol problems. In contrast to the findings for alcohol consumption, coping motives were significantly related to alcohol problems (b_1 = 2.080, p < .001) but enhancement motives were not (b_2 = -0.258, p = .581). The bootstrapped 95% *CIs* confirmed that the indirect effect through alcohol coping motives (a_1b_1 = 0.150, 95% *CLs* of 0.039 & 0.284) was the driving force in the hypothesized parallel mediation model. The indirect effect through alcohol enhancement motives (a_2b_2 = -0.011) was not different from zero (95% *CLs* of -0.074 & 0.041). Consistent with a partial-mediation interpretation, the direct effect of emotion dysregulation on alcohol problems remained significant after accounting for the two alcohol motives (c' = 0.030, p < .001). Overall, the combination of emotion dysregulation and coping and enhancement motives accounted for 39.2% of the variance in alcohol problems, and coping motives appear to be the driving force in the relationship between emotion dysregulation and alcohol problems.

Indirect Effects of Emotion Dysregulation on Alcohol Consumption and Problems among the Dual User Group

The pattern of relationships between emotion dysregulation and alcohol consumption was markedly different among the dual consumption group. Specifically, emotion dysregulation was related to alcohol coping motives (a_1 = 0.012, p < .001) and alcohol enhancement motives (a_2 = 0.008, p = .030), but the indirect effects through alcohol coping motives and alcohol enhancement motives were not different from zero (95% *CLs* of -0.064 & 0.214 and -0.017 &

0.181, respectively; see Figure 2a). The direct effect of emotion dysregulation on alcohol consumption remained significant after accounting for the two alcohol motives, $c' = -0.014$, $p = .041$, 95% *CLs* of -0.028 & -0.001. Overall, the combination of emotion dysregulation and coping and enhancement motives accounted for 36.6% of the variance in alcohol consumption among dual users.

Figure 2b displays the decomposed standardized direct effects between emotion dysregulation and alcohol problems among the dual user group. The indirect effect through alcohol coping motives ($a_1b_1 = 0.297$) was significant (95% *CLs* of 0.104 & 0.502), however, the confidence interval around indirect effect through enhancement motives ($a_2b_2 = -0.109$) included zero, ranging from -0.245 to 0.001. The direct effect of emotion dysregulation on alcohol problems was no longer significant after accounting for the indirect effects, $c' = 0.010$, $p = .392$, 95% *CLs* of -0.013 & 0.033. Overall, the observed pattern was consistent with full mediation, and the combination of emotion dysregulation and motives accounted for 29.7% of the variance in alcohol problems among the dual users.

Indirect Effects of Emotion Dysregulation on Marijuana Consumption and Problems among the Dual User Group

Among the dual user group, the results for the marijuana consumption and problems followed the same pattern that was identified for drinking related problems. Specifically, the 95% *CI* indicated that the indirect effects through marijuana coping motives (consumption: $a_1b_1 = 0.085$; problems: $a_1b_1 = 0.125$) was significant (consumption: 95% *CLs* of 0.003 & 0.210; problems: 95% *CLs* of 0.028 & 0.260). Whereas the indirect effects through marijuana enhancement motives (consumption: a2b2 = 0.031; problems: a2b2 = -0.021) were not different

from zero (consumption: 95% *CLs* of -0.025 & 0.109; problems: 95% *CLs* of -0.096 & 0.032). The direct effects from emotion dysregulation to both marijuana consumption ($c' = -0.003$, $p = .523$, 95% *CLs* of -0.013 to 0.007) and problems ($c' = -0.020$, $p = .175$, 95% *CLs* of -0.049 to 0.009) were no longer significant once the motives variables were controlled. In total, the three key variables (i.e., coping, enhancement, emotion dysregulation) explained 36.7% of variance marijuana consumption and 16.8% of the variance in marijuana problems. The resultant patterns were consistent with full mediation for marijuana consumption and problems, and in both cases coping motives was the driving force.

Discussion

The primary purpose of the current study was to replicate and extend prior research in which coping motives mediated the relationship between emotion dysregulation and hazardous drinking (Aurora & Klanecky, 2016; Messman-Moore and Ward, 2014; Watkins et al., 2015) and emotion dysregulation and marijuana use (Bonn-Miller et al., 2008). The secondary purpose was to compare these patterns of relationships among college students who reported alcohol use only and college students who reported dual use.

Summary of Findings

Alcohol Outcomes among the Alcohol-Only Group. Among the group that reported alcohol use only, enhancement motives fully explained the relationship between dysregulation and alcohol consumption (Table 4 summarizes the pattern of results for both subsamples). This suggests that while emotion dysregulation alone was not related to alcohol consumption, individuals who use alcohol to enhance their emotions do consume more alcohol. In contrast, coping motives were the driving force in the relationship between emotion dysregulation and

alcohol-related problems though the relationship was only partially mediated. This is consistent with other research in which coping motives were associated with drinking problems (Cooper, 1994; Messman-Moore & Ward, 2014).

Alcohol Outcomes among the Dual Use Group. Among participants who reported dual use, emotion dysregulation was related to both coping and enhancement motives for alcohol use but, contrary to our hypotheses, this did not translate to levels of actual alcohol consumption (i.e., non-significant indirect effects). However, the combination of emotion dysregulation and both motives explained 36.6% of the variance in alcohol consumption, which suggests that other factors related to alcohol consumption should be examined here (e.g., other motives or alcohol expectancies; Hasking, Lyvers, & Carlopio, 2011).

Similar to findings with alcohol-only sample, for the dual-user group, alcohol coping motives fully mediated the association between emotion dysregulation and alcohol problems. Replicating the results of prior studies (Aurora & Klanecky, 2016; Messman-Moore & Ward, 2014; Watkins et al., 2015) with two new samples supports the conclusion that individuals who are unable to deal with negative emotions in healthy ways and engage in coping-oriented alcohol use are more likely to experience alcohol problems.

Marijuana Outcomes among the Dual Use Group. Consistent with our hypotheses, marijuana coping motives fully mediated the association between emotion dysregulation and both marijuana outcomes (i.e., consumption and problems). Consistent with the findings of Bonn-Miller and colleagues (2008), this suggests that while emotion dysregulation alone was not related to marijuana consumption, individuals higher in emotion dysregulation were more likely to use marijuana to cope with their negative emotions.

Comparisons between Alcohol-only and Dual Use Groups. Enhancement motives were only implicated in the relationship between emotion dysregulation and alcohol consumption among the alcohol-only group. Coping motives were consistently identified as the driving intermediary when it came to alcohol and marijuana problems, as well as marijuana consumption. This pattern of findings suggests that those who use both marijuana and alcohol may especially rely on these substances in times of emotional distress. Consistent with the literature, individuals who use both alcohol and marijuana have been found to experience more alcohol-related problems than those who only use alcohol (Midanik et al., 2007; Simons & Carey, 2006).

In addition, given that 39% of our sample reported both alcohol and marijuana use, it is important to simultaneously examine use of both drugs in future research. Prior research suggests that young adults who use both alcohol and marijuana may use them simultaneously and that doing so increases overall health risks and substance use-related consequences in comparison to using either drug alone (Patrick, Fairlie, & Lee, 2017).

Emotion dysregulation and motives explained approximately one-third (29-39%) of the variance in alcohol problems, alcohol consumption, and marijuana consumption, but only about 17% of the variance in marijuana problems. The percentage of unexplained variance in marijuana problems suggests that other variables associated with marijuana problems, such as marijuana expectancies (Foster, Jeffries, Zvolensky, & Buckner, 2016), anxiety sensitivity (Bonn-Miller et al., 2008), use of other substances (Shillington & Clapp, 2001; Simons et al., 2005), and social anxiety (Buckner, Heimberg, Matthews, & Silgado, 2012) that may play a role in this relationship should be investigated further.

Limitations

The primary limitation of this study is that it is cross-sectional, so causal inferences cannot be made based on the results (Kenny, 2008). For example, while emotion dysregulation may lead to coping-motivated substance use as hypothesized, an equally plausible alternative explanation given the research design is that that substance use may also lead to deficits in emotion dysregulation is also possible. Such an explanation would be consistent with a variety of physiological studies suggest that chronic alcohol use may adversely affect the regions of the brain involved in emotion regulation (Giancola & Moss, 1998; Gorka, Fitzgerald, King, & Phan, 2013; Petit et al., 2015). Moreover, without independent variable manipulation the true causal role of emotion dysregulation as hypothesized herein remains somewhat unclear. Thus, while the overall patterns of relationships described herein are consistent with full or partial mediation, it is important to describe them using their analytical equivalents (i.e., significant *indirect effects*) as opposed to significant *mediators*, which implies a causal sequence. An alternative to independent variable manipulation that could further understanding of these relationships in a causal sense would be longitudinal exploration of these same relationships (e.g., O'Laughlin et al., 2018).

In addition to the methodological limitation of cross-sectional surveys for testing mediation models, it should also be noted that alternative data analytic approaches may have allowed for simultaneous exploration of marijuana use and alcohol use motives as potential mediators in the same model. In addition, use of latent variables (as opposed to scale scores) may have lessened the attenuating impact of (lack of) reliability on the coefficients and effect sizes reported herein. Therefore, it is important that future work incorporates longitudinal data

collection and advanced analytic approaches (SEM) to confirm the pattern of relationships described herein. Another important consideration for future work is to employ multi-group analytic approaches to better explore potential differences in the hypothesized relationships between alcohol and dual users.

Although our questionnaire did not include a diagnostic assessment for psychological disorders, the use of such a screening tool could provide useful information regarding the relationship between emotion dysregulation and the use of alcohol and marijuana as a coping strategy. These variables should be examined among individuals who experience symptoms at subclinical levels as well as among those who meet diagnostic criteria for one or more psychological disorders.

Substance use was measured in different timeframes (e.g., during the past year for alcohol consumption and during the past six months for marijuana consumption). Thus, the use of these substances may have occurred separately, limiting our ability to compare those who used alcohol only versus those who used both substances. In addition, retrospective self-report measures may be inaccurate due to recall bias (Lee et al., 2007) or memory issues related to substance use, which may be particularly relevant to marijuana users (Buckner, Zvolensky, & Ecker, 2013). To address these limitations, future research may benefit from the employment of an Ecological Momentary Assessment (EMA) approach to assess substance use and other variables of interest in the moment at multiple points across time, rather than using retrospective measures.

Conclusions and Implications

Despite these limitations, this research is informative for the future development of interventions and treatments for problematic substance use, particularly for individuals who consume alcohol and other drugs to cope with negative affect. Consistent links between emotion dysregulation, coping motives, and alcohol/marijuana use and problems demonstrated in the literature were replicated in this study (e.g., Aurora & Klanecky, 2016; Bonn-Miller et al., 2008; Messman-Moore and Ward, 2014; Watkins et al., 2015), which revealed meaningful differences between those who reported alcohol use only and those who reported dual use.

Overall, these findings suggest that individuals higher in emotion dysregulation who endorse coping-oriented alcohol or marijuana use may benefit from interventions designed to teach them adaptive emotion regulation skills to utilize as alternatives to substance use (Bradizza et al., 2018). Dialectical Behavioral Therapy (DBT; Linehan, 1993) has been found to improve emotion regulation skills and mood and decrease substance use frequency in women that met DSM-IV criteria for borderline personality disorder and substance dependence (Axelrod, Perepletchikova, Holtzman, & Sinha, 2011). Although further research is warranted to determine whether the findings of our study or the therapeutic outcomes of DBT would extend to other patient populations, it is critical to continue exploring risk factors for substance use disorders and to develop empirically-based interventions.

Table 1.

Sample Demographic Comparison

Variable	Both Samples	Alcohol Users Only	Dual Users
N	619	378	241
Age Range (years)	18-65	18-65	18-53
M(SD) Age	22.40 (6.99)	23.20 (7.82)	21.15 (5.21)
Gender			
Female	433 (70.0%)	270 (71.4%)	163 (67.6%)
Male	149 (24.1%)	89 (23.5%)	60 (24.9%)
Other	37 (5.9%)	19 (5.1%)	18 (7.5%)
Ethnicity			
White/Caucasian	368 (59.5%)	253 (66.9%)	115 (47.7%)
Black/African American	132 (21.3%)	60 (15.9%)	72 (29.9%)
Hispanic/Latinx	76 (12.3%)	40 (10.6%)	36 (14.9%)
Mixed	20 (3.2%)	10 (2.6%)	10 (4.1%)
Other	23 (3.7%)	15 (4.0%)	8 (3.3%)
Sexual Orientation			
Heterosexual	436 (70.4%)	263 (69.6%)	173 (71.8%)
Gay/Lesbian	138 (22.3%)	97 (25.7%)	41 (17.0%)
Bisexual	38 (6.1%)	14 (3.7%)	24 (10.0%)
Other	7 (1.1%)	4 (1.1%)	3 (1.2%)
Year in School			
Freshman	166 (26.8%)	94 (24.9%)	72 (29.9%)
Sophomore	120 (19.4%)	65 (17.2%)	55 (22.8%)
Junior	156 (25.2%)	89 (23.5%)	67 (27.8%)
Senior	123 (19.9%)	88 (23.3%)	35 (14.5%)
Graduate/College Graduate	54 (8.7%)	42 (11.1%)	12 (5.0%)

Table 2.

Descriptive Statistics and Correlations among Variables of Interest among the Subsample of Alcohol Users

Variable	*M (SD)*	1.	2.	3.	4.	5.	6.
1. DERS Total	81.92 (24.91)	(.95)	.25^{+}	.14*	.26^{+}	.03	.36^{+}
2. DMQ-R Coping	1.54 (1.02)		(.91)	.95^{+}	.66^{+}	.54^{+}	.57^{+}
3. DMQ-R Enhancement	1.77 (1.10)			(.89)	.64^{+}	.58^{+}	.53^{+}
4. AUDIT Total	5.55 (5.04)				(.82)	.79^{+}	.90^{+}
5. AUDIT Consumption	3.50 (2.41)					(.76)	.45^{+}
6. AUDIT Problems	2.06 (3.47)						(.80)

Note. Correlations reported following listwise deletion for omitted items/scale scores, usable n = 307. Cronbach's alphas are reported on the diagonal in parentheses. DERS = Difficulties in Emotion Regulation Scale; DMQ-R = Drinking Motives Questionnaire – Revised; AUDIT = Alcohol Use Disorders Identification Test. *p <.05, **p <.01, ^{+}p <.001 (two-tailed).

Table 3.

Descriptive Statistics and Correlations among Variables of Interest among the Subsample of Dual Users

Variable	*M (SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. DERS Total	89.69 (24.30)	(.95)	.26^{+}	.15*	.18*	-.01	.27^{+}	.23**	.15*	.03	.09	.01
2. DMQ-R Coping	2.14 (1.10)		(.89)	.95^{+}	.59^{+}	.55^{+}	.47^{+}	.32^{+}	.33^{+}	.14	.14	.13
3. DMQ-R Enhancement	2.54 (1.21)			(.90)	.55^{+}	.59^{+}	.39^{+}	.30^{+}	.36^{+}	.12	.14	.10
4. AUDIT Total	8.38 (6.05)				(.81)	.77^{+}	.91^{+}	.05	.08	.21**	.19*	.19**
5. AUDIT Consumption	4.72 (2.61)					(.80)	.43^{+}	.03	.08	.06	.11	.04
6. AUDIT Problems	3.65 (4.32)						(.75)	.06	.06	.26^{+}	.20**	.25**
7. MMM Coping	2.73 (1.17)							(.90)	.94^{+}	.50^{+}	.60^{+}	.40^{+}
8. MMM Enhancement	3.01 (1.19)								(.90)	.47^{+}	.59^{+}	.37^{+}
9. CUDIT Total	9.09 (6.70)									(.81)	.76^{+}	.97^{+}
10. CUDIT Consumption	3.71 (2.02)										(.63)	.56^{+}
11. CUDIT Problems	5.35 (5.35)											(.77)

Note. Correlations reported following listwise deletion for omitted items/scale scores, usable n = 186. Cronbach's alphas are reported on the diagonal in parentheses. DERS = Difficulties in Emotion Regulation Scale; DMQ-R = Drinking Motives Questionnaire – Revised; AUDIT = Alcohol Use Disorders Identification Test; MMM = Marijuana Motives Measure; CUDIT = Cannabis Use Disorders Identification Test. *p <.05, **p <.01, ^{+}p <.001 (two-tailed).

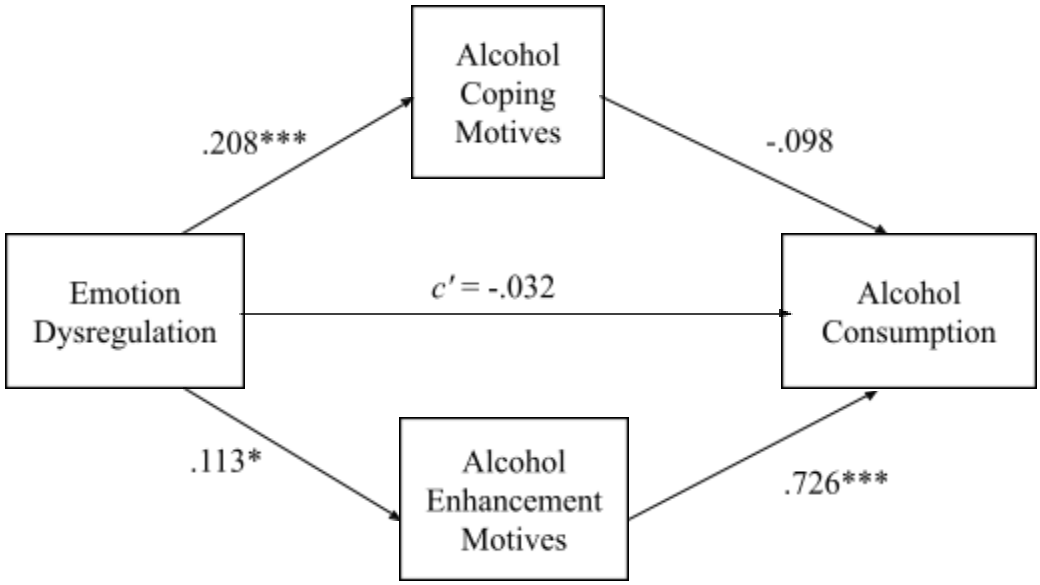
Table 4.

Role of Coping and Enhancement Motives in the Relationship between Emotion Dysregulation and Substance Use

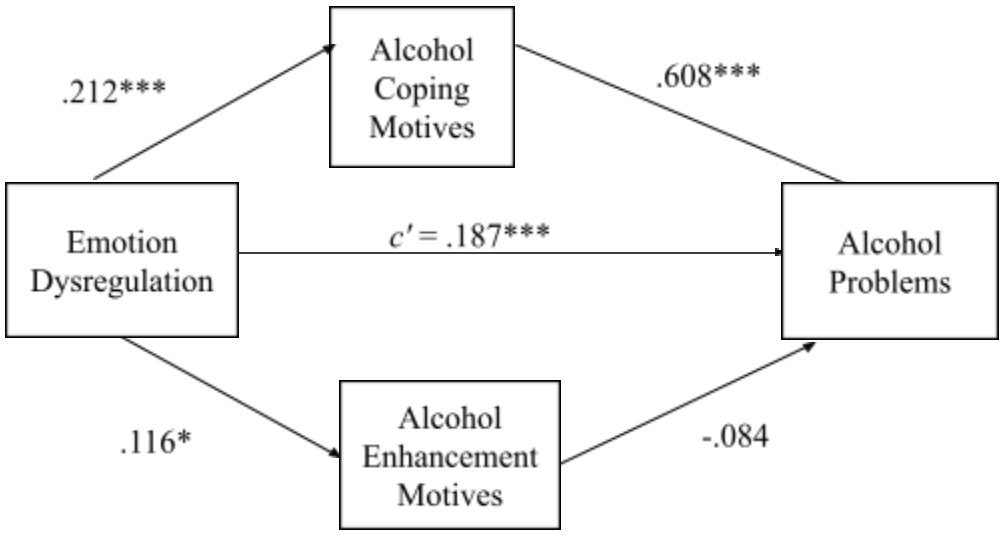
		Indirect (*ab*) Through		Residual	
Group/Outcome	Total (*c*)	Coping	Enhancement	direct (*c′*)	Reflected Pattern
Alcohol Users					
Alcohol Consumption	.029	-.020	**.082**	-.032	Full Mediation
Alcohol Problems	.306	**.129**	-.010	.187	Partial Mediation
Dual Users					
Alcohol Consumption	-.002	.072	.056	-.130	Direct Only
Alcohol Problems	.266	**.323**	-.118	.062	Full Mediation
Marijuana Consumption	.066	**.073**	.027	-.033	Full Mediation
Marijuana Problems	.009	**.132**	-.022	-.101	Full Mediation

Note. Dual Users refers to participants who reported both alcohol and marijuana use. "Mediation" refers to the pattern of statistical effects (i.e., estimates) but should not be interpreted in a causal sense due to the cross-sectional nature of the data. Values reported in table and figures are standardized, values reported in-text are unstandardized. Bolding denotes the primary driver of the indirect effects.

Figure 1. Standardized direct and indirect effects of alcohol motives in the relationship between emotion dysregulation and (a) alcohol consumption (R^2 = .344) and (b) alcohol problems (R^2 = .392). Estimates were obtained among the subsample of participants who reported consuming alcohol only. *p < .05, **p < .01, ***p < .001, two-tailed.

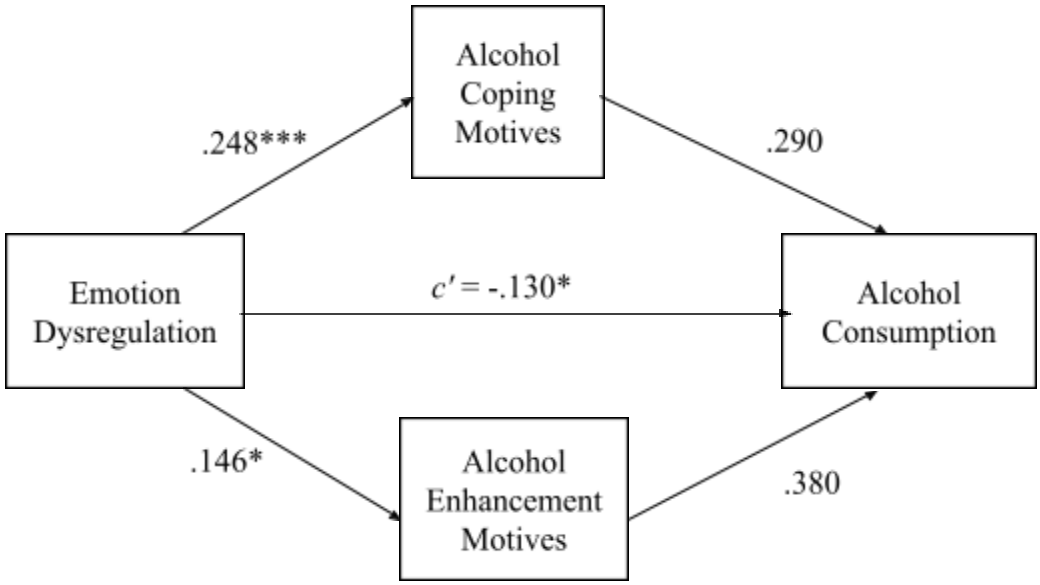


(a)

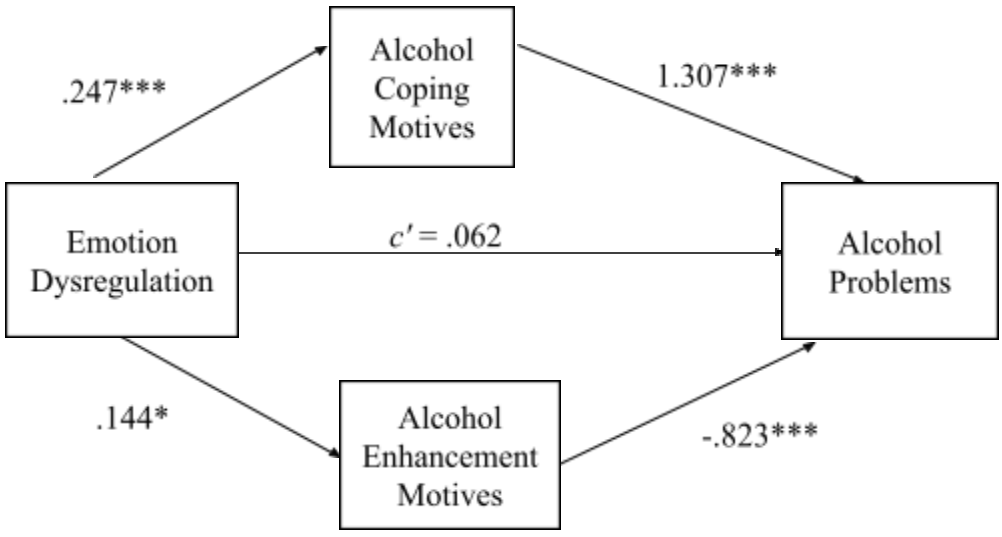


(b)

Figure 2. Standardized direct and indirect effects of alcohol motives in the relationship between emotion dysregulation and (a) alcohol consumption (R^2 = .366) and (b) alcohol problems (R^2 = .297). Estimates were obtained among the subsample of participants who reported consuming alcohol and marijuana. *p < .05, **p < .01, ***p < .001, two-tailed.

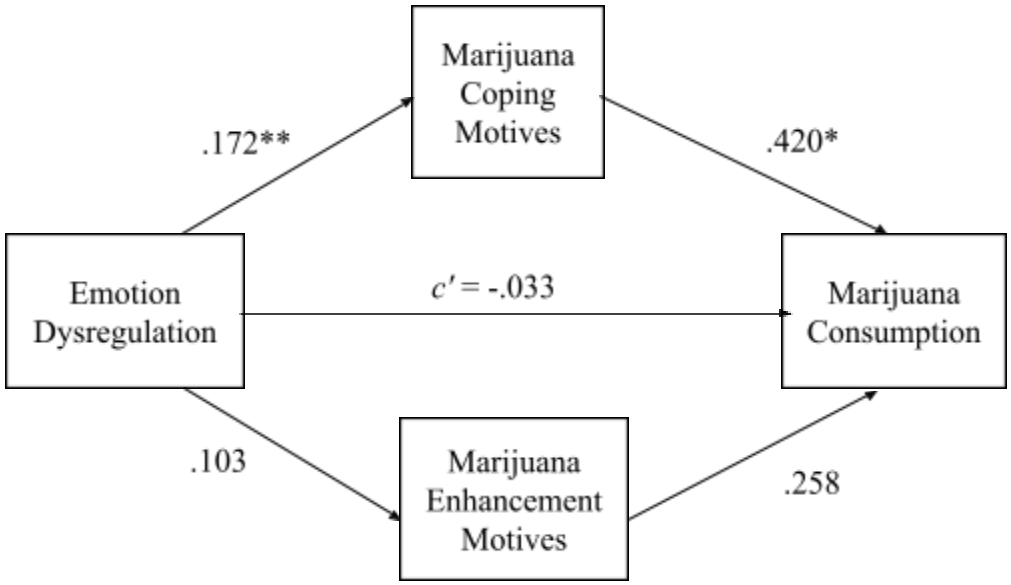


(a)

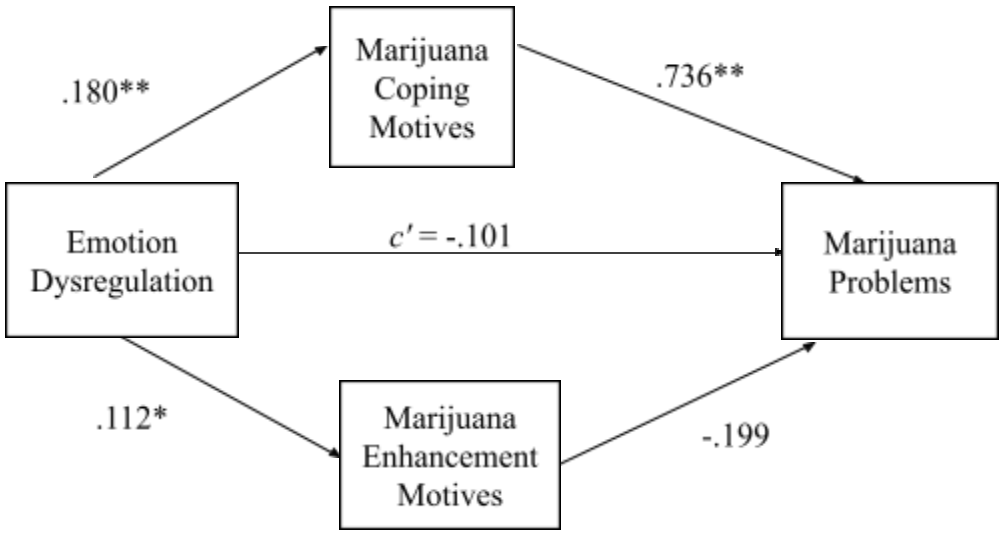


(b)

Figure 3. Standardized direct and indirect effects of marijuana motives in the relationship between emotion dysregulation and (a) marijuana consumption (R^2 = .367) and (b) marijuana problems (R^2 = .168). Estimates were obtained among the subsample of participants who reported consuming alcohol and marijuana. *p < .05, **p < .01, ***p < .001, two-tailed.



(a)



(b)

References

Adamson, S. J., Kay-Lambkin, F. J., Baker, A. L., Lewin, T. J., Thornton, L., Kelly, B. J., & Sellman, J. D. (2010). An improved brief measure of cannabis misuse: the Cannabis Use Disorders Identification Test-Revised (CUDIT-R). *Drug and Alcohol Dependence*, *110*(1), 137-143. https://doi.org/10.1016/j.drugalcdep.2010.02.017

Aldao, A., Gee, D. G., De Los Reyes, A., & Seager, I. (2016). Emotion regulation as a transdiagnostic factor in the development of internalizing and externalizing psychopathology: Current and future directions. *Development and Psychopathology*, *28*(4pt1), 927-946. https://doi.org/10.1017/S0954579416000638

Arria, A. M., Caldeira, K. M., Bugbee, B. A., Vincent, K. B., & O'Grady, K. E. (2015). The academic consequences of marijuana use during college. *Psychology of Addictive Behaviors*, *29*(3), 564–575. https://doi.org/10.1037/adb0000108

Aurora, P., & Klanecky, A. K. (2016). Drinking motives mediate emotion regulation difficulties and problem drinking in college students. *The American Journal of Drug and Alcohol Abuse*, *42*(3), 341-350. https://doi.org/10.3109/00952990.2015.1133633

Axelrod, S. R., Perepletchikova, F., Holtzman, K., & Sinha, R. (2011). Emotion regulation and substance use frequency in women with substance dependence and borderline personality disorder receiving dialectical behavior therapy. *The American Journal of Drug and Alcohol Abuse*, *37*(1), 37–42. https://doi.org/10.3109/00952990.2010.535582

Berking, M., & Wupperman, P. (2012). Emotion regulation and mental health: Recent findings, current challenges, and future directions. *Current Opinion in Psychiatry*, *25*(2), 128–134. https://doi.org/10.1097/YCO.0b013e3283503669

Bonn-Miller, M. O., Vujanovic, A. A., & Zvolensky, M. J. (2008). Emotional dysregulation: Association with coping-oriented marijuana use motives among current marijuana users. *Substance Use & Misuse*, *43*(11), 1656–1668. https://doi.org/10.1080/10826080802241292

Bradizza, C. M., Brown, W. C., Ruszczyk, M. U., Dermen, K. H., Lucke, J. F., & Stasiewicz, P. R. (2018). Difficulties in emotion regulation in treatment-seeking alcoholics with and without co-occurring mood and anxiety disorders. *Addictive Behaviors, 80*, 6-13. https://doi.org/10.1016/j.addbeh.2017.12.033

Bresin, K., & Mekawi, Y. (2019). Do marijuana use motives matter? Meta-analytic associations with marijuana use frequency and problems. *Addictive Behaviors*, 106102. https://doi.org/10.1016/j.addbeh.2019.106102

Buckner, J. D., Heimberg, R. G., Matthews, R. A., & Silgado, J. (2012). Marijuana-related problems and social anxiety: The role of marijuana behaviors in social situations. *Psychology of Addictive Behaviors*, *26*(1), 151. https://doi.org/10.1037/a0025822

Buckner, J. D., Zvolensky, M. J., & Ecker, A. H. (2013). Cannabis use during a voluntary quit attempt: An analysis from ecological momentary assessment. *Drug and Alcohol Dependence*, *132*(3), 610–616. https://doi.org/10.1037/a0025822

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*(2), 117-128. https://doi.org/10.1037/1040-3590.6.2.117

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology*, *97*(2), 168–180. https://doi.org/10.1037/0021-843X.97.2.168

Doyle, S. R., Donovan, D. M., & Kivlahan, D. R. (2007). The factor structure of the alcohol use disorders identification test (AUDIT). *Journal of Studies on Alcohol and Drugs*, *68*(3), 474-479. https://doi.org/10.15288/jsad.2007.68.474

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*(2), 125-130. https://doi.org/10.3109/00952990.2013.877920

Foster, D. W., Jeffries, E. R., Zvolensky, M. J., & Buckner, J. D. (2016). The interactive influence of cannabis-related negative expectancies and coping motives on cannabis use behavior and problems. *Substance Use & Misuse*, *51*(11), 1504-1511. https://doi.org/10.1080/10826084.2016.1188947

Giancola, P. R., & Moss, H. B. (1998). Executive cognitive functioning in alcohol use disorders. In *Recent Developments in Alcoholism* (pp. 227-251). Springer, Boston, MA. https://doi.org/10.1007/0-306-47148-5_10

Gorka, S. M., Fitzgerald, D. A., King, A. C., & Phan, K. L. (2013). Alcohol attenuates amygdala-frontal connectivity during processing social signals in heavy social

drinkers: A preliminary pharmaco-fMRI study. *Psychopharmacology*, *229*(1), 141–154. https://doi.org/10.1007/s00213-013-3090-0

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*(1), 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94

Green, M. J., Cahill, C. M., & Malhi, G. S. (2007). The cognitive and neurophysiological basis of emotion dysregulation in bipolar disorder. *Journal of Affective Disorders*, *103*(1–3), 29–42. https://doi.org/10.1016/j.jad.2007.01.024

Ham, L. S., & Hope, D. A. (2003). College students and problematic drinking: A review of the literature. *Clinical psychology review*, *23*(5), 719-759. https://doi.org/10.1016/S0272-7358(03)00071-0

Hasking, P., Lyvers, M., & Carlopio, C. (2011). The relationship between coping strategies, alcohol expectancies, drinking motives and drinking behaviour. *Addictive Behaviors*, *36*(5), 479-487. https://doi.org/10.1016/j.addbeh.2011.01.014

Hayaki, J., Anderson, B. J., & Stein, M. D. (2016). Dual cannabis and alcohol use disorders in young adults: Problems magnified. *Substance abuse*, *37*(4), 579-583. https://doi.org/10.1080/08897077.2016.1176613

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Publications.

Hyman, S. M., & Sinha, R. (2009). Stress-related factors in cannabis use and misuse: Implications for prevention and treatment. *Journal of Substance Abuse Treatment*, *36*(4), 400–413. https://doi.org/10.1016/j.jsat.2008.08.005

Joormann, J., & Vanderlind, W. M. (2014). Emotion regulation in depression: The role of biased cognition and reduced cognitive control. *Clinical Psychological Science*, *2*(4), 402–421. https://doi.org/10.1177/2167702614536163

Kenny, D. A. (2008). Reflections on mediation. *Organizational Research Methods, 11*, 353–358. https://doi.org/10.1177/1094428107308978

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harvard Review of Psychiatry*, *4*(5), 231–244. https://doi.org/10.3109/10673229709030550

Lee, C. M., Neighbors, C., & Woods, B. A. (2007). Marijuana motives: Young adults' reasons for using marijuana. *Addictive Behaviors*, *32*(7), 1384–1394. https://doi.org/10.1016/j.addbeh.2006.09.010

Linehan, M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford Press.

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, *43*(10), 1281–1310. https://doi.org/10.1016/j.brat.2004.08.008

Mennin, D. S., McLaughlin, K. A., & Flanagan, T. J. (2009). Emotion regulation deficits in generalized anxiety disorder, social anxiety disorder, and their co-occurrence. *Journal of Anxiety Disorders*, *23*(7), 866–871. https://doi.org/10.1016/j.janxdis.2009.04.006

Messman-Moore, T. L., & Ward, R. M. (2014). Emotion dysregulation and coping drinking motives in college women. *American Journal of Health Behavior*, *38*(4), 553–559. https://doi.org/10.5993/AJHB.38.4.8

Midanik, L. T., Tam, T. W., & Weisner, C. (2007). Concurrent and simultaneous drug and alcohol use: results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence*, *90*(1), 72-80. https://doi.org/10.1016/j.drugalcdep.2007.02.024

Moitra, E., Christopher, P. P., Anderson, B. J., & Stein, M. D. (2015). Coping-motivated marijuana use correlates with DSM-5 cannabis use disorder and psychological distress among emerging adults. *Psychology of Addictive Behaviors*, *29*(3), 627–632. https://doi.org/10.1037/adb0000083

O'Laughlin, K. D., Martin, M. J., & Ferrer, E. (2018). Cross-sectional analysis of longitudinal mediation processes. *Multivariate behavioral research, 53*(3), 375-402. https://doi.org/10.1080/00273171.2018.1454822

Patrick, M. E., Fairlie, A. M., & Lee, C. M. (2018). Motives for simultaneous alcohol and marijuana use among young adults. *Addictive Behaviors*, *76*, 363-369. https://doi.org/10.1016/j.addbeh.2017.08.027

Peng, C. Z., Wilsnack, R. W., Kristjanson, A. F., Benson, P., & Wilsnack, S. C. (2012). Gender differences in the factor structure of the Alcohol Use Disorders Identification Test in multinational general population surveys. *Drug and Alcohol Dependence*, *124*(1-2), 50-56. https://doi.org/10.1016/j.drugalcdep.2011.12.002

Petit, G., Luminet, O., Maurage, F., Tecco, J., Lechantre, S., Ferauge, M., ... & Timary, P. (2015). Emotion regulation in alcohol dependence. *Alcoholism: Clinical and Experimental Research*, *39*(12), 2471-2479. https://doi.org/10.1111/acer.12914

Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption. *Addiction*, *88*(6), 791–804. https://doi.org/10.1111/j.1360-0443.1993.tb02093.x

Schreiber, L. R. N., Grant, J. E., & Odlaug, B. L. (2012). Emotion regulation and impulsivity in young adults. *Journal of Psychiatric Research*, *46*(5), 651–658. https://doi.org/10.1016/j.jpsychires.2012.02.005

Shillington, A. M., & Clapp, J. D. (2001). Substance use problems reported by college students: Combined marijuana and alcohol use versus alcohol-only use. *Substance Use & Misuse*, *36*(5), 663-672. https://doi.org/10.1081/JA-100103566

Simons, J. S., & Carey, K. B. (2006). An affective and cognitive model of marijuana and alcohol problems. *Addictive Behaviors*, *31*(9), 1578-1592. https://doi.org/10.1016/j.addbeh.2005.12.004

Simons, J., Correia, C. J., Carey, K. B., & Borsari, B. E. (1998). Validating a five-factor marijuana motives measure: Relations with use, problems, and alcohol motives. *Journal of Counseling Psychology*, *45*(3), 265–273. https://doi.org/10.1037/0022-0167.45.3.265

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*(3), 326–334. https://doi.org/10.1037/0893-164X.19.3.326

Substance Abuse and Mental Health Services Administration. (2019). *Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health* (HHS Publication No. PEP19-5068, NSDUH Series H-54). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Tice, D. M., & Bratslavsky, E. (2000). Giving in to feel good: The place of emotion regulation in the context of general self-control. *Psychological Inquiry*, *11*(3), 149–159. https://doi.org/10.1207/S15327965PLI1103_03

Trull, T. J., Sher, K. J., Minks-Brown, C., Durbin, J., & Burr, R. (2000). Borderline personality disorder and substance use disorders: a review and integration. *Clinical Psychology Review*, *20*(2), 235–253. https://doi.org/10.1016/S0272-7358(99)00028-8

Veilleux, J. C., Skinner, K. D., Reese, E. D., & Shaver, J. A. (2014). Negative affect intensity influences drinking to cope through facets of emotion dysregulation. *Personality and Individual Differences*, *59*, 96–101. https://doi.org/10.1016/j.paid.2013.11.012

Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. (2014). Adverse health effects of marijuana use. *New England Journal of Medicine*, *370*(23), 2219-2227. https://doi.org/10.1056/NEJMra1402309

Watkins, L. E., Franz, M. R., DiLillo, D., Gratz, K. L., & Messman-Moore, T. L. (2015). Does drinking to cope explain links between emotion-driven impulse control

difficulties and hazardous drinking? A longitudinal test. *Psychology of Addictive Behaviors*, *29*(4), 875–884. https://doi.org/10.1037/adb0000127

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*(3), 453–458. https://doi.org/10.1016/j.janxdis.2012.01.007

Weiss, N. H., Sullivan, T. P., & Tull, M. T. (2015). Explicating the role of emotion dysregulation in risky behaviors: A review and synthesis of the literature with directions for future research and clinical practice. *Current Opinion in Psychology*, *1*(3), 22–29. https://doi.org/10.1016/j.copsyc.2015.01.013

Weiss, N. H., Forkus, S. R., Contractor, A. A., & Schick, M. R. (2018). Difficulties regulating positive emotions and alcohol and drug misuse: A path analysis. *Addictive Behaviors*, *84*, 45-52. https://doi.org/10.1016/j.addbeh.2018.03.027

Yurasek, A. M., Aston, E. R., & Metrik, J. (2017). Co-use of alcohol and cannabis: a review. *Current Addiction Reports*, *4*(2), 184-193. https://doi.org/10.1007/s40429-017-0149-8