More Than Meditation: The Role of Dispositional Mindfulness in Alcohol and Marijuana-Related Problems

by

Andrew Charles Philip

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Approved by

Chris Correia, Chair, Associate Professor of Psychology
William Buskist, Distinguished Professor of Psychology
Richard Mattson, Assistant Professor of Psychology

Abstract

Mindfulness refers to experiencing one's self and environment in a conscious and unbiased manner focusing on the temporary, passing quality of thoughts, feelings, and life. Treatment providers have employed mindfulness-based interventions to manage issues including stress, depression, and substance abuse. Greater dispositional mindfulness has been correlated with lesser severity of gambling problems, begging the question of how it may be related to other areas of addictive and compulsive behaviors. The present study found significant relationships between dispositional mindfulness, alcohol use, and marijuana use. Regression analyses revealed that dispositional mindfulness acts as a protective factor against problems related to alcohol use beyond what is mediated by usage alone and Five Factor personality models. Implications for the usage of dispositional mindfulness in treatment interventions and further research are discussed.

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Introduction

Attention to mindfulness is increasing within scientific psychology (Kabat-Zinn, 2000). Over 1000 articles and books became available on the topic over the past two decades. Mindfulness stems from Buddhist philosophy and meditation. It refers to a conscious and unbiased experience, with a focus on the temporary passing quality of thoughts, feelings, and life in general (Kabat-Zinn, 2003). Mindfulness meditation allows individuals to interpret bodily signals and the world around them without applying traditional value statements and feelings to them. Value statements can include self-talk such as "I'm pathetic for feeling guilty," or "it's shameful that I can't stay focused on this meaningful conversation." This type of inner commentary can be harmful because individuals are adding a layer of negativity to an already difficult situation. This negativity can result in feeling worse and less able to solve a problem, when perhaps one should not feel bad at all. By interpreting signals in their original form, an individual practicing mindfulness can evaluate events clearly without adding confusing and possibly inaccurate messages of emotional reactions or associations. This type of unpolluted experience can help individuals understand and respond to events clearly and honestly (Gunaratana, 2002).

For example, although an individual may see a nice car passing by and become overwhelmed by jealousy and begin to think negative thoughts about the driver, one employing mindfulness will observe the feeling of jealousy, label it as jealousy, and then allow the feeling to pass without dwelling on it or judging the emotion as wrong or shameful. Similarly, an

individual with a drug addiction may relapse every time he passes by a location where he previously used substances that taps into the feelings he used to associate with substance abuse. With mindfulness training, an individual becomes keenly aware of his body and mind, noticing that as he passes a certain area their pulse begins to increase and a somewhat nervous sort of feeling arises. An individual can label this feeling as a craving, observe that it will pass just like any other feeling, and allow it to do so without acting on it or judging the craving.

Meditation-based Mindfulness

Traditionally used as a component of meditation, mindfulness is employed in clinical settings as a technique for reducing stress and managing cravings (i.e., Anderson, Lau, Segal, & Bishop, 2007; Witkiewitz, Marlatt, & Walker, 2005). Mindfulness-based meditation (MBM) practitioners are able to assess consciously drug-related cravings and motivations for engaging in substance use, thereby allowing them to respond without succumbing to cravings. Although situational cues to cravings are typically included in relapse prevention programs, the addition of MBM better allowed participants to increase their awareness and self-monitoring of cues to use substances. While increasing their awareness, participants become more present-oriented (by releasing obsessions with the past or future, as well as continually observing the present environment), and decrease impulsivity through being aware and thoughtful of their motivations. MBM also seemed to increase self-efficacy through its use as a challenging skill, and may be useful as an alternate behavior to substance use. Witkiewitz et al. commented that by practicing mindfulness skills during high-risk situations, the reinforcing qualities previously associated with the addictive substance are counterconditioned. By focusing on the present moment, clients are less likely to ruminate and feel guilty about past occasions they have used in that situation, nor do they think about the future gratification of using a substance.

Engaging in thought suppression, such as attempting to ignore all thoughts related to drinking in order to curb alcohol consumption, can have deleterious consequences. Researchers have linked thought suppression to increased substance use in individuals trying to maintain sobriety (Bowen, Witkiewitz, Dillworth, & Marlatt, 2007). MBM decreases the avoidance of difficult thoughts and events because it involves accepting all thoughts into consciousness, regardless of their acceptability or associated discomfort. Furthering Witkiewtiz and colleague's (2005) findings, Bowen et al. (2007) examined the role of MBM in thought suppression using a population of incarcerated males. The MBM helped decrease thought avoidance and contributed to an overall decrease in alcohol use and alcohol-related deleterious consequences during a 3-month period after release from jail. Murray and Leigh (2005) found MBM to work though similar mechanisms (metacognition, acceptance of thoughts and emotions, etc.) as a tool for decreasing avoidance-coping strategies in teaching participants to discontinue the use of escapism to tolerate negative events.

Everyday Mindfulness

Recent work began to tease apart the exact mechanisms by which mindfulness functions and to what extent meditation is required to possess or employ mindfulness techniques. Although encouraging mindfulness during sitting meditation is a useful aspect of treatment, the end goal of MBM is to promote mindfulness during everyday life (everyday mindfulness). It can be important to distinguish between mindfulness experienced during MBM and everyday mindfulness related to meditation.

Thompson and Waltz (2007) examined the relationship between everyday mindfulness, mindfulness during meditation, and personality using a sample of undergraduates with no prior mindfulness experience. Participants completed mindfulness measures before and after

practicing a session of mindfulness-based meditation. The authors found that everyday mindfulness was unrelated to one's skill in practicing mindfulness during sitting meditation.

When Thompson and Waltz (2007) examined personality, everyday mindfulness positively correlated with conscientiousness and agreeableness and negatively correlated with neuroticism. MBM correlated positively with openness but there was no relationship to other personality characteristics. In the second part of the study, Thompson and Waltz (2007) used a five-factor model of mindfulness (FFMQ: Baer et al., 2006) and found a relationship between mindfulness during meditation and observing everyday experience. However, there were several methodological problems in this study. Perhaps most notable was that undergraduates went through one trial of mindfulness meditation, which served as the basis for the comparison between everyday mindfulness and MBM. It is possible that using such an inexperienced and possibly differentially motivated group of meditators created differences in the type and quantity of mindfulness they experienced as compared to more experienced meditators. Nonetheless, this study raises the point that mindfulness during sitting meditation may in fact be a different and perhaps unrelated construct from "everyday" mindfulness, and that skill in MBM does not necessarily lead to high everyday mindfulness and vice versa. Further research is needed to address the long-term effects of MBM.

Dispositional Mindfulness

Given the lack of relationship between sitting and everyday mindfulness and differential patterning of correlations among mindfulness and personality, a dispositional model of mindfulness may indicate a more trait-like type of mindful existence. When viewed as a trait, dispositional mindfulness need not be specifically tied to any form of meditation. Due to a number of currently undefined factors, some individuals are likely better equipped to view

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themselves and the world in a present-focused, judgment-free, and consciously accepting manner.

Lakey, Campbell, Brown, and Goodie (2007) used dispositional mindfulness (DM) to describe this idea of everyday mindfulness unrelated to MBM. The authors conducted two studies to understand better DM as it relates to severity of gambling behaviors. According to the authors, mindfulness may be related to gambling behaviors because gambling problems are linked to difficulties in attending to thoughts and events, which are connected to impulsivity and poor decision-making. When an individual attaches valuative, biased judgments to thoughts, it may result in maladaptive, and unwanted thoughts and actions (Creswell, Way, Eisenberger, & Lieberman, 2007).

In the first study, Lakey et al. (2007) tested frequent (at least weekly) gamblers to determine whether DM relates to problematic gambling, and what, if any, mediating variables are involved in the relationship. Participants (N = 180; 60 female) completed the study for course credit. Participants completed the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Self Control Scale (SCS; Tangney, Baumeister, & Boone, 2004), and the Diagnostic Interview for Gambling Severity (DIGS) (Winters, Specker, & Stinchfield, 2002). Participants that rated higher on the MAAS reported less severe gambling problems when controlling for frequency of gambling and trait self-control. The authors posited that their results were indicative of the utility of mindfulness in maintaining awareness and the resulting positive behavioral consequences.

In a second study, Lakey et al. (2007) sought to replicate the findings of their first study and tease apart the mechanisms involved in the influence of mindfulness on problematic gambling behaviors. Lakey et al.'s second study examined participants' DM with regard to self-

regulation, attention, and judgment biases. The Georgia Gambling Task (GGT; Goodie, 2003) measured overconfidence and willingness to take risks and the Iowa Gambling Task (IGT; Bechara, Tranel, & Damasio, 2000) examined narrow focus on rewards. Both tasks evaluated risk-taking in gambling behaviors as well. Undergraduate participants (N = 309) completed the measures. Results of the first study were replicated. The second study also found that higher mindfulness correlated with higher scores on the IGT and GGT, indicating that participants with greater levels of mindfulness make more effective and accurate judgments and have a less myopic reward focus.

Dispositional Mindfulness and Personality

When discussing mindfulness as a disposition, a plausible argument is that DM is redundant with other personality traits, as DM is correlated with a number of "big five" personality factors (Brown & Ryan, 2003). Significant correlations exist between DM and personality characteristics in the domain of neuroticism and extraversion (negatively and positively correlated, respectively). However, studies report mixed results regarding the personality domains of openness and agreeableness (e.g., Thompson & Waltz, 2007; Baer, Smith, & Allen, 2004). As such, it seems that there is still some degree of uncertainty regarding the extent to which DM may be related to various personality traits. A better understanding of how DM may be correlated with personality is necessary in order to delineate more precisely what DM is and whether it can be considered a unique construct or perhaps an amalgamation of different constructs (i.e. a combination of pre-existing personality traits within the individual).

Measuring Mindfulness

Currently many self-report measures exist for the measure of mindfulness. Baer et al., (2006) summarized and compared five measures of mindfulness in terms of their psychometric

properties. The MAAS (Brown & Ryan, 2003) is a unifactorial measure that assesses daily

attention and awareness. The authors of the MAAS reported the internal consistency as .82, and

test-retest reliability as .81 (intraclass correlation). The MAAS correlates modestly with the

NEO-PI (.18, $p < .01$) and moderately with other measures of mindfulness such as the MMS

(.33, $p < .001$) (Bodner & Langer, 2001). The MAAS is used in MBM programs and more

recently in DM studies (Lackey et al., 2007). The MAAS has been found to be positively

correlated with openness, emotional intelligence, and well-being.

The Mindfulness Questionnaire (MQ; Chadwick, Hember, Mean, Lilley, & Dagnan,

2005) measures how individuals perceive "distressing thoughts and images" in terms of

acceptance, avoidance, and reactance to the stressor. Psychometric data support the use of a

single factor that maps onto mindful observation, letting go, nonaversion, and nonjudgment. The

MQ has an internal consistency of .89. It is correlated ($r = .57$) with the MAAS when used in

MBM studies examining mindfulness based stress reduction (Baer et al., 2006).

The Freiburg Mindfulness Inventory (FMI; Buchheld, Grossman, & Walach, 2001)

measures nonjudgmental present-moment observation and openness to negative experience. The

authors developed the scale for usage in an intensive MBM treatment setting and it is interpreted

unidimensionally. The authors reported an internal consistency of .93. The measure is useful in

assessing increases in mindfulness due to meditation (Walach et al., 2005).

A fourth assessment tool, the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et

al., 2004) measures dispositional mindfulness without relation to MBM. The KIMS was released

in very close temporal proximity with the MAAS and is notable for its measurement of

mindfulness as an attribute rather than a meditation-related skill set. The KIMS has a four factor

design measuring observing, describing, acting with awareness, and accepting without judgment.

Each of the scale's measures is interpreted separately with good internal consistencies ranging from .76 to .91. The measure was used with individuals with borderline personality disorder and college students (Baer et al., 2006).

Although MBM is studied as a treatment mechanism for alcoholism and illicit drug use (i.e., Bowen et al., 2006; Witkiewitz et al., 2005), the only addictive or compulsive behavior DM has been examined with is gambling (Lakey et al., 2007). As problematic drinking behavior and substance abuse continue to be significant problems on college campuses (Ham & Hope, 2003), it could be useful to study the relationship between DM and problems associated with substance use in a college setting. Higher levels of DM may act as a protective factor from certain deleterious behaviors beyond problematic gambling. Similar insulating properties may be present with alcohol and marijuana use, two of the most common substances used on college campuses at this time (Ham & Hope, 2003; Mohler-Kuo, Lee, & Wechsler, 2003).

Current Study

The present study seeks to determine the nature and extent of the relationship between DM and problems related to alcohol and marijuana use in college students. The current literature does not allow for a firm hypothesis on the nature of relationship between mindfulness and the quantity and frequency of alcohol and marijuana consumption. We will seek to describe the relationships between mindfulness and alcohol and marijuana use in a sample of college students. Based on a previous study looking at problems related to gambling (Lakey et al., 2003), it seems that that students assessed as having higher levels of DM will report fewer problematic experiences related to alcohol and marijuana use. This research also seeks to elaborate on the current body of knowledge related to the nature of the role of personality in DM.

Methods

Participants

Participants were 428 Auburn University undergraduates enrolled in psychology courses during the fall 2009 semester. Participants were compensated for their involvement in the study with psychology course research credit. One participant was dropped due to misreporting on self-report measures (e.g., reporting to have drank on "29 out of the past 28 days").

Measures

Mindfulness. The MAAS (Brown & Ryan, 2003) was used in order to draw comparisons with earlier research examining dispositional mindfulness (i.e., Lakey et al., 2007). As noted, although the MAAS is reported to survey several variables related to mindfulness (mindful observation, letting go, nonaversion, and Nonjudgment), it is best utilized as a unifactorial measure. The 15-item measure is scored on a 6-point Likert-scale (1 = *Almost Always*, 6 = *Almost Never*). Internal consistency in the present study was adequate ($\alpha = .89$)

Alcohol Problems. Problems related to alcohol use were assessed with a modified version of the Rutger's Alcohol Problem Index (RAPI; White & Labouvie, 1989). The RAPI consists of 23 items assessing presence or absence of specified problems with alcohol over the individual's lifetime. Ratings are provided on a 5-point Likert scale (0 = *never*, 1 = *1-2 times*, 2 = *3-5 times*, 3 = *6-10 times*, 4 = *more than 10 times*). The RAPI was modified to measure problems during the previous 28 days; a 1-month RAPI displayed adequate test-retest reliability in a

sample of college students ($r = .72$; Borsari & Carey, 2000). Internal consistency in the present study was adequate ($\alpha = .89$).

      Alcohol Consumption. Alcohol consumption was assessed with a modified version of the Daily Drinking Questionnaire (Dimeff, Baer, Kivlahand, & Marlatt, 1999). This measure consists of a grid representing each day of the week to assess participants' daily alcohol consumption for each day of a typical week during the past 6 months. Typical weekly consumption is calculated by summing the number of standard drinks (one standard drink is equal to 12 oz. beer, 5 oz. wine, or 1.5 oz. hard liquor) across the number of drinking days reported by the participant.

      Marijuana Problems and Consumption. Parallel versions of the RAPI and DDQ were used to assess marijuana problems and consumption. Previous research supports the use of these modified parallel versions to assess marijuana use among college students (Simons, Correia, Carey, & Borsari, 1998; Simons, Gaher, Correia, Hansen, & Christopher, 2005). The internal consistency of the Marijuana Problem Index (MPI) the present study was adequate ($\alpha = .95$).

      Personality. Personality characteristics was measured using the Big Five Inventory-10, a brief 10-item measure of the Five Factor personality traits consisting of two questions per trait scale measuring each pole of the trait (Rammstedt & John, 2007). Participants respond to respond to the extent they see themselves as someone who fits a given personality trait. Subjects respond on a 5-point Likert scale (1 = *Disagree Strongly*, 5 = *Agree Strongly*). The measure demonstrates adequate validated using both American and European university students. Test-retest reliability was adequate ($r = .72$); convergent validity with the NEO-PI-R (Costa & McCrae, 1992) was also satisfactory ($r = .67$). Internal consistency in the present study was adequate across each of the five personality traits ($\alpha = .81$ to $\alpha = .84$).

Statistical Analyses

  Descriptive statistics were used to characterize the sample in terms of demographics, alcohol and marijuana use, personality measures, and dispositional mindfulness. Initial analyses screened for potential outliers and made necessary corrections. Internal reliability was assessed for all of the primary measures. Pearson correlations were used to examine the bivariate relationships among the primary variables, and to examine the specific relationship between substance use and dispositional mindfulness, and the relationship between dispositional mindfulness and measures of personality. A series of regression analyses were then conducted to determine the relative contribution of demographic variables, substance use consumption variables, personality variables, and disposition mindfulness in predicting substance-related problems. Parallel analyses were used to investigate predictions of alcohol and marijuana related problems. The analyses were designed to determine if measures of DM contribute to reports of the severity and extent of problems related to alcohol and marijuana use above and beyond the amount of usage itself and after controlling for other variables. More specifically, the models looked to see if the relationship between MAAS and substance related problems was either moderated by levels of substance use or mediated by personality variables.

Results

Summary of Descriptive Data

The descriptive data (e.g., sample size, mean, standard deviation, minimum, and maximum) for all variables used in the analyses are presented in Table 1 (Appendix A). Of the 427 participants, 71% were female. The mean age of the sample was 20.42 (SD=1.66). The majority of participants were White (85.9%). Of our sample, 74.2% of participants reported drinking alcohol in the past 28 days; 57.1% reported at least 1 binge drinking episode in the past 28 days. The majority (60.4%) of participants reported at least 1 problem associated with alcohol consumption. Regarding marijuana, 21.8% reported using in the past 28 days, and 21.1% of participants reported at least 1 problem associated with marijuana use. When examining only those who reported past 28 day substance use, 80.2% of drinkers and 75.6% of marijuana users reported 1 or more problems related to substance use. On the measure of mindfulness (MAAS), the average score was 3.75 (SD=.78).

Correlations Among Alcohol, Marijuana, and Mindfulness

Correlations between the alcohol and marijuana variables are presented in Table 2 (Appendix A). Daily drinking measured by the DDQ and problems related to drinking, as measured by the RAPI, were significantly correlated ($r = .46$, $p < .01$), and daily marijuana usage measured by the DMQ was significantly correlated with problems associated with marijuana use as measured by the MPI ($r = .51$, $p < .01$). Daily drinking and daily marijuana use

were also significantly correlated ($r = .25$, $p < .01$), as were problems related to drinking and marijuana usage ($r = .45$, $p < .01$).

Correlations between the mindfulness, drinking, and marijuana variables are presented in Table 2 (Appendix A). When examining the entire subject pool, there were significant correlations between the mindfulness scores and daily drinking ($r = -.12$, $p < .05$), as well as between mindfulness and drinking related problems ($r = -.24$, $p < .01$). A significant correlation was also found between mindfulness and problems associated with marijuana use ($r = -.12$, $p < .05$). Although not depicted in a table, when examining only those reporting drinking and/or marijuana use in the past 28 days, the MAAS was significantly correlated with alcohol use ($r = -.14$, $p < .05$) and alcohol related problems ($r = -.29$, $p < .01$) among those reporting alcohol use. Among marijuana users, marijuana use ($r = -.02$, $p = .89$) and related problems ($r = -.17$, $p = .12$) were not significantly associated with mindfulness.

Correlations Among Mindfulness and Personality Variables

Correlations among the mindfulness and Five Factor personality variables are presented in Table 3 (Appendix A). The correlation between the MAAS and Extraversion scores was significant ($r = .10$, $p < .05$). The correlation between the MAAS and Agreeableness scores was significant ($r = .29$, $p < .01$). The correlation between the MAAS and Conscientiousness scores was significant ($r = .41$, $p < .01$). The correlation between the MAAS and Neuroticism scores was also significant ($r = -.35$, $p < .01$). Openness and mindfulness were not significantly correlated.

Regression Analyses for Mindfulness and Substance Variables

A series of regression analyses were conducted to determine if scores on the MAAS were predictive of scores on the RAPI and MPI after accounting for the DDQ and DMQ, respectively.

We sought to determine whether relationships between mindfulness and problems were mediated by personality variables assessed by the BFI. We also included regression steps to test if relationships were moderated by an interaction between mindfulness and substance use.

The first regression is presented in Table 4 (Appendix A) and attempts to predict the level of problems individuals who endorsed drinking reported on the RAPI. Gender and age were entered as the first step and accounted for 2.1% of the variance, $F(2, 310) = 3.31$, $p < .05$. The addition of the quantity of alcohol consumed in a typical week (DDQ) in the second step increased the amount of variance accounted for to 18.7%, $F(1, 309) = 15.60$, $p < .01$. As noted in the table, the increase in the amount of variance accounted for with the addition of the MAAS in the third step was statistically significant (R^2 change $= 13.2\%$, $p < .001$), and the MAAS was a significant contributor to the model ($t = -4.61$, $p < .001$). The addition of The Big 5 personality variables (BFI) in the fourth step to test whether these personality variables mediated the relationship between the MAAS and alcohol related problems increased the total variance accounted for to 25.4%, $F(5, 303) = 11.43$, $p < .01$. With the addition of the BFI, the MAAS remained a statistically significant contributor to the model ($t = -.27$, $p < .05$), suggesting that the relationship was not mediated by the personality variables. The addition of the fifth step of a drinking and mindfulness interaction term (DDQxMAAS) to test moderation did not add significant variance accounted for, $F(1, 302) = 10.29$, $p = .59$.

In the second regression (Table 5) predicting problems marijuana smokers reported on the MPI, gender and age were entered as the first step and accounted for 8.5% of the variance, $F(2, 83) = 3.88$, $p < .05$. The addition of smoking habits (DMQ) in the second step increased the amount of variance accounted for to 27.2%, $F(1, 82) = 10.21$, $p < .01$. The addition of mindfulness (MAAS) in the third step approached significance and increased the total variance

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accounted for to 30.1%, $F(1, 81) = 8.72$, $p = .07$. The addition of The Big 5 personality variables (BFI) in the fourth step did not lead to a statistically significant increase in R^2. The addition of the fifth step of a smoking and mindfulness interaction term (DMQxMAAS) did not add a significant amount of variance. Models 3 and 4 suggest that the MAAS and the personality variables do not add to the prediction of marijuana related problems after marijuana use is accounted for.

Discussion

Previous research has identified dispositional mindfulness as a significant contributor to models of gambling-related problems, with high levels of DM serving as a protective factor (Lakey, Campbell, Brown, & Goodie, 2007). Research has also defined clear relationships between problematic substance use and other addictive and compulsive behaviors, including gambling (Cronce & Corbin, 2010). Further, Ham & Hope (2003) have described substance abuse as a significant problem on college campuses. The current study was designed to assess how ratings of DM are related to alcohol and marijuana use among college students, and how DM could predict and potentially protect against problems related alcohol and marijuana use. Information was also collected to examine how mindfulness may be related to personality. This section will discuss the results of the current study in the context of literature in the areas of mindfulness and substance use.

Alcohol

An analysis of bivariate relationships indicated that quantity and frequency of drinking is negatively correlated with DM. This finding supported our initial hypothesis that DM would be related to alcohol usage, and consistent with research supporting the use of MBM as a treatment for alcohol abuse (Bowen et al., 2006). The inverse relationship between DM and alcohol use may be due to the physiological effects of alcohol as well as the cognitive tendencies of high level drinkers may employ. The depressant quality of alcohol causes decreases in nervous system functioning and physical sensation. These effects are contrary to the mindful qualities of

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awareness and observing because, presumably, those high in DM would be less likely to seek out experiences that decrease their ability to sense and perceive. As discussed earlier in this paper, an impediment to sobriety is rumination about past mistakes and worry about the future. These thoughts are also contrary to a mindful existence, which includes maintaining one's focus on the present, because those higher in DM seem less likely to need alcohol as a way of temporarily forgetting or focusing away from rumination or worry. Also, recent studies indicate that both MBM and DM involve neural qualities that are contrary to negative emotions such as depression (Farb et al, 2010; Way, Creswell, Eisenberger, & Lieberman, 2010), which may serve as a protective factor against problematic drinking.

Results of the regression analyses indicated that mindfulness predicted problems related to drinking beyond the amount of usage alone. This finding supported our second hypothesis that mindfulness would add predictive validity beyond quantity and frequency of use. Along with being incompatible with problematic cognitions related to drinking discussed above, it is possible that drinkers higher in DM have different approaches to solving issues that could potentially result from drinking. A mindful individual may be more aware of the connection between their drinking and tendency to feel ill or get into arguments, and regulate their drinking accordingly (e.g., spacing out drinks, drinking at certain places or times of the week). Furthermore, lesser problems in the presence of higher DM may be connected to better decision making (possibly because mindfulness is negatively correlated with impulsivity; Tangney, Baumeister, & Boone, 2004). Plausibly, any number of characteristics may contribute to fewer problems: avoidance of interpersonal misunderstandings, lower levels of stress and depression (and as a result less drinking aimed at escaping these feelings), and so on. As noted earlier, MBM has been used to ameliorate a number of problems that individuals may experience

concurrent with heavy drinking (Witkiewitz, Marlatt, & Walker, 2005). Therefore, it may be possible that being high in DM negates the development of or alleviates these issues.

Marijuana

An analysis of bivariate relationships indicated that quantity and frequency of smoking marijuana is negatively correlated with DM. This finding supported our initial hypothesis that DM would be related to marijuana usage. However, this finding only existed when examining the entire subject pool. When examining only participants that reported smoking in the past 28 days, the relationship between smoking and DM was not significant. This discrepancy may be partially due to the relatively small number of marijuana users in the study compared to drinkers. Indeed, even among drinkers the strength of the relationship between drinking and DM decreased when restricting the analyses to drinkers only. Further, there was no relationship between marijuana related problems and DM, regardless of smoking status.

Results of the regression also failed to find a significant relationship between marijuana and DM. However, when examining marijuana users, the relationship between DM and marijuana related problems did approach significance. This finding further indicates that there may exist a relationship between DM and marijuana, and that the present study's subject pool was insufficient to fully detect one. Nonetheless, it does seem clear that DM interacts qualitatively differently with marijuana usage and problems than it does with alcohol usage and problems. While marijuana use does share some of the same influencing factors as alcohol (e.g., impulsivity), it may also have some unique qualities (Simons, Gaher, Correia, Hanson, & Christopher, 2005).

One hypothesis regarding differences between alcohol and marijuana is that an individual's motivation to smoke marijuana may be different from drinking alcohol, thereby

influencing DM's relationship with these substances. Specifically, Simons, Correia, and Carey (2000) reported that college student substance users endorsed social motives as reasons for drinking more so than smoking, and that students endorsed expansion motives (e.g., "I use marijuana so I can understand things differently," "I use marijuana so I can expand my awareness,") as reasons for smoking more so than drinking. These findings lend credence to the possibility that increasing awareness (expansion) would actually result in individuals higher in characteristics of DM (e.g., appreciation for more in-depth awareness and thought) seeking out marijuana more than those lower in DM. While this positive correlation was not found in the present study, it may have been involved in decreasing the strength of a negative correlation. Later work by Simons and Carey (2006) also identified within and between-person differences in predictors for alcohol and marijuana use. Adding complication to the relationship between alcohol and marijuana use as it relates to mindfulness, some have found MBM deceases the usage of marijuana and alcohol (Bowen et al., 2006), while others found that that mindfulness may actually be positively correlated with some forms of substance use (Leigh, Bowen, & Marlatt, 2005). Essentially, any number of traits, tendencies, or cognitive processes may serve as a moderator between DM and marijuana usage. Clearly, this area necessitates further elucidation.

Personality

As noted above, personality factors such as impulsivity and self-control share relationships with mindfulness and substance use. One aim of the present study was to test if the relationship between substance-related problems and DM was merely a byproduct of mediation through personality. Regression analyses indicated that DM remained a statistically significant predictor of alcohol related problems even after accounting for the Five Factor model of personality, and served as evidence against mediation. Similar findings have also shown that

although DM is correlated with personality, its protective features extend beyond those provided for solely by personality and other trait qualities (Smalley et al., 2009; Lakey et al., 2007).

Limitations

There were several limitations in the present study. First, data collection consisted of retrospective self-report instruments. Along with participant biases and social desirability, responses on the MAAS may be of particular concern due to the nature of the questions asked. For example, in determining a respondent's level of mindfulness, the MAAS queries: "I find myself doing things without paying attention." This item is tapping into whether or not the subject is *aware* of their unawareness, which is somewhat confounded (it is plausible that the subject is so absent minded that they do not realize how much they miss). While this problem is common to self-report measures, it may be of particular note in measuring DM, because there does not yet exist a validated behavioral measure or well-defined behavioral correlates with which to test the external validity of the MAAS (discussion of a potential behavioral measure may be found in the Future Directions section). Furthermore, as mindfulness is not yet a well-defined construct within psychological science, it is important that the measures that ultimately define the construct being measured are valid. Fortunately, other self-report measures exist which ask about DM and MBM in different terms, and are generally correlated (Baer, Smith, & Allen, 2004), and so we may conclude that the construct being measured is at least stable and somewhat agreed upon.

Second, responses were collected over the Internet at the location of the participant's choice. Due to this lack of control, it is possible that some participants were completing the questionnaire in a distracting or otherwise scientifically undesirable setting. However, given the

sensitive nature of substance use questions, it is possible that subjects were more comfortable answering them unobserved, resulting in more valid data.

Third, the majority of participants were female (71%), Caucasian (86%), and were all enrolled in psychology courses. While these factors did not seem to impede the study's analyses, it is possible that they may limit generalizability. In addition, by the nature of their active participation in the academic process, students may not represent individuals suffering from particularly debilitating types of substance related problems (i.e., failing to fulfill personal and scholastic obligations).

Treatment Implications

The National Institute on Alcohol Abuse and Alcoholism has recommended that universities provide preventative interventions for college students to reduce problematic substance use (NIAAA, 2002). Previous research defined MBM as a viable treatment component for treating problematic alcohol and drug use (Witkiewitz et al., 2005). The present study's finding that individuals lower in dispositional mindfulness experience greater drinking related problems further suggest that mindfulness based treatments may be beneficial for student drinkers. A measure such as the MAAS may be able to serve as a screener to help identify individuals that may benefit from MBM treatments for alcohol related problems. Similarly, personalized brief interventions for alcohol and drug use with college students have demonstrated efficacy (Butler & Correia, 2009). By screening for low DM, treatment providers may be able to provide helpful details about one's level of DM and recommendations specific to boosting mindfulness. For example, a brief intervention for students low in DM may educate students about the principles of mindful awareness and action, offer a brief MBM tutorial, and provide resources such as literature and student-accessible programs to increase DM. Further, the

MAAS can be useful for measuring progress through a MBM program, as well as other treatments that may be aimed at changing features related to DM. It is important to note, as discussed earlier, that DM and MBM are not yet clearly related. Therefore the use of MBM or other programs to boost DM must be carefully evaluated.

Future Directions

The present study has been one of the first to examine the role of DM in alcohol and marijuana problems in college students, independent of a MBM intervention. Further investigation is needed to delineate mediators of these relationships, and to determine more specifically the nature of DM's impact upon substance use and problems. While a Five Factor model of personality may not completely mediate the relationship, it is possible that some other combination of already established traits will be responsible. For example, it should be investigated whether motives for use, personal history, or life stressors can more accurately predict problems. Other variables related to substance use and problems, such as impulsivity, self-control, interpersonal relationships, and socioeconomic status should also be investigated further in connection with DM.

Assessment of a more demographically diverse population is also necessary to assure generalizability of these findings. Previous studies with MBM have been successful in treating clinical populations (Goldin & James, 2010; Biegel, Brown, Shapiro, & Schubert, 2009; Bowen et al., 2006), yet DM has not yet received similar levels of inquiry. As noted in the above section, DM may be a useful component of treatment programs, which may extend to those occurring in clinical settings. Further, greater information is necessary to delineate the relationship between DM and MBM, and the long-term impacts of MBM.

Lastly, it is crucial that behavioral measures of mindfulness be developed and validated. As noted earlier, DM remains a fairly elusive construct and may be best defined by its method of measurement. Reliance upon self-report may not be as valid a measure of DM as an objective technique that can be conducted independent of one's self-perceptions. Possible directions for behavioral measurement may include design of a task that necessitates a participant to observe quickly and accurately qualities of passing images or experiences controlled by the experimenter. For example, a computer task in which participants observes a detailed image briefly, and then must describe as many details about the image and their corresponding feelings, would be useful in assessing at least the level of awareness one engages in during a measured period. Although such a task would be useful for measuring one's perceiving with awareness, further investigation would be needed to determine one's ability to act with awareness, and to parse out possible confounding or related variables such as working memory. With a better-established method to measure DM, the development of brief interventions and other treatments will likely be more efficacious and focused on specific mechanisms of mindfulness.

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Table 1
Summary of Descriptive Data for Sample

	N	Minimum	Maximum	Mean	Std. Deviation
Drinking Variables (All Participants)					
DDQ Total	427	0	120	9.65	11.97
RAPI Total	427	0	43	3.90	5.99
Drinking Variables (Drinkers)					
DDQ Total	313	1	120	13.16	12.21
RAPI Total	313	0	43	5.25	6.46
Marijuana Variables (All Participants)					
DMQ Total	426	0	54	1.68	5.73
MPI Total	427	0	46	1.98	6.30
Marijuana Variables (Marijuana Smokers)					
DMQ Total	86	1	54	8.33	10.40
MPI Total	86	0	44	7.10	9.77
MAAS Total	427	1	6	3.75	.78

Note: Total n=427
   DDQ Total: Daily Drinking Questionnaire
   RAPI Total: Rutgers Alcohol Problems Index
   DMQ Total: Daily Marijuana Questionnaire
   MPI Total: Marijuana Problem Index
   MAAS Total: Mindfulness Attention Awareness Scale

Table 2

Correlations Among Alcohol, Marijuana, and Mindfulness Variables

	DDQ Total	RAPI Total	DMQ Total	MPI Total	MAAS Total
DDQ Total	1.00				
RAPI Total	.46**	1.00			
DMQ Total	.25**	.27**	1.00		
MPI Total	.18**	.45**	.51**	1.00	
MAAS Total	-.12*	-.24**	-.04	-.12*	1.00

*Note: N = 427; ** = p < .01; * = p < .05*

Table 3

Correlations Among Mindfulness and Big Five Personality Traits

	MAAS	Extrav.	Agreea.	Conscie.	Neurot.	Openn.
MAAS	1.00					
Extrav.	.10*	1.00				
Agreea.	.29**	.18**	1.00			
Conscie.	.41**	.12*	.42**	1.00		
Neurot.	-.35**	-.35**	-.37**	-.31**	1.00	
Openn.	.07	.19**	.14**		-.06	1.00
				.08		

*Note: N=427; * = p<.05; ** = p<.01*

Table 4

Hierarchical Regression Predicting Alcohol Related Problems in Drinkers

	R^2	β	t	p
Model 1	.02			
Sex		-.11	-1.92	.056
Age		-.11	-1.90	.059
Model 2	.13			
Sex		-.01	-.14	.886
Age		-.10	-1.88	.061
DDQ		.35	6.27	<.001
Model 3	.19			
Sex		-.02	-.43	.665
Age		-.08	-1.62	.107
DDQ		.31	5.70	<.001
MAAS		-.24	-4.61	<.001
Model 4	.25			
Sex		-.02	-.30	.767
Age		-.06	-1.21	.226
DDQ		.27	4.86	<.001
MAAS		-.13	-2.27	<.05
Extraversion		.07	1.20	.232
Agreeableness		-.14	-2.41	<.05
Conscientiousness		-.15	-2.48	<.05
Neuroticism		.10	1.66	.098
Openness		.05	.97	.332
Model 5	.25			
Sex		-.01	-.19	.846
Age		-.06	-1.21	.229
DDQ		.15	.69	.490
MAAS		-.16	-2.05	<.05
Extraversion		.06	1.13	.258
Agreeableness		-.14	-2.44	<.05
Conscientiousness		-.15	-2.43	<.05
Neuroticism		.10	1.62	.107
Openness		.05	.93	.355
DDQxMAAS		.12	.54	.591

Note: Dependent Variable: RAPI

Table 5

Hierarchical Regression Predicting Marijuana Related Problems in Marijuana Users

	R^2	β	t	p
Model 1	.09			
Sex		-.29	-2.78	<.05
Age		-.02	-.16	.875
Model 2	.27			
Sex		-.20	-2.09	<.05
Age		-.11	-1.16	.250
DMQ		.45	4.58	<.001
Model 3	.30			
Sex		-.21	-2.17	<.05
Age		-.12	-1.23	.222
DMQ		.45	4.62	<.001
MAAS		-.17	-1.84	.070
Model 4	.34			
Sex		-.13	-1.14	.260
Age		-.09	-.96	.340
DMQ		.44	4.41	<.001
MAAS		-.13	-1.14	.260
Extraversion		-.11	-1.02	.310
Agreeableness		-.17	-1.46	.149
Conscientiousness		-.10	-.94	.352
Neuroticism		-.13	-.97	.335
Openness		.03	.34	.731
Model 5	.35			
Sex		-.11	-.97	.337
Age		-.07	-.74	.460
DMQ		1.18	1.83	.072
MAAS		-.03	-.18	.859
Extraversion		-.10	-.95	.346
Agreeableness		-.17	-1.45	.152
Conscientiousness		-.10	-.97	.336
Neuroticism		-.13	-.97	.336
Openness		.03	.34	.735
DMQxMAAS		-.76	-1.17	.248

Note: Dependent Variable: MPI