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Measuring Mindfulness and Examining its Relationship with Alcohol Use and Negative Consequences

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Abstract

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Mindfulness has been proposed as a useful adjunct to alcohol abuse treatment. However, very little research has examined the basic relationship between alcohol use and mindfulness. Inconsistency in definition and measurement of mindfulness across studies makes research difficult to interpret and conduct. Therefore, the current research sought to validate an emerging mindfulness measure, the Five Facet Mindfulness Questionnaire (FFMQ), and examine its relationship with alcohol use and alcohol-related negative consequences among a sample of 316 college-aged adults. The purported factor structure of the FFMQ was examined using confirmatory factor analysis. Structural equation modeling (SEM) was used to examine relations among mindfulness, alcohol use and alcohol-related negative consequences. Consistent with past research, results supported the five-factor structure of the FFMQ. SEM analyses revealed that two awareness-based factors of mindfulness were negatively related to alcohol use. After controlling for alcohol use, one acceptance-based factor (non-judging of thoughts and feelings) was negatively related to negative consequences (all $ps < .05$). The results reported here inform the burgeoning development of mindfulness-based addiction treatment and provide additional psychometric validation of the FFMQ.

Keywords: Mindfulness, Alcohol, Alcohol-Related Negative Consequences, Measurement Validity, Addiction

Validation of the Five Facet Mindfulness Questionnaire and the Relationship between Mindfulness and Alcohol Use

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Mindfulness has been defined as “the clear and single-minded awareness of what actually happens to us and in us, at the successive moments of perception” ([Mahathera, 1971](#), p. 103). In an effort to understand mindfulness in the broader context of personality, past studies have examined the association between mindfulness and a myriad of personality and psychological variables ([Baer, Smith, & Allen, 2004](#); [Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006](#); [Brown & Ryan, 2003](#); [Lau et al., 2006](#); Walach, Buchheld, Bütünmüller, Kleinknecht, & Schmidt, 2006). Positive associations between mindfulness and self-esteem, optimism, life satisfaction, and positive affect have been observed ([Brown & Ryan, 2003](#)) as well as negative correlations between mindfulness and depression, anxiety, self-consciousness ([Brown & Ryan, 2003](#)), and psychological distress ([Baer et al., 2004](#)). The consistent association between mindfulness and healthy psychological functioning, along with its potential therapeutic benefits, has led naturally to its incorporation into numerous treatments for mental and physical health. To date, mindfulness-based interventions have led to reductions in physical and psychological distress ([Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003](#); [Specia, Carlson, Goodey, & Angen, 2000](#); Weissbecker et al., 2002), mood

disturbance ([Specia et al., 2000](#)), depressive relapse ([Teasdale et al., 2000](#); Williams, Russell, & Russell, 2008), and suicidal behavior ([Linehan, Armstrong, Suarez, & Allmon, 1991](#)), as well as increases in sleep quality ([Shapiro et al., 2003](#)).

Mindfulness is an integral component of many emerging behavioral and cognitive-behavioral treatments ([Hayes, 2004](#)). These include Acceptance and Commitment Therapy ([Hayes, Strosahl, & Wilson, 1999](#)), Dialectical Behavior Therapy ([Linehan, 1987](#)), and Mindfulness-Based Cognitive Therapy ([Segal, Williams, & Teasdale, 2002](#)). These therapies, also referred to as “third-wave behavioral therapies” are distinct from their predecessors because they emphasize changing the *context* and experience of psychological phenomena rather than changing the *content* of thoughts and feelings ([Hayes, 2004](#)). Mindfulness fits well within this treatment modality because it can be conceptualized as a “cognitive mode” in which distressing thoughts and feelings can take place and be observed without personal judgment ([Segal, Teasdale, & Williams, 2004](#)). The ability to objectively observe one’s own thoughts without judging them as good or bad/right or wrong is believed to enhance psychological well-being and has also been described as a type of meta-cognition ([Teasdale et al., 2002](#)). Treatments which enhance meta-cognitive awareness of negative thoughts have been shown to reduce the likelihood of depressive relapse in one randomized controlled trial ([Teasdale et al., 2002](#)).

Mindfulness and Substance Abuse

Over the years there has been an increasing interest in using mindfulness as a tool to treat substance abuse (Alterman, Koppenhaver, Mulholland, Ladden, & Baime, 2004; [Bowen et al., 2006](#); [Breslin, Zack, & McMains, 2002](#); [Groves & Farmer, 1994](#); [Witkiewitz, Marlatt, & Walker, 2005](#)). Mindfulness is theorized to aid in addiction treatment by increasing awareness of triggers for drug use and acting as a cognitive mode through which cravings can be observed without reaction ([Marlatt, 2002](#)). Mindfulness and meditation are also believed to act as a drug replacement behavior by inducing feelings of relaxation and positive affect that were previously associated with drug use ([Marlatt 2002](#); [Witkiewitz et al., 2005](#)).

Despite the general enthusiasm among researchers regarding the potential therapeutic role of mindfulness in treating substance abuse only a small number of well-controlled studies exist on this topic. [Bowen and colleagues \(2009\)](#) conducted a randomized controlled trial of a Mindfulness-Based Relapse Prevention (MBRP) program designed to increase mindfulness and reduce substance use. Participants were recruited from an alcohol and drug abuse treatment facility. MBRP participants received eight weeks of training in mindfulness, meditation, and relapse prevention skills. Results indicated that relative to the treatment as usual control group, MBRP participants had greater reductions in substance use and craving at the four month follow-up and greater increases in mindfulness (i.e. acceptance and awareness). [Bowen and Marlatt \(2009\)](#) also found that mindfulness training elicited short-term reductions in smoking but not urges to smoke (relative to a no-training control group), suggesting that mindfulness may reduce smoking by preventing smokers from reacting to their smoke-related urges.

In an earlier quasi-experimental study men and women in a minimum-security prison volunteered to take part in either a 10-day Vipassana (breath and body focused meditation) course or to receive treatment as usual (TAU; mental health and chemical dependency treatment/education). Those who took the course reduced their alcohol, marijuana, and crack cocaine use significantly at the three-month follow-up relative to those in the TAU group ([Bowen et al., 2006](#)). However, mindfulness was not measured directly and outcomes were confounded by self-selection of participants into treatment conditions.

While additional applied research on mindfulness-based addiction treatment is needed, it is important to note that the basic relationship between mindfulness and substance use is not well understood. Several studies by Leigh and colleagues ([Leigh & Neighbors, 2009](#); [Leigh, Bowen, & Marlatt, 2005](#)) indicate that college students higher in some aspects of mindfulness (e.g. mind/body awareness) use more alcohol and tobacco than those low in mind/body awareness. Given the presumption that *enhancing* mindfulness is considered a means to *reduce* substance use/abuse, these findings are somewhat surprising. However, mindfulness is a multi-faceted construct and the directionality of the relationship between mindfulness and alcohol use may depend on which aspects of mindfulness are being examined. For example, men higher in “non-attachment” to their thoughts and feelings have been shown to drink less ([Leigh & Neighbors, 2009](#)), and acceptance-based aspects of mindfulness have been shown to moderate the relationship between automatic alcohol motivation and risky drinking ([Ostafin & Marlatt,](#)

2008). Clearly, additional research is needed to clarify the basic relationship between mindfulness and alcohol use. Unfortunately, pre-existing measurement issues make conducting and interpreting such research difficult.

Measuring Mindfulness

Synthesis of research on mindfulness is made difficult by the inconsistency in the content, scope, and psychometric validity of measurement instruments. Across measures, mindfulness is inconsistently defined and the boundaries of this construct are not clearly agreed upon (Herndon, 2008). One of the most widely used mindfulness measures, the Mindfulness Attention and Awareness Scale (Brown & Ryan, 2003), defines mindfulness as attention and awareness of experience only. Some researchers have posited that this definition is too narrow and argue that mindfulness incorporates an orientation towards the present moment characterized by objectivity and acceptance (Bishop et al., 2004). In terms of alcohol use, this distinction may be especially important considering that high levels of acceptance, but not awareness, have been indirectly linked to alcohol-related behavior in one recent study (Ostafin & Marlatt, 2008). Thus the use of broader multi-factorial measures of mindfulness may be integral to better understanding the relationship among mindfulness, alcohol use, and alcohol-related negative consequences. One such measure is the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The FFMQ is a five-factor, 39-item measure designed to assess mindfulness across multiple facets, including: the ability to observe experience, the tendency to pay attention to one's actions, the capacity to accept thoughts and feelings without judgment or reaction, and the ability to describe internal states. At this time only one published study of the psychometric properties of the FFMQ is available in the literature (Baer et al., 2006) underscoring the need for replication and further psychometric investigation of this measure.

The Aims of the Current Study

Accordingly, the aims of the current research were two-fold. First, the reliability and validity of the FFMQ were examined. The factor structure of the FFMQ was tested using a series of confirmatory factor analyses (CFA) testing several plausible factor-structures observed in past research (Baer et al., 2006). Secondly, the basic associations among mindfulness (as measured by the FFMQ), alcohol use, and alcohol-related consequences were examined using structural equation modeling. Despite mixed research findings on the magnitude and directionality of the relationship between mindfulness and alcohol use, there is strong evidence that mindfulness is related to healthy psychological functioning. In addition, numerous theoretical papers suggest a negative relationship between mindfulness and alcohol use/abuse (Breslin, Zack, & McMains, 2002; Groves & Farmer, 1994; Witkiewitz et al., 2005). Therefore, mindfulness was predicted to be inversely related to both alcohol use and alcohol-related negative consequences. Alcohol-related negative consequences were included in addition to alcohol use because they are an important marker of risky drinking and a major public health concern (Hingson, Zha, & Weitzman, 2009).

Method

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Sample Characteristics

Participants included in the present study ($N = 316$) were 56% ($n=177$) female, 92% ($n=291$) white, 3% ($n=11$) Hispanic, 3% ($n=10$), black, <1% ($n=2$) Asian, and 4% ($n=13$) "other" (categories are not mutually exclusive). The mean age was 22 years-old ($SD = 0.41$). Data were collected from the initial cohort of students taking part in the 46-month follow-up of a larger randomized clinical trial testing two interventions designed to reduce alcohol use and abuse among incoming students at a mid-sized Northeastern public university. The interventions were a parent-based intervention and a brief motivational intervention. For additional details see Wood et al. (in press). At baseline, a sample of incoming first-year students was recruited. Non-traditional students (e.g., older, married, returning, and transfer students older than age 20) were excluded, as were individuals who consumed 40 or more drinks per week and endorsed two or more symptoms of alcohol dependence ($n = 8$). Sixty two percent of the original baseline sample took part in the 46 month-follow-up. When data were collected for the current analysis 82% ($n = 259$) of participants were full or part-time 4th-year students at the target university, 11% ($n = 35$) were attending another college/university, and 7% ($n = 22$) were no longer in school.

Data Collection Procedures

All data were gathered by telephone through a survey research center at the target university. Participants provided their initial consent verbally over the phone at baseline (parents provided verbal consent for students under 18 years-old) and again when the initial project was extended to include a 46 month follow-up assessment. Participants were compensated \$25 for their participation. The university's institutional review board approved all study procedures.

Measures

The following measures were assessed as part of a larger questionnaire battery at 46 month follow-up unless otherwise indicated.

Demographics Relevant demographic variables such as gender, race, and ethnicity were assessed at baseline.

Mindfulness Mindfulness was measured using the 39-item Five-Facet Mindfulness Questionnaire (FFMQ; [Baer et al., 2006](#)). Respondents were asked to rate how true given statements are for themselves on a five-point Likert-type scale (1 = *rarely true* to 5 = *very often or always true*). The factors, and coefficient alphas for the current data were as follows: Non-Reactivity to Experience (7 items, $\alpha = .75$; e.g. "I perceive my feelings and emotions without having to react to them"), Acting with Awareness (8 items, $\alpha = .87$; e.g. "I find it difficult to stay focused on what's happening in the present" -reverse scored), Describing with Words (8 items, $\alpha = .87$; e.g. "I'm good at finding words to describe my feelings"), Non-Judging of Experience (8 items, $\alpha = .88$; e.g. "I criticize myself for having irrational or inappropriate emotions"-reverse scored), and Observation of Experience (8 items, $\alpha = .84$; e.g. "I pay attention to how my emotions affect my thoughts and behavior"). An additional single item was used to assess past meditation experience (e.g. Do you have any experience with meditation?) Response options ranged from (1 = *none* to 5 = *a lot*).

Alcohol use Alcohol use was measured using the Daily Drinking Questionnaire (DDQ; [Collins, Parks, & Marlatt, 1985](#)). The DDQ records the number of drinks consumed on each day of a typical drinking week. Peak drinking over the past month was assessed using a single-item from the Quantity-Frequency Questionnaire ([Dimeff, Baer, Kivlahan, & Marlatt, 1999](#)), which asks participants to indicate the number of drinks that they consumed on the occasion in which they drank the most in the past month (peak drinks). Heavy episodic drinking was measured with a single item asking participants how often they consumed five or more drinks (for males) or four or more drinks (for females) on one occasion over the past two weeks.

Alcohol-related consequences Alcohol-related consequences were assessed with a 17-item version of the Young Adult Alcohol Problems Screening Test (YAAPST; [Hurlbut & Sher, 1992](#)). The adapted YAAPST scale ($\alpha = .88$) assessed past three-month frequency of alcohol problems for general consequences (e.g., hangovers, blackouts, driving while intoxicated) and problems presumably more unique to college students (e.g., missing class). A severity summary score was created by weighting each problem experienced by the number of times it occurred.

Results

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Descriptive Statistics

In terms of alcohol use, 95% ($n = 291$) of participants reported drinking in the past year. Participants who did not report alcohol use in the past year ($n = 25$) were given scores of zero on all alcohol-related variables. All means, medians, and standard deviations for FFMQ factors and alcohol-related variables are presented in [Table 1](#). Participants reported consuming a median number of nine drinks per week, and the median number of 'peak' drinks consumed on any one occasion in the past month was eight for men and six for women. Meditation experience in this sample was relatively low (87% of the sample reported little to no experience). Correlations between study constructs of interest are presented in [Table 2](#).

Variable	M	SD	Median
Alcohol use	2.12	1.02	1.00
Peak drinks	8.00	3.00	8.00
Heavy episodic	0.10	0.30	0.00
Number of FFMQ	2.00	0.50	2.00
FFMQ	1.00	0.50	1.00
Number of Alcohol	1.00	0.50	1.00
Problems	1.00	0.50	1.00

[Table 1](#)

Means, Medians, and Standard Deviations of Main Study Variables

Table 2
Intercorrelations among Alcohol Use, Alcohol-Related Consequences, and the FFMQ factors

Table 2

Intercorrelations among Alcohol Use, Alcohol-Related Consequences, and the FFMQ factors

Preliminary Analysis

Assumptions of the general linear model were examined with respect to central tendency (mean, median, mode), variance, skew, and kurtosis. Several variables and composite variables with a skew greater than two and kurtosis greater than four underwent data adjustment. In such cases, all far outliers (cases more than three standard deviation outside the mean) were reduced to one value larger than the greatest non-far outlier (Fidell & Tabachnick, 2003). This procedure was successful in reducing skew and kurtosis to acceptable levels (< 2 and 4 respectively). Coefficient alphas were examined for all relevant measures and are presented in the measures section. Alphas for all FFMQ factors were within an acceptable range (between .70 and .90; Redding, Maddock, & Rossi, 2006). Chi-square tests revealed that the current sample was representative of the overall baseline sample and university population in terms of gender, race, and ethnicity (all $ps > .05$). Several demographic (gender, age, and race/ethnicity) and personality variables (psychoticism, neuroticism, and extraversion) were examined for systematic correlations with both alcohol use and mindfulness, but none were found.

Confirmatory Factor Analysis

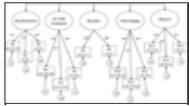
All CFAs were conducted with SAS Proc Calis (SAS, 2004) using maximum likelihood estimation. Model fit was evaluated using multiple indices including the χ^2 goodness-of-fit test. This test is a standard in the field but is not recommended as an isolated guide to model adequacy because it is sensitive to sample size, data non-normality, and is likely to capture small and inconsequential differences between a model and the data (Li-Tze & Bentler, 1995). Adjunct fit indices included the comparative fit index (CFI; Bentler, 1990) and the root mean square error of approximation (RMSEA; Steiger, 1980; Kline, 2005). For the CFI a score greater than .90 indicated acceptable model fit. For the RMSEA a .05 was considered a good fit, .08 a fair fit, and .10 a marginal fit (Kline, 2005).

Based on previous psychometric testing and development of the FFMQ (Baer et al., 2006), we elected to conduct a series of CFAs comparing, a five-factor correlated model, a five-factor uncorrelated model, and a single factor model. Noar (2003) suggests that conducting a progression of single factor and multi-factor models is appropriate when testing and/or developing a measure using CFA. Factor structures were compared using χ^2 difference tests and the model of best fit was determined through fit indices, previous research, theory, and model parsimony. Item parcels were used here to replicate procedures applied in the study conducted by Baer et al. (2006) and to reduce error variance and increase reliability of the factors (Little, Cunningham, Shahar, & Widaman, 2002). Parcels were created by averaging two or three randomly selected items within each of the factors.

For all models, the variance of each factor was fixed at one and all factor loadings were free. Nested models were created by restricting specific parameters of the correlated five-factor model (Bollen, 1989). The five factor uncorrelated model was created by setting the covariance paths between all factors to zero. The single factor model was created by setting the covariances of all factors to one. Overall results of the five factor correlated model indicated a modest fit: $\chi^2 (80, N = 316) = 335.84, p < .001, CFI = .90, RMSEA = .10$. The fit of the five factor uncorrelated model was poor: $\chi^2 (90, N=316) = 568.53, p < .001, CFI = .79, RMSEA = .13$, as was the fit of the single factor model: $\chi^2 (90, N = 316) = 1690.95, p < .001, CFI = .35, RMSEA = .24$. Chi-square difference tests supported selection of the five factor correlated model.

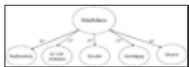
All factor loadings in the five factor correlated model were significant at the $p < .001$ level. Their standardized factor loadings ranged from .50 to .96 ($R^2 = .25$ to .81). However, a number of other model results indicated problems with model fit. One indicator, Parcel 7, was responsible for nine out of ten of the largest standardized residuals, which ranged from an absolute value of 5.2 to 7.2. Standardized residuals larger than .10 indicate a problem with the explanatory power of the model (Kline, 2005). To examine possible model misspecification, Lagrange multiplier tests were conducted and suggested adding paths from Parcel 7 to other mindfulness factors. As adding these paths would have obscured interpretation of the model, we elected to remove Parcel 7.

Conducting the CFA with Parcel 7 removed improved model fit: $\chi^2 (67, N = 316) = 195.19, p < .001, CFI = .94, RMSEA = .08$. Standardized factor loadings for this model are presented in [Figure 1](#). All loadings were significant at the $p < .001$ level. The R^2 values for each factor ranged from .25 to .81, reflecting large multivariate effect sizes (Cohen, 1992). Factor correlations suggested the presence of a single hierarchical factor (see [Table 2](#)), thus a hierarchical CFA was tested. Similar to methods used by [Baer et al. \(2006\)](#), all factors were used as indicators of one higher-order factor (see [Figure 2](#)). Model fit was acceptable: $\chi^2 (72, N = 316) = 261.52, p < .001, CFI = .92, RMSEA = .09$. All factor loadings in the hierarchical model were significant ($p < .001$). The ‘Act with Awareness’ and ‘Non-Judging’ factors were inversely related to the higher-order mindfulness factor, while all other factor loadings were positive. Factors were treated separately in subsequent analyses.



[Figure 1](#)

Confirmatory factor analysis with Parcel 7 removed. All path coefficients represent standardized estimates. * $p < .001$.



[Figure 2](#)

Hierarchical factor analysis. All path coefficients represent standardized estimates. * $p < .001$.

Structural Equation Modeling

Structural equation modeling was conducted using MPLUS Version 5.1 ([Muthén & Muthén, 2006](#)). Model fit was assessed using the same fit indices, cut-off scores, and parceling procedures used in the CFA model. The model, presented in [Figure 3](#) incorporates the five factors of the FFMQ as exogenous latent variables and alcohol use and alcohol-related consequences as endogenous latent variables. Alcohol use was comprised of weekly drinking, peak drinking, and heavy episodic drinking. The items comprising the alcohol-related negative consequences measure were combined into four parcels with a single factor structure. This was done in order to model this construct as a latent variable separate from alcohol use. An exploratory principal components analysis and a confirmatory factor analysis confirmed the single factor structure of this measure. A path from alcohol use to consequences was included to account for the known robust association between these variables. Direct paths from the five factors of the FFMQ to alcohol use and alcohol-related consequences were included in the model. Finally, participants in this study had taken part in interventions designed to reduce alcohol use and related harm; thus, these potential intervention effects were statistically controlled for in the subsequent analysis. Intervention conditions (dummy coded 1, -1) were incorporated as manifest variables with associations with alcohol use and consequences estimated to control for intervention effects. There was only one significant negative relationship between the brief motivational intervention and the alcohol use factor ($p = .002$; not shown in model).



[Figure 3](#)

Relationship between FFMQ and alcohol use and negative consequences. Intervention conditions controlled for (not shown in figure). HED = DDQ = Daily Drinking Questionnaire, Heavy Episodic Drinking, P = Parcel

Model fit was good: $\chi^2 (210, N = 316) = 344.46, p < .001, CFI = .96, RMSEA = .045$. [Figure 3](#) displays all standardized path coefficients. As can be seen in [Figure 3](#), alcohol use was significantly and negatively related to the ‘Describe’ factor ($\beta = -.18, p < .05$), and the ‘Act with Awareness’ factor ($\beta = -.17, p < .05$). The R^2 values indicate that these two factors accounted for approximately 3.2% and 2.9% of the variance in alcohol use respectively. After controlling for robust associations between alcohol use and consequences ($\beta = .80, p < .001$), the ‘Non-Judging’ factors had a significant negative association with alcohol-related consequences ($\beta = -.12, p < .05$), and the ‘Describe’ factor had a significant positive relationship with consequences ($\beta = .11, p < .05$). The relationship between alcohol-related consequences and ‘Non-Reactivity,’ approached significance ($\beta = -.12, p < .10$). The negative relationship between ‘Describe’ factor and alcohol use, coupled with a positive relationship between this factor and alcohol-related negative consequences was anomalous. A suppression effect was suspected because the beta for ‘Describe’ and consequences was positive ($\beta = .11$), but the zero-order correlation was negative ($r = -.10$). If alcohol use was acting as a suppressor it could have artificially decreased the regression

coefficient between 'Describe' and consequences by its inclusion in a regression equation (Conger, 1974). This promoted a follow-up analysis that omitted alcohol use from the original model. In this model, the beta for 'Describe' and consequences changed from a positive to a negative in value ($\beta = -.03$, *ns*).

Discussion

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The aims of this study were to determine the reliability and validity of the FFMQ, and to examine the value and magnitude of relations among mindfulness, alcohol use, and alcohol-related negative consequences. Results indicated that the factor-level reliabilities of the FFMQ were within an acceptable range, and a series of CFAs generally supported the previously established factor structure reported by [Baer et al., \(2006\)](#). The hypothesized negative relationships among mindfulness, alcohol use, and alcohol-related negative consequences were partially supported. As anticipated, several specific factors of the FFMQ held significant negative direct relationships with alcohol use and consequences. In new areas of research for which effect sizes standards have not yet been established, path coefficients below .10 are considered small, and coefficients around .30 are considered medium ([Kline, 2005](#)). The effects observed here were small-medium, ranging from .11 to .18.

The correlated five factor model of the FFMQ was originally suggested as a result of psychometric testing conducted by [Baer et al. \(2006\)](#). Our findings support this factor structure but an item parcel was omitted from the 'Describe' factor in order to improve model fit. The parcel contained three items. (a) *I have trouble thinking of the right words to express how I feel about things*, (b) *It's hard for me to find the words to describe what I am feeling*, (c) *When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words*. No clear theoretical differences were retrospectively observed between these items and other items in this factor, making interpretation of these findings difficult.

A hierarchical model with a single overarching factor was also tested. The fit was adequate with three of the factors (Non-Reactivity, Describe, and Observe) loading positively on the hierarchical factor and two of the factors (Act with Awareness, and Non-Judging) loading negatively. Theoretically, the FFMQ was designed to measure mindfulness as a single overarching construct, in which case more mindful individuals would be expected to have higher scores across all factors. The hierarchical factor loadings found here do not support this conceptualization of the FFMQ but instead suggest that the mindfulness has distinct elements that vary within individuals (i.e. a person can be high in awareness but low in acceptance). These findings should be considered within the context of our sample frame which included individuals with relatively little meditation experience. [Baer et al. \(2006\)](#) found that students with meditation experience scored consistently and positively across all five factors of the FFMQ, but students without meditation experience did not. The authors theorized that some factors of the FFMQ may be more sensitive to meditation experience than others. If this is the case, the factors of the FFMQ should be treated separately in future research among meditation naïve populations.

Results of the structural equation modeling procedures indicated significant negative associations between alcohol use and the factors 'Act with Awareness' and 'Describe'. The 'Describe' factor was created based on mindfulness teachings encouraging individuals to *identify* and briefly *label* thoughts and feelings, particularly intrusive or repetitive thoughts that take place during meditation ([Baer et al., 2004](#)). Reduction in thought suppression was found to mediate reductions in alcohol use following a mindfulness meditation retreat ([Bowen, Witkiewitz, Dillworth, & Marlatt, 2007](#)). It was theorized that avoiding unwanted thoughts perpetuates addictive behavior and that meditation can help reduce this link. The negative relationship reported here provides tentative support for this hypothesis by linking thought labeling and verbalization with reduced levels of alcohol use.

The negative relationship between alcohol use and the 'Act with Awareness' factor suggests that individuals who are able to focus on an activity with undivided attention may be less likely to engage in heavy alcohol consumption. To our knowledge, this study is the first to report a link between experiential awareness and reduced levels of alcohol use. Awareness is believed to play a role in controlled substance use. Some cognitive processes that help perpetuate addictive behaviors are believed to be implicit, taking place below the level of conscious awareness ([Ostafin & Marlatt, 2008](#)). Dual process models of addiction ([Wiers et al., 2007](#)) suggest that these automatic processes perpetuate addictive behaviors but conscious controlled cognitive processes reduce it. Therefore, increasing awareness, or making automatic thoughts explicit through mindfulness-based approaches, may be a method through which problematic alcohol use can be reduced. Increased awareness may also interrupt impulsive

behavioral tendencies which perpetuate addictive behavior and are a known precursor to hazardous drinking among college students ([MacKillop, Mattson, MacKillop, Castelda, & Donovan, 2007](#)).

It is important to note that these findings are somewhat inconsistent with those reported by Leigh and colleagues who observed, positive associations with mind/body awareness and drinking among college students ([Leigh et al., 2005](#); [Leigh & Neighbors, 2009](#)) and a positive association between 'non-attachment' and alcohol use among men ([Leigh & Neighbors, 2009](#)). In this study, the 'Observe' factor measures mind/body awareness and was unrelated to alcohol use or consequences. The 'Non-reactivity' factor measures non-attachment to thoughts and feeling, and was not significantly related to alcohol use or consequences. These discrepancies may be the result of differences in measurement and data analytic technique, but future research is needed to clarify this assumption.

Direct relationships between the FFMQ and alcohol-related negative consequences were observed for the 'Describe' and 'NonJudging' factors, and a near significant relationship was observed for the 'NonReactivity' factor. These relationships were found even after the robust relationship with alcohol use was controlled for, suggesting that there may be a unique relationship between mindfulness and alcohol-related consequences that exists independently of alcohol use. The relationships among the 'Describe' factor, alcohol use, and alcohol-related negative consequences prompted a follow-up analysis that indicated that the positive relationship between 'Describe' and consequences in our initial model may have been spurious. However, formal testing of the suppression effect was not carried out. The negative relationship between 'NonJudging' and alcohol-related consequences suggests that the ability to observe one's thoughts and feelings without judging them may be a marker of behavioral restraint that is related to alcohol-related behavior and risk-taking. [Ostafin & Marlatt \(2008\)](#) reported that high-level acceptance (i.e. Non-Judging of Experience) reduced the link between automatic alcohol-approach motivation and risky drinking among college students. They theorized that acceptance is needed to decouple the relationship between automatic mental processes and resulting behavior. Similar findings and conclusions were reported by [Wikiewicz & Bowen \(2010\)](#) who observed a reduced link between depressive symptoms and substance use when acceptance of thoughts and feelings was increased through mindfulness and meditation training. In general, training in mindfulness skills such as objective observation of thoughts and feelings has been shown to help individuals suffering from substance dependence disorders ([Hamed et al., 2008](#)) and can help enhance psychological well-being in general ([Linehan et al., 1991](#)).

Limitations and Future Directions

A number of limitations should be considered when interpreting these findings. Our sample was relatively homogeneous, containing exclusively current or former university students and few racial or ethnic minorities. Participants in this study were not selected on the basis of any alcohol use criteria, although very heavy drinkers were excluded ($n = 8$ who were drinking more than 40 drinks per week and had at least two current symptoms of alcohol dependence). On average, the sample was drinking at problematic levels (i.e. reporting at least two episodes of heavy drinking a month and close to eight alcohol-related negative consequences in the past three months); nonetheless these results can not be generalized to a treatment-seeking, alcohol abusing/dependent population. Future research in clinical populations is recommended. Such research may even reveal a more robust negative relationship between mindfulness and alcohol use and improve upon the modest effect sizes reported here. The cross-sectional nature of this study constitutes an additional limitation. Longitudinal research examining relations between changes in facets of mindfulness and alcohol use over time is needed to better understand the potential dynamic interplay between these constructs.

Despite these limitations, the findings reported here further the current understanding of basic issues surrounding mindfulness research. Precise operational definition and measurement are the foundation on which future mindfulness research will be built. The growing popularity of mindfulness-based research underscores the importance of these issues. While this study contributes to our understanding of the factor-level reliability and validity of the FFMQ, there is still a need for continued exploratory and confirmatory factor analytic procedures in order to identify and remove poorly specified items that were identified in this study. The current sample was not large enough to conduct both exploratory and confirmatory tests consecutively. Additional questions also remain regarding the hierarchical factor structure of the FFMQ. The presence or absence of a theoretically-grounded hierarchical factor should be a next step in research. The use of populations with varying levels of mindfulness training is recommended when conducting such research.

The results reported here are correlational and cannot be used to infer any causal relationship between variables. Accordingly, future research would benefit from the use of an experimental design to test whether manipulations in mindfulness can be causally linked to changes in alcohol use. Despite the negative relationship between some aspects of mindfulness and alcohol use reported here, we can not infer that mindfulness can be manipulated to reduce alcohol use. Likewise, the modest associations observed in this study do not imply that mindfulness is a modestly effective tool for treating alcohol abuse problems. These findings merely provide a preliminary picture of how mindfulness is related to alcohol use at a basic level among college-attending young adults. Ultimately, research on mindfulness-based addiction treatments should measure mindfulness pre and post intervention to determine whether increases in mindfulness can be linked to decreases in alcohol and/or drug use through mediation analyses ([MacKinnon, 2008](#)). Unfortunately, past mindfulness/meditation-based treatment outcome studies have typically omitted such measures altogether.

Finally, the current findings can be used to inform the integration of mindfulness into alcohol abuse interventions. Specific aspects of mindfulness such as increasing awareness of one's actions and enhancing the ability to identify and verbalize thoughts may be particularly useful intervention targets. Evidence also points to the potential role of objectivity (i.e. NonJudging) in observing thoughts and feelings as a means to reduce alcohol-related negative consequences. This approach may be particularly effective for those who drink to reduce negative affect. [Witkiewitz & Bowen, \(2010\)](#) found that substance use in response to depressive symptoms may be reduce through mindfulness-based relapse prevention training, and [Leigh & Neighbors \(2009\)](#) found that mindfulness was negatively related to drinking to cope with negative affect (among men only). In summary, the findings reported here, combined with recent research, provide support for mindfulness-based relapse prevention ([Witkiewitz et al., 2005](#)) and other efforts that aim to increase awareness of actions, identification of thoughts and feelings, acceptance, and non-judgement of experience to help reduce alcohol use..

Acknowledgments

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