

Running head: MINDFULNESS AND SUBSTANCE USE

Examining the Prospective Associations between Mindfulness Facets and Substance Use in
Emerging Adulthood

by

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Abstract

Emerging adulthood (i.e., ages 18-25) is a developmental phase associated with frequent alcohol and cannabis use, placing this population at risk for substance use problems. Depression and anxiety (i.e., emotional psychopathology) are also prevalent during this phase and some emerging adults use substances to cope with these negative emotions. Mindfulness – a multifaceted construct – involves being present in a nonjudgmental and nonreactive way. Certain mindfulness facets are particularly relevant in buffering against substance use. A recent longitudinal study (Single et al., 2019) showed that specific mindfulness facets (i.e., acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience) predicted decreased alcohol and drug use in undergraduates. These pathways were explained by low levels of emotional psychopathology. This study expanded this recent work by using a three time-point longitudinal design and including measures of both alcohol and cannabis use and related problems. Using MTurk, participants ($N = 299$; 58% female; $M_{\text{age}} = 23.69$, $SD_{\text{age}} = 1.77$) completed online measures of trait mindfulness, depression, anxiety, alcohol and cannabis use, and related problems at three time-points, each two weeks apart. Structural Equation Modelling (SEM) was used to test the hypotheses. Results revealed that the acting with awareness and nonjudging of inner experience facets predicted fewer alcohol problems, but not alcohol use, and this effect was mediated by low levels of emotional psychopathology. These results were not supported for cannabis use and problems. This study demonstrates that there may be differences in the pathways from trait mindfulness to alcohol and cannabis use during emerging adulthood.

Keywords: mindfulness, alcohol use, cannabis use, emerging adulthood, emotional psychopathology, longitudinal

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Examining the Prospective Associations between Mindfulness Facets and Substance Use in
Emerging Adulthood

The ages of 18 to 25 comprise *emerging adulthood*; a developmental stage that is characterized by numerous opportunities for individuals to define and establish their identities (Arnett, 2000). This unique transitional period is marked by the exploration of important life domains, such as romantic relationships, entering the workforce, moving away from home for the first time, or enrolling in a postsecondary institution (Arnett, 2000). In fact, approximately 80% of emerging adults in North America attend some form of postsecondary education (i.e., university or college) (Arnett & Schwab, 2012; Shaienks et al., 2008). Individuals in this phase are faced with various difficulties as they learn to navigate a different educational environment, engage in interactions with peers and professors, and adjust to a new curriculum and learning habits. Navigating these challenges might lead to increases not only in substance use but in the prevalence of experiencing mental health difficulties, such as depression or anxiety.

Emerging adulthood is characterized by high rates of substance use (Arnett, 2005). In general, the highest rates of alcohol use occur among emerging adults (Hingson et al., 2009; Johnston et al., 2015). In North America, approximately 70-83% of emerging adults report drinking alcohol in the past year (Chen et al., 2004; Statistics Canada, 2017). Heavy episodic drinking, or binge drinking, can be defined as having greater than four alcoholic drinks in two hours for women and greater than five alcoholic drinks for men (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2004). Rates of binge drinking peak during emerging adulthood, and then diminish during the later 20's (Lee et al., 2013), with the prevalence of alcohol use disorder following the same trajectory (Chassin et al., 2004; Johnston et al., 2015). Harmful alcohol use poses various complications for emerging adults, including driving while

intoxicated, injury, assaults, memory loss, lower academic performance, and in some extreme cases, attempting suicide (Hingson, et al., 2005; White & Hingson, 2014). Thus, emerging adults are at heightened risk of experiencing negative repercussions from harmful alcohol use.

Additionally, cannabis is the second most used drug among emerging adults (Johnston et al., 2015). Similar to alcohol consumption, emerging adults use cannabis at higher levels compared to any other age group in North America, with rates of 21-33% compared to 6% for adults (Statistics Canada, 2018; Substance Abuse and Mental Health Services Administration [SAMHSA], 2010). Due to heavy use, emerging adults also have the highest prevalence of cannabis use disorder relative to other age groups (Farmer et al., 2015 Perkonigg et al., 2008). High levels of cannabis use are also associated with negative consequences, such as poor educational attainment, cognitive impairment, anxiety, and depression (Hall & Degenhardt, 2009; Volkow et al., 2014). Considering these findings, it is essential to understand more about the factors which may buffer against risky alcohol and cannabis use in emerging adulthood.

Mindfulness

A factor that could potentially protect against harmful alcohol and cannabis use is mindfulness. Mindfulness involves focusing on and paying attention to the present moment in a purposeful and nonjudgmental way (Kabat-Zinn, 1990). Trait mindfulness (i.e., naturally existing levels of mindfulness) has been operationalized as both a single and a multifaceted construct. One of the most common ways to conceptualize mindfulness is with the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) where the construct is defined using five different, but interrelated components. These components are observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience (Baer et al., 2006). Observing involves attending to internal and external experiences like cognitions,

emotions, sensations, sounds, sights, and smells. Describing involves having the capacity to articulate one's internal experiences. Acting with awareness requires being present in the moment. Nonjudging of inner experience involves being non-biased toward thoughts and feelings. Finally, nonreactivity to inner experience involves allowing thoughts and feelings to occur without reacting to them.

Plenty of research has examined mindfulness interventions, which have shown to be effective in contributing to adaptive psychological functioning and reducing negative symptoms in both clinical and non-clinical populations (Keng et al., 2011; Khoury et al., 2015; Spijkerman et al., 2016). Much of the current literature focuses on how trait mindfulness is associated with broad psychological health outcomes. A systematic review on mindfulness and psychological health revealed that trait mindfulness was negatively related to psychopathology symptoms (i.e., depression and anxiety) and positively related to adaptive functioning (Tomlinson et al., 2018). Further research has examined the associations between specific trait mindfulness facets and psychological health. A study conducted by Bodenlos and colleagues (2015) found that the acting with awareness and nonjudging of inner experience facets were positively associated with psychological health, suggesting that only specific FFMQ subscales are demonstrably effective with certain outcomes. This research highlights not only the importance of mindfulness as a broad construct, but that specific facets might be integral in the pathways to mental health outcomes.

More specific research has focused on FFMQ facets in relation to alcohol use during emerging adulthood. Using a cross-sectional design, Fernandez et al. (2010) found that nonjudging of inner experience was associated with fewer alcohol problems, acting with awareness was associated with less alcohol use, and describing was associated with more alcohol

problems. Further cross-sectional work revealed that the acting with awareness and nonreactivity to inner experience facets were negatively related to alcohol problems, in addition to the nonjudging of inner experience facet being negatively related to alcohol use and problems (Murphy & MacKillop, 2012). Additionally, Roos et al. (2015) found the describing, nonjudging of inner experience, and acting with awareness facets to be negatively associated with alcohol problems in students in a cross-sectional study. Another cross-sectional study found that both the acting with awareness and nonreactivity to inner experience subscales were associated with lower levels of harmful drinking in problematic student drinkers when mediated by drinking motives (Vinci et al., 2016). Overall, inconsistencies across these studies have demonstrated that further research is needed to better understand the relation between FFMQ facets and alcohol use during emerging adulthood.

Compared to work examining FFMQ facets in relation to alcohol use in emerging adulthood, far less research has investigated how these mindfulness facets relate to cannabis use in this population. One recent study by Barrington et al. (2019) found that the acting with awareness and nonjudging of inner experience facets predicted lower levels of both problematic alcohol and cannabis use in a first-year university student population. Although one of the first studies to examine the relation between FFMQ facets and cannabis use, this study was cross-sectional in design, thus propositions regarding causation cannot be made. Additionally, the participants were university students, so the results may not be generalizable to emerging adults who are not attending a postsecondary institution. Aside from this one study, no other work has specifically examined FFMQ facets and how they relate to cannabis use in emerging adulthood.

Evidently, not all five FFMQ facets are relevant in buffering against substance use. As the acting with awareness facet requires being attentive to the present moment, having the ability

to be aware of your present state could help prevent uninhibited behaviours. If an individual were to have difficulty with this aspect, they could act without prior intent to try and rid themselves of the unpleasant state they are in, potentially leading to harmful substance use. Both the nonjudging of inner experience and nonreactivity to inner experience facets relate to accepting unwanted internal experiences (like negative emotions) when they occur and not feeling the need to eliminate them. Thus, an individual high in the nonjudging of inner experience and nonreactivity to inner experience facets might be less likely to engage in any impulsive behaviours to evade any unwelcome experiences. Alternatively, recent work has criticized the observing subscale stating that it does not accurately assess an individual's ability to notice internal emotions (Rudkin et al., 2018). Furthermore, the describing subscale involves having the ability to articulate one's current experience, which might not be particularly relevant in substance use pathways. Overall, the acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience facets are likely the most relevant predictors for substance use in emerging adulthood.

Emotional Psychopathology

In general, there are diverse reasons which help to explain why people engage in substance use. Indeed, plenty of research has examined emerging adults' motives for substance use (Buckner et al., 2007; Lee et al., 2007; Merrill & Read, 2010; Skalisky et al., 2019). Individuals drink alcohol and use cannabis for many reasons – including coping (i.e., to reduce negative emotions), enhancement (i.e., to increase positive emotions), conformity (i.e., to fit in), and social (i.e., to increase social affiliation) motives (Cooper, 1994; Cox & Klinger, 1988). However, substance use prompted by coping motives tends to be one of the most common reasons for use among emerging adults and is uniquely related to risk for harm. For example,

emerging adults who experience more frequent and harmful alcohol and cannabis use report drinking or smoking for coping reasons (Carey & Correia, 1997; Hides et al., 2008; Johnson et al., 2010; Moitra et al., 2015; Neighbors et al., 2007). Moreover, emerging adults who drink to cope tend to experience persistent problems later in life, during a time when others in their respective cohort would mature out of substance-related harms (Keough & O'Connor, 2015; Patrick & Schulenberg, 2011). Although there are multiple reasons why an individual might use alcohol or cannabis, the present study will focus on using substances to reduce negative affective states, considering the prevalence of emotional psychopathologic symptoms in emerging adulthood (Moffitt et al., 2007; Waszczuk et al., 2016) and the harms experienced from alcohol and drug use for coping related reasons (Carey & Correia, 1997; Hides et al., 2008; Johnson et al., 2010; Neighbors et al., 2007).

Depression and anxiety are mental health problems that are commonly experienced during emerging adulthood (Moffitt et al., 2007; Waszczuk et al., 2016). In fact, these emotional problems increase during emerging adulthood compared to other developmental age periods (Costello et al., 2011). Prevalence research illustrates that roughly 21% and 13% of emerging adults meet the diagnostic criteria for major depressive disorder and generalized anxiety disorder in a 12-month timeframe, respectively (American Psychiatric Association, 2013; Peralta & Wei, 2016). Further, major depressive disorder is also highly comorbid with generalized anxiety disorder (Kessler et al., 2003). Due to the high comorbidity of depression and anxiety (Kessler et al., 2003; Moffitt et al., 2007), there has been a shift to merge the single-diagnosis disorders into one dimension (Craske, 2012). Accordingly, some current literature has conceptualized depression and anxiety together to reflect a common transdiagnostic element, which may be

thought of as emotional psychopathology (Barlow et al., 2004; Brown & Barlow, 2009; Single et al., 2019).

Both depression and anxiety are deleterious as they can trigger harmful substance use in emerging adults (Weiss et al., 2018). In general, depression and anxiety coincide with harmful alcohol use (Caldwell et al., 2002; Schuckit, 1996). Likewise, frequent cannabis use has been associated with higher levels of depression and anxiety (Degenhardt et al., 2003; Fergusson & Boden, 2008; Volkow et al., 2014), and increases the risk of developing a mood disorder (van Laar et al., 2007; Patton et al., 2002). Moreover, reductions in cannabis use have demonstrated noteworthy improvements in depression and anxiety (Hser et al., 2017). Using a self-medication theory framework, alcohol and cannabis use are often motivated by a need to alleviate negative emotions, such as depression or anxiety (Baker et al., 2004; Johnson & Kaplan, 1990; Khantzian, 1997). However, from a mindfulness perspective, negative emotions are deemed to be transient states that inherently disappear over time. When individuals are mindful, they are attuned to these negative emotions in a nonreactive and nonjudgmental manner. Hence, it should follow that being mindful should lessen the need for emerging adults to drink alcohol or use cannabis for coping reasons; thereby lessen the risk for related harms. Overall, self-medication theory would predict that certain facets of mindfulness should result in less alcohol and cannabis use because of reduced susceptibility to experiencing depression and anxiety.

As previously mentioned, research has examined the associations between specific FFMQ facets and alcohol use among emerging adults (Fernandez et al., 2010; Murphy & MacKillop, 2012; Roos et al., 2015) and cannabis use (Barrington et al., 2019); however, there is a dearth of longitudinal research examining how these facets relate to cannabis use in this population. One recent prospective study tested the comprehensive mediational pathways from

FFMQ facets to alcohol and cannabis use through emotional psychopathology. In this study, I found that the acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience facets were related to less harmful drinking, drug use, and drug problems, mediated by low levels of emotional psychopathology (Single et al., 2019). This study was the first to longitudinally examine the association between FFMQ facets and substance use with emotional psychopathology as a mediator. Further, this study examined specific mindfulness facets in relation to both alcohol and drug use among undergraduate students (Single et al., 2019).

Although this study was longitudinal, it only used two time-points over an undergraduate academic semester. The two-wave design did not allow for a strong test of mediation effects due to lack of temporal precedence. Additionally, the sample consisted of emerging adults from an undergraduate student population, thus results might not be generalizable to emerging adults who are not enrolled in university. Currently, FFMQ facets have not yet been examined longitudinally in the pathways to alcohol and cannabis use within an emerging adult population, which is broader than strictly undergraduates.

The Current Study

Given that trait mindfulness is negatively associated with depression and anxiety (Tomlinson et al., 2018), and that harmful alcohol and cannabis use are also related to both depressive and anxious psychopathology (Caldwell et al., 2002; Volkow et al., 2014), it should follow that emotional psychopathology plays an integral role in the pathways of mindfulness facets to substance use in emerging adults. Grounded in previous longitudinal work (Single et al., 2019), the primary aim of this study is to augment current literature by examining whether specific FFMQ facets influence emotional psychopathology and, in turn, alcohol and cannabis use and related problems among emerging adults.

The current study used a three time-point longitudinal design and was administered through Amazon's Mechanical Turk (MTurk; <http://www.mturk.com>), with each assessment being two weeks apart. Longitudinal designs are virtually absent in prior research in this area (Fernandez et al., 2010; Murphy & MacKillop, 2012; Roos et al., 2015; Vinci et al., 2016). Moreover, previous work in this area has been limited, due to the lack of inclusion of mediators or mechanisms that account for mindfulness' effects on alcohol and other substance use. Using a three time-point design allowed for temporal precedence to be established between mindfulness facets, emotional psychopathology, alcohol and cannabis use. I also utilized a broad sample of emerging adults – including both students and non-students – to help bolster the generalizability of these results. Additionally, this research used distinct measures to assess both alcohol use and alcohol problems, instead of conflating the two aspects as seen in past research (Single et al., 2019). Another novel piece is that measures of both cannabis use and cannabis problems will be included. Cannabis is the second most used substance in emerging adulthood, and no prior work has examined mindfulness facets and their prospective associations with cannabis use. Similar to prior research (Single et al., 2019), I expected that the FFMQ facets acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience at baseline will predict less alcohol and cannabis use and fewer related problems at the end of the four-week timeframe. Additionally, I predicted that lower levels of emotional psychopathology will mediate these effects.

Method

Participants

Archival data were used for this study. A total sample of 299 participants were recruited from Canada and the United States through MTurk (see Table 1). MTurk was originally created

as a platform for people to complete tasks that are difficult for computers, but now one of its primary uses is for recruiting “workers” to participate in online studies (Mason & Suri, 2012). One benefit of MTurk is that the participants tend to come from very diverse backgrounds, which can broaden the external validity beyond undergraduate populations (Mason & Suri, 2012). Of the recruited sample, 51% were non-students, and 49% were students (i.e., both part-time and full-time). Additionally, the sample predominantly identified as being White (68%). Other ethnicities identified included Black (11%), Hispanic or Latino (8%), East Asian (7%), South Asian (2%), and other (4%). Finally, participants’ ages ranged from 18 to 26, with an average age of 23.69 (SD = 1.77).

Procedure

Ethical approval was obtained from the University of Manitoba Psychology/Sociology Research Ethics Board before commencement of the study. Informed consent was obtained from all participants prior to their participation in this research (see Appendix A-C). The study was programmed and administered through Qualtrics, an online survey platform. A three-wave short-term longitudinal design was used. Cross-sectional designs neglect temporal precedence, whereas long-term longitudinal designs may potentially ignore short-term associations between variables. Hence, longitudinal research with short time-frames between assessments is capable of capturing changes in dynamic behaviours, such as depression, anxiety, and substance use (Graham et al., 2010; Mushquash et al., 2013; Sherry et al., 2013). Similar to other studies that have utilized a rapid, short-term longitudinal design, participants in this study were recruited at three time-points; each two weeks apart. As mindfulness is temporally stable, I did not expect this trait to fluctuate throughout the four-week timeframe, whereas depression, anxiety, and substance use would likely change due to the inherent dynamic nature of these variables. Similar

to previous studies hosted through MTurk, individuals received \$2.50 as compensation for their participation at each time-point, and an additional \$2 if they participated in all three time-points, thus potentially earning a maximum of \$9.50.

A battery of online self-report questionnaires were administered at all three time-points. Data collection through MTurk is often criticized for being subject to various biases and inaccuracies; however, research has demonstrated that online anonymous self-reports of alcohol and cannabis use through MTurk use are generally reliable and valid (Kim & Hodgins, 2017; Ramo et al., 2012), and that quality of the data is quite high (Shapiro et al., 2013). Nevertheless, numerous safeguards were established to ensure that high-quality data was collected, such as embedding Captchas throughout the surveys at each time-point to prevent bots, excluding participants with short survey completion times (i.e., < 300 seconds), and only allowing reliable “workers” to participate in each survey. At the first assessment (Time 1), measures asked about behaviour in the past year. However, at the second and third assessments (Time 2 and Time 3, respectively), the timeframe was adjusted to reflect the accurate amount of time that had elapsed between assessments (i.e., two weeks). This enabled me to gain an understanding of how depression, anxiety, alcohol use, and cannabis use may have changed between time-points. Feedback pertaining to the study objectives was provided to participants following the completion of the third survey.

Measures

Five facet mindfulness questionnaire. The FFMQ (Baer et al., 2006) is a 39-item measure that assesses trait mindfulness. The FFMQ consists of five subscales, these being observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. A sample item from each subscale is as follows: observing (e.g., “I pay

attention to how my emotions affect my thoughts and behavior”), describing (e.g., “I can usually describe how I feel at the moment in considerable detail”), acting with awareness (e.g., “I find myself doing things without paying attention”), nonjudging of inner experience (e.g., “I think some of my emotions are bad or inappropriate and I shouldn’t feel them”), and nonreactivity to inner experience (e.g., “When I have distressing thoughts or images, I just notice them and let them go”). Participants indicated how true a statement generally was for them using a 5-point Likert scale, with responses ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). Items for the describing, acting with awareness, and nonjudging of inner experience subscales are negatively valenced and were reverse-scored before individual subscale total scores were computed. The FFMQ has been validated in both meditating and nonmeditating samples (Baer et al., 2008), and has shown convergent validity in both clinical and non-clinical samples (Andrei et al., 2016; Bohlmeijer et al., 2011). In this study, the reliability for the FFMQ subscales were as follows: observing ($\alpha = .85$), describing ($\alpha = .88$), acting with awareness ($\alpha = .90$), nonjudging of inner experience ($\alpha = .92$), and nonreactivity to inner experience ($\alpha = .84$).

Timeline followback method. The Timeline Followback method (TLFB; Sobell & Sobell, 1992; Sobell, Sobell, et al., 1996) was the primary measure of alcohol and cannabis use, as it provided a quantitative understanding of an individuals’ alcohol and cannabis intake. The TLFB method can be self-administered, administered by an interviewer, or administered by a computer, but in this study it was administered by a computer. Participants reflected on their alcohol and cannabis use in the past 14 days and recorded what a typical day looks like for a week (i.e., seven days). The TLFB method for alcohol used standard drink units to quantify alcohol intake per day (e.g., 12 oz. of regular beer is equivalent to one standard drink). Similarly, the TLFB method for cannabis uses ‘standard joints’ to quantify cannabis intake, which was

defined as .25 grams of cannabis per joint. The TLFB has demonstrated good test-retest reliability (Sobell, Brown, et al., 1996).

Rutgers alcohol problem index. Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a 23-item measure that assesses alcohol-related problems (e.g., “Wanted to stop drinking but couldn’t”). Participants responded on a 4-point Likert scale using a response range from 0 (*none*) to 3 (*more than 5 times*). Participants indicated how many times they experienced a specific alcohol-related problem in the past year at Time 1 or in the past two weeks at Time 2 and Time 3. Higher scores are indicative of a greater amount of alcohol-related problems experienced. A total score was computed. The original validation study demonstrated that the RAPI is highly reliable (White & Labouvie, 1989). Other research has shown that the RAPI has high internal consistency with emerging adult populations with the original (Hartman et al., 2019; Shin et al., 2019) and modified timeframe (Carey et al., 2010). In this study, the RAPI had excellent levels of internal consistency at Time 1 ($\alpha = .96$), Time 2 ($\alpha = .96$), and Time 3 ($\alpha = .96$).

Rutgers marijuana problem index. Rutgers Marijuana Problem Index (RMPI; Johnson & White, 1995) is an 18-item measure that is adapted from the RAPI (White & Labouvie, 1989). Similar to the RAPI, the RMPI assesses marijuana- or cannabis-related problems (e.g., “Felt physically or psychologically dependent on marijuana”). Participants responded on a 4-point Likert scale using a response range from 0 (*none*) to 3 (*more than 5 times*) for how many times they experienced a cannabis-related problem in the past year at Time 1, or in the past two weeks at Time 2 and Time 3. Higher scores are indicative of a greater amount of cannabis-related problems experienced. A total score was computed. The RMPI has been shown to have adequate internal consistency in emerging adult samples (Gray et al., 2018; Skalisky et al., 2019). In this

study, the RMPI had excellent levels of internal consistency at Time 1 ($\alpha = .94$), Time 2 ($\alpha = .94$), and Time 3 ($\alpha = .95$).

Centre for epidemiologic studies depression scale. The Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) is a 20-item measure that assesses self-reported symptoms of depression (e.g., “I felt that everything I did was an effort”). Participants responded on a 4-point Likert scale from 0 (*rarely or none of the time*) to 3 (*most or all of the time*), indicating how often they have felt or behaved in the past week. Total scores range from 0 to 60, with higher scores indicative of experiencing greater depressive symptoms, and a cut-off of 16 indicating clinical risk for depression. A total score was computed. The CES-D has been proven to have good internal consistency with emerging adult samples (Kenny & Sirin, 2006; Przepiorka et al., 2019). In this study, the CES-D had excellent levels of internal consistency at Time 1 ($\alpha = .94$), Time 2 ($\alpha = .94$), and Time 3 ($\alpha = .95$).

Generalized anxiety disorder scale. The Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) is a 7-item scale that is used for screening for generalized anxiety. Participants responded on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*) to items asking about how often they were bothered by specific things in the past two weeks (e.g., “Over the last two weeks, how often have you been feeling nervous, anxious, or on edge?”). Total scores on the GAD-7 range from 0 to 21, with cut-off scores of 5, 10, and 15 indicating mild, moderate, and severe levels of anxiety, respectively. A total score was computed. The GAD-7 has demonstrated to be a valid (Löwe et al., 2008) and reliable measure for anxiety screening in emerging adult samples (Cheng et al., 2015; Pedersen & Paves, 2014). In this study, the GAD-7 had excellent levels of internal consistency at Time 1 ($\alpha = .93$), Time 2 ($\alpha = .93$), and Time 3 ($\alpha = .94$).

Demographics. Several demographic questions were asked to gain a more fulsome understanding of the sample population. Participants were asked to report their age, sex, gender, ethnicity, the highest level of education achieved, and current work experience (see Table 1). Additionally, participants were asked if they were currently enrolled in a post-secondary institution to establish student and non-student status. There are potential differences in alcohol and cannabis use between students and non-students (Carter et al., 2010; Linden-Carmichael & Lanza, 2018), so student status was controlled for in the main statistical models (see below). Additionally, there are known gender differences between males and females regarding substance use outcomes (Adams et al., 2014; Duncan et al., 2015), as well as depression and anxiety (Girgus & Yang, 2015; Weisberg, 2009), so gender was also included as a covariate in statistical models.

Statistical Plan

The primary objective of this research was to examine the pathways of FFMQ facets on alcohol and cannabis use during emerging adulthood, via emotional psychopathology. In line with previous research (Single et al., 2019), I anticipated that the FFMQ facets acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience at Time 1 would be associated with lower levels of emotional psychopathology at Time 2, and in turn, associated with lower levels of alcohol use and alcohol problems at Time 3. Structural Equation Modelling (SEM) was used to test the hypothesized models. All analyses were performed in IBM SPSS version 25 (IBM Corp., 2017) and Mplus version 8 (Muthén & Muthén, 2017). In the first model, FFMQ facets were specified as the predictors, a latent variable (i.e., emotional psychopathology) comprised of the depression and anxiety measures were specified as the mediator, and alcohol use and problems were specified as correlated outcomes (see Figure 1).

Additionally, I expected the same pathway to emerge for cannabis use and cannabis problems, therefore the second model had the same predictors and mediator, but cannabis use and cannabis problems were specified as correlated outcomes (see Figure 2). In both models, baseline emotional psychopathology and alcohol and cannabis use and related problems were controlled for to examine change of the variables throughout the four-week time-frame.

Model fit was evaluated using the following tests and corresponding cut-offs: chi-square statistic divided by degrees of freedom test (χ^2/df) of < 3.0 , comparative fit index (CFI) of $\geq .95$, root mean square error of approximation (RMSEA) of $\leq .06$, and standardized root mean residual (SRMR) of $\leq .08$ (Hu & Bentler, 1999; Kline 2010). Instead of relying on significance testing, effect sizes with 95% confidence intervals (*CI*s) were used to assess the path and indirect effects (Kline, 2013; Lambdin, 2012). If the *CI*s did not include zero, then paths and indirect effects were considered supported (Fritz & MacKinnon, 2007). An a priori power analysis was conducted before data analysis to determine the minimum number of participants needed to achieve appropriate power for this study. In SEM research, a guideline is to recruit a ratio of 10 cases per parameter (Kline, 2010). In this model, there were 28 parameters for the variances and covariances of the exogenous (i.e., predictors) and endogenous (i.e., mediators and outcomes) variables; therefore, a minimum of 280 participants were needed to achieve adequate power.

Results

Preliminary Analyses

In this study, alcohol use, cannabis use, alcohol problems, and cannabis problems had non-normal distributions (skew > 3.0 ; kurtosis > 10 ; Kline, 2013), which is consistent with what is typically observed in community samples (Neal & Simons, 2007). Mindfulness, depression, and anxiety were normally distributed. I used robust maximum likelihood estimation (MLR) and

missing data were handled via full information methods (Muthén & Muthén, 2017). Using full information maximum likelihood was appropriate because we did not observe any systematic data loss.

A total of 299 participants completed the study at Time 1, but only 200 participants completed the study at Time 2, and only 100 participants completed the study at Time 3. Attrition is especially common in addictions and longitudinal research (Goodman & Blum, 1996; Pulford et al., 2010; Stark, 1992); however, this presents possible issues with data analyses, largely if participants who drop out differ systematically from participants with complete or partially complete data on critical variables (Enders, 2010). Therefore, I ran a series of t-tests to examine if there were potential baseline differences between those with complete versus those with incomplete data. Results revealed that there were no statistically significant differences between those who completed all three time-points and those who did not complete all three time-points on measures of mindfulness facets (observing: [$t_{(299)} = -.412, p = .681, d = 0.05$], describing [$t_{(299)} = -1.657, p = .099, d = 0.20$], acting with awareness [$t_{(299)} = -.501, p = .617, d = 0.06$], nonjudging of inner experience [$t_{(299)} = -.843, p = .400, d = 0.10$], and nonreactivity to inner experience [$t_{(299)} = -1.413, p = .159, d = 0.17$]), depression ($t_{(299)} = 1.794, p = .074, d = 0.22$), anxiety ($t_{(299)} = 1.473, p = .142, d = 0.18$), alcohol use ($t_{(299)} = .711, p = .478, d = 0.09$), alcohol problems ($t_{(299)} = -.330, p = .742, d = 0.04$), cannabis use ($t_{(299)} = 1.376, p = .179, d = 0.18$), and cannabis problems ($t_{(299)} = 1.030, p = .304, d = 0.13$). Additionally, for participants who did not complete all three time-points, their status was uncorrelated with gender ($r = .03, p = .64$), age ($r = -.05, p = .35$), and student status ($r = -.05, p = .44$).

Descriptive statistics and bivariate correlations are presented in Table 2. Similar to other studies with emerging adult samples, this study had comparable FFMQ subscale total scores

(Khaddouma & Gordon, 2018; Ramler et al., 2016; Single et al., 2019). Additionally, mean scores on the CES-D (Audrain-McGovern et al., 2011) and GAD-7 (Bonar et al., 2018; Stein et al., 2013) were similar to other studies utilizing emerging adult samples. Total scores for the RAPI (Gates et al., 2016; Kenney et al., 2012) and RMPI (Lee et al., 2010) were also comparable to previous research.

SEM Analyses: Hypothesis Testing

The fit of model one was excellent: $\chi^2 = 69.34$, $df = 38$, $\chi^2/df = 1.82$; $CFI = 0.935$; $RMSEA = 0.053$ (95% CI [0.032, 0.072]); $SRMR = 0.066$ (see Figure 1). The CI s for path coefficients showed that the acting with awareness and nonjudging of inner experience facets were negative predictors of emotional psychopathology. The other mindfulness facets (i.e., observing, describing, and nonreactivity to inner experience) were not supported as predictors of emotional psychopathology. The CI s also demonstrated that emotional psychopathology was a positive predictor of alcohol problems, but not alcohol use. Regarding the indirect effects, bias-corrected 95% CI s showed that emotional psychopathology mediated the pathways from acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience to alcohol problems, but not alcohol use (see Table 3). Surprisingly, the indirect effect from the nonreactivity to inner experience facet to alcohol problems via emotional psychopathology was supported, despite that there was no supported link from this facet to emotional psychopathology at the front of the model. This indirect effect – which is the product of path coefficients from the nonreactivity to inner experience facet to emotional psychopathology, and emotional psychopathology to alcohol problems – is largely driven by the back end of the model (i.e., emotional psychopathology to alcohol use and problems). Since the indirect effect is strong, it causes mediation despite the first path not being supported. Gender and student status were

entered as covariates in the model and were controlled for in terms of their effects on emotional psychopathology and alcohol-related outcomes. These pathways suggest that individuals who had elevated levels of these specific mindfulness facets at Time 1 had lower levels of emotional psychopathology at Time 2, which in turn reduced alcohol problems at Time 3.

The fit of model two was also excellent: $\chi^2 = 51.61$, $df = 38$, $\chi^2/df = 1.36$; $CFI = 0.969$; $RMSEA = 0.035$ (95% CI [0.000, 0.057]); $SRMR = 0.059$ (see Figure 2). Consistent with model one, the CI s for path coefficients demonstrated that the acting with awareness and nonjudging of inner experience facets were negative predictors of emotional psychopathology. Contrary to my hypotheses, the CI s did not show that emotional psychopathology was a positive predictor of cannabis use or cannabis problems. Further, the bias-corrected 95% CI s did not show that emotional psychopathology mediated the pathways from mindfulness facets to cannabis use or cannabis problems (see Table 3). As with the first model, gender and student status were entered as covariates and were controlled for in terms of their effects on emotional psychopathology and cannabis-related outcomes. These pathways suggest that individuals high in the specific mindfulness facets of acting with awareness and nonjudging of inner experience at Time 1 had lower levels of emotional psychopathology at Time 2, which in turn was not associated with cannabis use and cannabis problems at Time 3.

Discussion

In this study, I examined how specific mindfulness facets predicted alcohol and cannabis use and related problems throughout a four-week time-frame, through emotional psychopathology. Individuals who were high in the mindfulness facets of acting with awareness and nonjudging of inner experience experienced fewer alcohol problems, but not alcohol use, after four weeks. Yet, no clear pathways from mindfulness facets to cannabis use and cannabis

problems were found. However, there was a supported indirect effect from nonreactivity to inner experience to alcohol problems, via emotional psychopathology, suggesting that individuals who were high in the acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience facets saw a reduction in their alcohol problems after four weeks. Overall, this work demonstrates that some – but not all – mindfulness facets are predictive of alcohol problems in emerging adulthood.

Consistent with prior work, these results have identified that the acting with awareness, nonjudging of inner experience, or nonreactivity to inner experience facets were related to fewer alcohol problems (Fernandez et al., 2010; Murphy & MacKillop, 2012; Roos et al., 2015; Vinci et al., 2016). These previous findings were extended by longitudinally examining how emotional psychopathology mediates the association in a short, four-week timeframe. Considering the bulk of previous work in this area has been cross-sectional (Fernandez et al., 2010; Murphy & MacKillop, 2012; Roos et al., 2015; Vinci et al., 2016), the current study highlights how dynamic behaviours, such as depression, anxiety, alcohol use, and cannabis use, can be observed using a short-term longitudinal design. More importantly, this study advances the literature by looking at prospective mediation from mindfulness facets to alcohol and cannabis use and problems in emerging adulthood.

One novel piece of this study was that it separated alcohol use from alcohol problems, and the results showed unique pathways from mindfulness facets to alcohol problems. Perhaps this supported pathway can be best explained by the coping literature, or more specifically, on drinking for coping reasons. It is possible that individuals who were attuned to their negative mood states mindfully felt less of a need to drink to reduce their unwanted emotions. Indeed, drinking alcohol to cope consistently predicts alcohol-related problems, regardless of the

quantity of alcohol consumed (Cooper et al., 1995; Read et al., 2003). Therefore, our supported unique pathways from mindfulness facets to alcohol problems (but not to use) is not surprising. The literature suggests that individuals who drink for coping reasons can experience alcohol-related problems independent of the amount they drink (Merrill & Read, 2010). Therefore, our results support the notion that mindfulness, through being skilled at monitoring and being less reactive to internal states, may relate to experiencing fewer alcohol problems. Therefore, mindfulness may reduce the likelihood of riskier alcohol consumption, like binge drinking.

Contrary to previous research (Barrington et al., 2019; Single et al., 2019), we did not find that the pathways from specific mindfulness facets and alcohol problems were alike to those from specific mindfulness facets and cannabis problems. Although the literature suggests that alcohol and cannabis use are often prompted by the motive to cope with negative emotions (Baker et al., 2004; Johnson & Kaplan, 1990; Khantzian, 1997), cannabis use and problems were not associated with higher levels of acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience in the larger model, once the overlap between variables was controlled for. It is possible that this difference emerged since prior research in this area utilized a global measure of drug use instead of a specific cannabis use measure (Single et al., 2019). Another potential explanation for this difference could be that cannabis is not as socially accepted as a means of coping relative to alcohol, as cannabis remains an illicit drug in many jurisdictions. Perhaps in this sample, participants' motives for cannabis use were more diverse relative to motives for alcohol use. Indeed, research has shown that there are numerous reasons for using cannabis, such as to increase social cohesion, enhance positive affect, and improve creativity (Newcomb et al., 1988). The proposed associations in this study may be fitting in a sample with emerging adults with heavier cannabis use, since the present sample consisted of

individuals largely with subclinical alcohol and cannabis use. Individuals with heavier cannabis use might endorse different motives, as those with cannabis use disorder tend to report a primary motive of smoking to cope (Moitra et al., 2015). Future research should test the current model in a sample of emerging adults with heavier cannabis use habits (e.g., daily users).

This research has important clinical implications. Many empirically supported evidence-based treatments (e.g., motivational interviewing) aimed at reducing alcohol and cannabis use in emerging adults have positive outcomes (Davis et al., 2017; Laporte et al., 2018; Stein et al., 2018). A review of the literature shows that interventions which incorporate aspects of mindfulness, such as mindfulness-based relapse prevention or mindfulness meditation, are effective in reducing alcohol and cannabis use in subclinical (de Dios et al., 2012; Vinci et al., 2014) and clinical populations (Bowen et al., 2014; Enkema & Bowen, 2017; von Hammerstein et al., 2019). I may have observed differing results in this study since this sample consisted of a subclinical emerging adult population. It should be acknowledged that individuals in this age range typically have lower treatment rates despite the higher prevalence of mental health and substance use problems (Adams et al., 2014), and that most lifetime substance use or psychiatric disorders reach their peak near the denouement of emerging adulthood (Kessler et al., 2005). Therefore, capitalizing on well-known effective strategies during this period is paramount. These findings suggest that mindfulness interventions aimed at reducing alcohol use for emerging adults should be addressing and utilizing specific mindfulness skills, particularly ones with relevance to the acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience facets. Currently, research is aiming to better understand the effectiveness of interventions aimed at reducing cannabis use for emerging adults (Halladay et al., 2018).

This research had numerous strengths, as it utilized a diverse emerging adult sample of both students and non-students, included measures of both alcohol use and problems, and measured the mediator and outcome variables at three different time points to establish temporal precedence between mindfulness facets, emotional psychopathology, and alcohol and cannabis use and problems. However, certain limitations should be noted. First, this study relied on self-report data for substance use, which can sometimes be inaccurate. Since cannabis is currently not legalized in every state in the United States, some participants may have underreported use. However, I took the necessary safeguards to ensure that participants were aware that their responses would be kept completely anonymous. Second, this research did not examine the co-use of alcohol and cannabis and subsequent problems. In general, problems are exacerbated when individuals use both substances compared to independent use (Shillington & Clapp, 2006; Subbaraman & Kerr, 2015). Future research should examine co-use and subsequent problems relating to alcohol and cannabis in an emerging adult population. Despite these limitations, this study advances current knowledge regarding specific mindfulness facets and their buffering effects against harmful alcohol and cannabis use in emerging adulthood.

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Table 1
Participant Demographics

	M (SD) or n (%)
Age	23.69 (1.77)
Sex	
Male	126 (42.1%)
Female	173 (57.9%)
Gender	
Man	123 (41.1%)
Woman	169 (56.5%)
Transgender	2 (0.7%)
Non-binary	5 (1.7%)
Ethnicity	
East Asian, South-East Asian, Pacific Islander	21 (7.0%)
Middle Eastern, North African, Central Asian	2 (0.7%)
Hispanic or Latino	24 (8.0%)
Caucasian or White	204 (68.2%)
Black	33 (11.0%)
Aboriginal	4 (1.3%)
South Asian	5 (1.7%)
Other	6 (2.0%)
Student status	
Full-time	89 (29.8%)
Part-time	57 (19.1%)
Not a student	153 (51.2%)
Education	
Less than high school	1 (0.3%)
High school diploma	31 (10.4%)
One or two year post high school but not college	12 (4.0%)
One or two year diploma from a trade or professional school but not college	6 (2.0%)
Some college or university education	108 (36.1%)
College or university degree (Bachelors)	121 (40.5%)
Post graduate work	12 (4.0%)
Post graduate degree	8 (2.7%)
Job	
Not working	36 (12.0%)
No (enrolled as a post-secondary student)	19 (6.4%)
Yes, part-time (approximately 9 hours or less per week)	12 (4.0%)
Yes, part-time (approximately 10-19 hours per week)	26 (8.7%)
Yes, part-time (approximately 20 or more hours per week)	46 (15.4%)
Yes, full-time (approximately 40 hours per week)	160 (53.5%)

Table 2
Descriptive Statistics and Bivariate Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Observing	-	.35	.09	-.19	.50	-.03	-.05	-.02	.30	.06	.03	.09	.10	.15	-.00	-.04	-.03	.07	-.01	-.06	.02	-.02	-.06
2. Describing		-	.52	.39	.42	-.41	-.36	-.28	-.33	-.29	-.23	-.01	-.02	-.03	-.07	-.12	-.21	-.02	-.14	-.15	-.07	-.18	-.19
3. Acting with Awareness			-	.57	.22	-.53	-.46	-.52	-.43	-.42	-.39	-.04	-.03	-.08	-.14	-.16	-.26	-.06	-.10	-.10	-.09	-.15	-.14
4. Nonjudging of Inner Experience				-	.21	-.60	-.54	-.57	-.58	-.54	-.60	-.12	-.08	-.07	-.11	-.17	-.14	-.07	-.06	-.03	-.06	-.13	-.10
5. Nonreactivity to Inner Experience					-	-.31	-.28	-.25	-.30	-.26	-.32	.09	.14	.06	.03	-.02	-.03	.01	-.03	-.08	.06	-.01	-.00
6. Depressive Symptoms (Time 1)						-	.85	.85	.82	.71	.73	.16	.12	.05	.28	.35	.38	.10	.09	.07	.14	.22	.20
7. Depressive Symptoms (Time 2)							-	.85	.73	.83	.80	.07	.06	.02	.27	.34	.29	.12	.11	.12	.20	.26	.21
8. Depressive Symptoms (Time 3)								-	.72	.77	.87	.14	.12	.02	.23	.33	.29	.16	.09	.06	.17	.20	.20
9. Anxiety Symptoms (Time 1)									-	.81	.78	.14	.08	.13	.21	.28	.30	.16	.09	.06	.15	.25	.14
10. Anxiety Symptoms (Time 2)										-	.84	.09	.07	.12	.23	.32	.33	.18	.12	.12	.23	.28	.21
11. Anxiety Symptoms (Time 3)											-	.13	.08	.06	.13	.27	.22	.22	.16	.12	.09	.15	.19
12. Alcohol Use (Time 1)												-	.70	.67	.61	.45	.44	.31	.18	.05	.34	.20	.28
13. Alcohol Use (Time 2)													-	.75	.51	.56	.40	.10	.15	.05	.25	.24	.20
14. Alcohol Use (Time 3)														-	.37	.40	.36	.13	.10	.09	.21	.16	.16
15. Alcohol Problems (Time 1)															-	.77	.73	.25	.12	.16	.60	.46	.28
16. Alcohol Problems (Time 2)																-	.73	.11	.08	.13	.44	.54	.42
17. Alcohol Problems (Time 3)																	-	.25	.10	-.01	.47	.56	.61
18. Cannabis Use (Time 1)																		-	.79	.69	.50	.40	.44
19. Cannabis Use (Time 2)																			-	.77	.40	.33	.38
20. Cannabis Use (Time 3)																				-	.35	.36	.27
21. Cannabis Problems (Time 1)																					-	.83	.58
22. Cannabis Problems (Time 2)																						-	.65
23. Cannabis Problems (Time 3)																							-
<i>M</i>	26.03	25.93	25.89	25.00	20.28	19.09	17.5	16.77	6.75	5.82	5.78	6.33	5.06	3.60	3.30	3.06	2.42	4.76	3.64	2.56	1.77	1.73	1.13
<i>SD</i>	6.24	6.68	7.09	7.71	5.38	13.54	13.07	13.72	5.72	5.32	5.66	10.03	7.44	4.96	6.88	6.34	5.78	10.92	8.68	6.67	4.38	4.51	3.44
<i>Range</i>	8-40	8-40	8-40	8-40	7-35	0-60	0-59	0-60	0-21	0-21	0-21	0-49	0-34	0-22	0-31	0-27	0-25	0-56	0-43	0-28	0-20	0-20	0-18

Table 3

Summary of Indirect Effects from Mindfulness Facets to Alcohol and Cannabis Use and Problems via Emotional Psychopathology

Path	Unstandardized Estimate	95% CIs
Model 1: Alcohol Use and Problems		
Observing → Emotional Psychopathology → Alcohol Use	-0.001	[-0.022, 0.008]
Describing → Emotional Psychopathology → Alcohol Use	0.001	[-0.005, 0.022]
Acting with Awareness → Emotional Psychopathology → Alcohol Use	0.005	[-0.017, 0.034]
Nonjudging of Inner Experience → Emotional Psychopathology → Alcohol Use	0.011	[-0.037, 0.056]
Nonreactivity to Inner Experience → Emotional Psychopathology → Alcohol Use	0.005	[-0.015, 0.043]
Observing → Emotional Psychopathology → Alcohol Problems	0.003	[-0.016, 0.056]
Describing → Emotional Psychopathology → Alcohol Problems	-0.006	[-0.050, 0.008]
Acting with Awareness → Emotional Psychopathology → Alcohol Problems	*-0.023	[-0.090, -0.003]
Nonjudging of Inner Experience → Emotional Psychopathology → Alcohol Problems	*-0.046	[-0.125, -0.006]
Nonreactivity to Inner Experience → Emotional Psychopathology → Alcohol Problems	*-0.024	[-0.109, -0.002]
Model 2: Cannabis Use and Problems		
Observing → Emotional Psychopathology → Cannabis Use	-0.001	[-0.033, 0.011]
Describing → Emotional Psychopathology → Cannabis Use	0.003	[-0.005, 0.039]
Acting with Awareness → Emotional Psychopathology → Cannabis Use	0.011	[-0.009, 0.056]
Nonjudging of Inner Experience → Emotional Psychopathology → Cannabis Use	0.023	[-0.024, 0.093]
Nonreactivity to Inner Experience → Emotional Psychopathology → Cannabis Use	0.012	[-0.008, 0.071]
Observing → Emotional Psychopathology → Cannabis Problems	0.001	[-0.006, 0.032]
Describing → Emotional Psychopathology → Cannabis Problems	-0.003	[-0.035, 0.002]
Acting with Awareness → Emotional Psychopathology → Cannabis Problems	-0.010	[-0.058, 0.000]
Nonjudging of Inner Experience → Emotional Psychopathology → Cannabis Problems	-0.021	[-0.075, 0.004]
Nonreactivity to Inner Experience → Emotional Psychopathology → Cannabis Problems	-0.011	[-0.064, 0.000]

Note. *indicates the 95% CIs that do not contain zero.

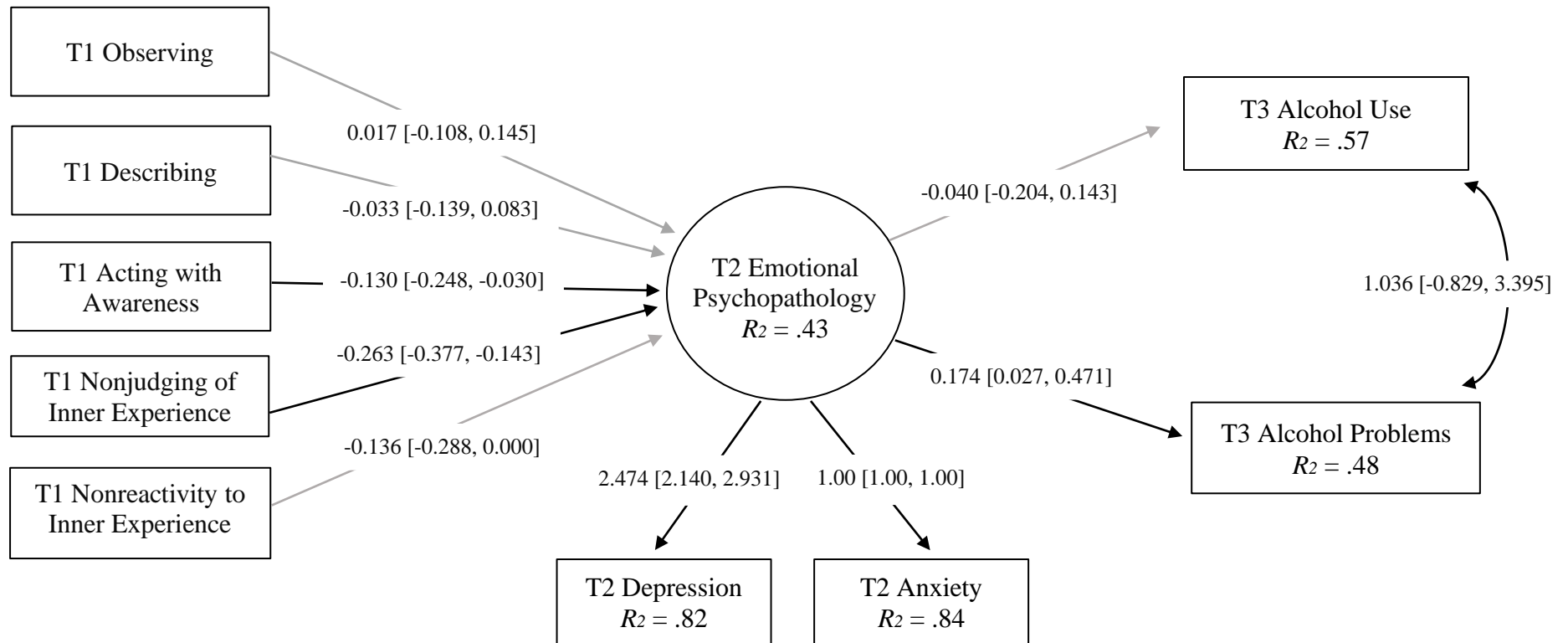


Figure 1. The final path model for pathways from mindfulness facets to alcohol use and alcohol problems via emotional psychopathology. Unstandardized parameter estimates are presented with 95% CIs. Dark lines are specified paths that were supported (i.e., the 95% CI did not include zero) and grey lines are specified paths that were not supported (i.e., the 95% CI included zero). T1 alcohol use and alcohol problems, as well as T1 emotional psychopathology, were controlled for in this model.

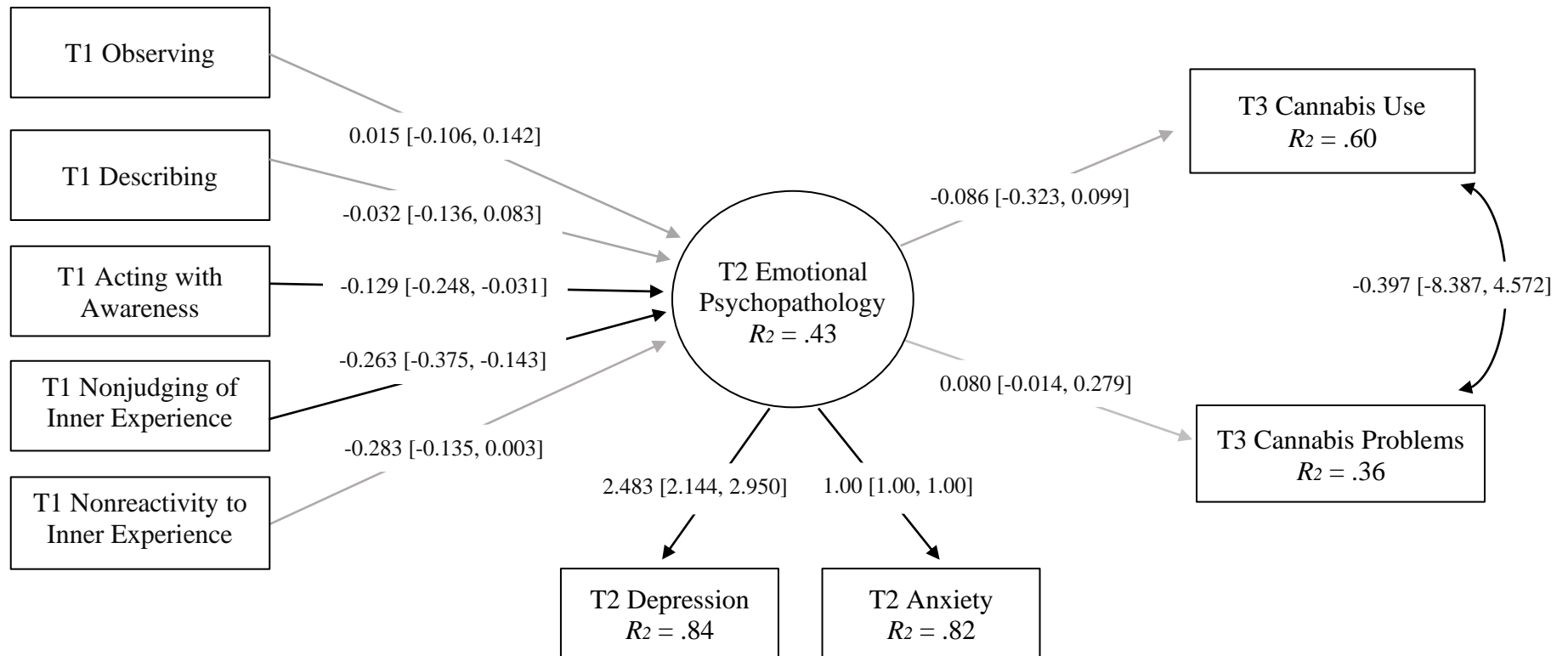


Figure 2. The final path model for pathways from mindfulness facets to cannabis use and cannabis problems via emotional psychopathology. Unstandardized parameter estimates are presented with 95% CIs. Dark lines are specified paths that were supported (i.e., the 95% CI did not include zero) and grey lines are specified paths that were not supported (i.e., the 95% CI included zero). T1 cannabis use and cannabis problems, as well as T1 emotional psychopathology, were controlled for in this model.

Appendix A

Time 1 Consent Form

UNIVERSITY
OF MANITOBA**Informed Consent – Time 1****Research Project Title:** Mindfulness and Substance Use**Principal Investigator:** Alanna Single, Master's Student, Department of Psychology
singlea@myumanitoba.ca**Supervisor:** Dr. Matthew Keough, Assistant Professor, Department of
Psychology, matthew.keough@umanitoba.ca; (204) 474-7400

This consent form, a copy of which can be downloaded and/or printed for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The primary purpose of this study is to examine the association between mindfulness and substance use in young adults. As a participant in this study, you will be asked to complete an online survey, consisting of questions regarding demographics, mindfulness, alcohol use, and cannabis use. This study should take approximately 25-30 minutes and you will receive \$2.50 for your participation.

While completing the survey, you may be answering questions of a sensitive nature pertaining to your substance use behaviour. If you experience significant distress during participation or after completing the survey, please seek help. Here are some potential resources:

Online Treatment Program:

<https://lastdoor.org/treatment/biopsychosocial-supports/>

Resources for Canadian residents:

<https://www.canada.ca/en/health-canada/services/substance-use/get-help/get-help-problematic-substance-use.html>

Resources for United States of America residents:

<https://findtreatment.samhsa.gov>

There are also significant benefits of this research. You may enjoy learning about yourself through completing the survey measures. Also, you may use the experience to learn more about psychological research, specifically in the area of mindfulness and substance use. This research has the potential to improve our clinical treatments for heavy drinking and drug use among young adults.

Participation in this study is voluntary and you may decline consent or withdraw at any time without reprisal by simply closing down your internet browser. You may also refuse to answer any questions that you do not wish to answer. If you decide to withdraw from participation in this research, the information in your research file will be destroyed. However, to receive your payment, you must proceed to the end of the survey to order to obtain the code to submit. Should you choose to wish to opt out of the study after completing part or all of the survey, you may have the option to press the “next” button at the bottom of the webpage to submit your responses or have your responses deleted by contacting the principal investigator.

This survey is part one of a three-part study. Should you choose to participate, there will be three time-points of the study (now, two weeks from now, and four weeks from now). At each time point, you will be asked to fill out several surveys related to your mood and use of cannabis and alcohol.

Your responses in this study will remain confidential at all times. Your answers to the consent form and survey are collected by Qualtrics™. Similar to social media and e-mail sites such as Facebook or Yahoo™ mail, risks to confidentiality are minimal. Your Mechanical Turk Worker ID will be used to connect responses from the first, second, and third surveys. This information will be permanently deleted approximately one year within the conclusion of the third survey, making it impossible to withdraw your responses at that point. Only the principal investigator, supervisor, and associated researchers (i.e., research assistants) will have access to the data. The anonymous data will be stored on password-protect computers in a locked laboratory room in the Duff Roblin building. For quality-assurance and safety purposes, the University of Manitoba Research Ethics Board(s) may also require access to the research records.

Results from the study will be disseminated through publication and research conferences. Any publication of findings will only report aggregate results (i.e., averages across participants). You will be provided an explanation of the purpose of this study in further detail at the end of this study. A summary of aggregate findings will be available at <https://addictionslab.weebly.com/results-summaries.html> within one year of the conclusion of the third survey.

By clicking “Agree” below you will indicate that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be

as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at (204)-474-7122. A copy of this consent form has been given to you to keep for your records and reference.

Agree

Decline

Appendix B

Time 2 Consent Form

UNIVERSITY
OF MANITOBA**Informed Consent – Time 2**

Research Project Title: Mindfulness and Substance Use

Principal Investigator: Alanna Single, Master's Student, Department of Psychology
singlea@myumanitoba.ca

Supervisor: Dr. Matthew Keough, Assistant Professor, Department of
Psychology, matthew.keough@umanitoba.ca; (204) 474-7400

This consent form, a copy of which can be downloaded and/or printed for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The primary purpose of this study is to examine the association between mindfulness and substance use in young adults. As a participant in this study, you will be asked to complete an online survey, consisting of questions regarding demographics, mindfulness, alcohol use, and cannabis use. This study should take approximately 25-30 minutes and you will receive \$2.50 for your participation.

While completing the survey, you may be answering questions of a sensitive nature pertaining to your substance use behaviour. If you experience significant distress during participation or after completing the survey, please seek help. Here are some potential resources:

Online Treatment Program:
<https://lastdoor.org/treatment/biopsychosocial-supports/>

Resources for Canadian residents:
<https://www.canada.ca/en/health-canada/services/substance-use/get-help/get-help-problematic-substance-use.html>

Resources for United States of America residents:
<https://findtreatment.samhsa.gov>

There are also significant benefits of this research. You may enjoy learning about yourself through completing the survey measures. Also, you may use the experience to learn more about psychological research, specifically in the area of mindfulness and substance use. This research has the potential to improve our clinical treatments for heavy drinking and drug use among young adults.

Participation in this study is voluntary and you may decline consent or withdraw at any time without reprisal by simply closing down your internet browser. You may also refuse to answer any questions that you do not wish to answer. If you decide to withdraw from participation in this research, the information in your research file will be destroyed. However, to receive your payment, you must proceed to the end of the survey to order to obtain the code to submit. Should you choose to wish to opt out of the study after completing part or all of the survey, you may have the option to press the “next” button at the bottom of the webpage to submit your responses or have your responses deleted by contacting the principal investigator.

This survey is part two of a three-part study. Should you choose to participate, there will be one more time-point to this study (two weeks from now). At each time point, you will be asked to fill out several surveys related to your mood and use of cannabis and alcohol.

Your responses in this study will remain confidential at all times. Your answers to the consent form and survey are collected by Qualtrics™. Similar to social media and e-mail sites such as Facebook or Yahoo™ mail, risks to confidentiality are minimal. Your Mechanical Turk Worker ID will be used to connect responses from the first, second, and third surveys. This information will be permanently deleted approximately one year within the conclusion of the third survey, making it impossible to withdraw your responses at that point. Only the principal investigator, supervisor, and associated researchers (i.e., research assistants) will have access to the data. The anonymous data will be stored on password-protect computers in a locked laboratory room in the Duff Roblin building. For quality-assurance and safety purposes, the University of Manitoba Research Ethics Board(s) may also require access to the research records.

Results from the study will be disseminated through publication and research conferences. Any publication of findings will only report aggregate results (i.e., averages across participants). You will be provided an explanation of the purpose of this study in further detail at the end of this study. A summary of aggregate findings will be available at <https://addictionslab.weebly.com/results-summaries.html> within one year of the conclusion of the third survey.

By clicking “Agree” below you will indicate that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at (204)-474-7122. A copy of this consent form has been given to you to keep for your records and reference.

Agree
 Decline

Appendix C

Time 3 Consent Form

UNIVERSITY
OF MANITOBA**Informed Consent – Time 3**

Research Project Title: Mindfulness and Substance Use

Principal Investigator: Alanna Single, Master's Student, Department of Psychology
singlea@myumanitoba.ca

Supervisor: Dr. Matthew Keough, Assistant Professor, Department of
Psychology, matthew.keough@umanitoba.ca; (204) 474-7400

This consent form, a copy of which can be downloaded and/or printed for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The primary purpose of this study is to examine the association between mindfulness and substance use in young adults. As a participant in this study, you will be asked to complete an online survey, consisting of questions regarding demographics, mindfulness, alcohol use, and cannabis use. This study should take approximately 25-30 minutes and you will receive \$2.50 for your participation.

While completing the survey, you may be answering questions of a sensitive nature pertaining to your substance use behaviour. If you experience significant distress during participation or after completing the survey, please seek help. Here are some potential resources:

Online Treatment Program:
<https://lastdoor.org/treatment/biopsychosocial-supports/>

Resources for Canadian residents:
<https://www.canada.ca/en/health-canada/services/substance-use/get-help/get-help-problematic-substance-use.html>

Resources for United States of America residents:
<https://findtreatment.samhsa.gov>

There are also significant benefits of this research. You may enjoy learning about yourself through completing the survey measures. Also, you may use the experience to learn more about psychological research, specifically in the area of mindfulness and substance use. This research has the potential to improve our clinical treatments for heavy drinking and drug use among young adults.

Participation in this study is voluntary and you may decline consent or withdraw at any time without reprisal by simply closing down your internet browser. You may also refuse to answer any questions that you do not wish to answer. If you decide to withdraw from participation in this research, the information in your research file will be destroyed. However, to receive your payment, you must proceed to the end of the survey to order to obtain the code to submit. Should you choose to wish to opt out of the study after completing part or all of the survey, you may have the option to press the “next” button at the bottom of the webpage to submit your responses or have your responses deleted by contacting the principal investigator.

This survey is part three of a three-part study. Your responses in this study will remain confidential at all times. Your answers to the consent form and survey are collected by Qualtrics^{STM}. Similar to social media and e-mail sites such as Facebook or YahooTM mail, risks to confidentiality are minimal. Your Mechanical Turk Worker ID will be used to connect responses from the first, second, and third surveys. This information will be permanently deleted approximately one year within the conclusion of the third survey, making it impossible to withdraw your responses at that point. Only the principal investigator, supervisor, and associated researchers (i.e., research assistants) will have access to the data. The anonymous data will be stored on password-protect computers in a locked laboratory room in the Duff Roblin building. For quality-assurance and safety purposes, the University of Manitoba Research Ethics Board(s) may also require access to the research records.

Results from the study will be disseminated through publication and research conferences. Any publication of findings will only report aggregate results (i.e., averages across participants). You will be provided an explanation of the purpose of this study in further detail at the end of this study. A summary of aggregate findings will be available at <https://addictionslab.weebly.com/results-summaries.html> within one year of the conclusion of the third survey.

By clicking “Agree” below you will indicate that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

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This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at (204)-474-7122. A copy of this consent form has been given to you to keep for your records and reference.

- Agree
- Decline