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Assessing the effectiveness and utility of a mindfulness-based ecological momentary intervention in college students

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ASSESSING THE EFFECTIVENESS AND UTILITY OF A MINDFULNESS-BASED ECOLOGICAL MOMENTARY INTERVENTION IN COLLEGE STUDENTS

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ABSTRACT

Mental health problems are common and increasing in college students. Despite the high prevalence rates of mental health problems in college students, a small percentage of students seek treatment. Low treatment seeking is associated with different factors, such as stigma, financial barriers, and emotion dysregulation. Identifying and delivering evidence-based treatments is critical to curtailing mental health problems and promoting psychological well-being in this population. One intervention that offers significant promise is Ecological Momentary Intervention (EMI), which incorporates technology to administer interventions. EMIs are widely applied for heterogeneous psychological problems and effective through different modalities. Mindfulness-based interventions (MBIs) ameliorate psychological distress and promote psychological well-being in college students. However, MBIs are generally administered in-person and may not be best suited for college students given barriers to in-person treatment. The current study examined the effectiveness of an EMI intervention incorporating mindfulness-based text messages. The current study also examined the perceived utility of the EMI intervention, as well as the between- and within-person associations in daily constructs. Compared to individuals assigned to the Ecological Momentary Assessment condition, individuals assigned to the EMI condition receiving mindfulness-based text messages did not report greater reductions in negative affect and greater increases in positive affect, mindfulness, and emotion regulation throughout the study. Participants mostly found the messages useful and helpful, and within- and between-individual factors predicted changes in positive and negative

affect. Higher engagement in the mindfulness activities was related to higher levels of positive affect, and lower awareness was related to higher emotion dysregulation throughout the study.

Keywords: College students; mindfulness; ecological momentary intervention

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

In college students, mental health problems are widespread and increasing (Oswalt et al., 2020; SAMHSA, 2019). One in five college students meets diagnostic criteria for at least one 12-month *Diagnostic and Statistical Manual-Fourth Edition* (*DSM-IV-TR*; American Psychiatric Association, 2000) mood, anxiety, behavioral, or substance use disorder (Auerbach et al., 2016). Other epidemiological studies report even higher prevalence rates for 12-month psychological disorders in college student samples (i.e., 31% to approximately 50%; Auerbach et al., 2018; Blanco et al., 2008). Regarding topographies of psychological problems in college students residing in both Western and non-Western countries, 31% of university students experience clinical levels of depression (Ibrahim et al., 2013). Further, approximately 12 to 15% of college students meet diagnostic criteria for an anxiety disorder, with five to seven percent meeting criteria for a 12-month substance use disorder (Auerbach et al., 2016). Other issues of clinical significance in college student samples that may not necessarily be characterized under the umbrella of common 12-month psychological disorders, albeit still functionally impairing, include insomnia (Taylor et al., 2013), eating disorders (Oswalt et al., 2020), and mental health problems resulting from discrimination (Oswalt & Lederer, 2017), among many others.

Regarding trajectories of mental health problems in college students, Twenge et al. (2010) discussed a marked increase in psychopathology in young Americans within the past 10 years, and the American College Health Association reported a twofold increase in anxiety disorders in recent years, with rates projected to continue increasing in the future (American

College Health Association, 2019). College students endorsing higher levels of homesickness report more difficulties adjusting to college (English et al., 2017), as well as increased sleep difficulties (Biasi et al., 2018). While not a focus of the current study, the new onset of specific stressors, such as COVID-19, exacerbate the prevalence rates of mental health problems in college students (Perz et al., 2020).

Increased mental health problems during college are associated with immediate downstream consequences, such as decreased school performance (Bruffaerts et al., 2018; De Luca et al., 2016), increased problematic substance use (Walters et al., 2018), lower levels of social support (Alsubaie et al., 2019), and poorer academic achievement (Andrews & Wilding, 2004). Functional outcomes are similar for long-term consequences related to mental health problems in college students; psychological disorders account for a significant percentage of dropouts in college students and are associated with both lower employment rates (Bruffaerts et al., 2018) and decreased engagement in future romantic relationships (Rothman et al., 2019).

Most college students with mental health problems develop emotional difficulties prior to beginning college. Auerbach et al. (2016) showed that, among the 20.3% of students diagnosed with a *DSM-IV-TR* 12-month disorder in their epidemiological review of mental health problems in college students, 83.1% of these disorders developed prior to college. Psychological problems predating college matriculation (i.e., most saliently substance use disorders and major depression) predicted early onset of psychological problems in college students and various functional outcomes after college. The prevalence rates of mental health problems and associated consequences in college students are well-documented, and the projected increase of mental health problems in college students is alarming. Understanding etiological and maintenance

factors for college students' mental health problems is imperative for designing intervention and prevention efforts.

Conceptualizing Mental Health in College Students

A burgeoning literature details the etiology of mental health problems in the general population, with most theoretical work supporting a biopsychosocial model as a template for case conceptualization. Etiological factors attributed to biological and psychological domains, such as neuroticism (Sauer-Zavala et al., 2017), or the propensity to experience negative emotions accompanied by negative worldviews, account for a significant proportion of the variance in clinical presentations across different psychological disorders (Barlow et al., 2014). Neuroticism is especially important to consider given elevated comorbidities between different psychological problems (e.g., anxiety and depressive disorders), which suggests an underlying negative affectivity across different symptom presentations of psychopathology (Brown et al., 2001). Higher levels of neuroticism predict the onset of anxiety and depressive disorders, and interventions targeting neuroticism are effective, even in small doses (Bentley et al., 2018).

Other psychological factors, such as classical and operant conditioning, also contribute to the development of psychological problems through associative learning, while operant conditioning principles explain the maintenance and exacerbation of psychological problems through negative reinforcement cycles or, more generally, difficulties regulating emotions and attempting to downregulate emotions through maladaptive emotion regulation strategies (e.g., escape or avoidance; Cousins et al., 2017; De Houwer, 2020; Gratz et al., 2015). Social factors, such as negative social evaluation, are also relevant to consider for understanding psychopathology (Yeager et al., 2016), and cultural norms contribute to the categorization and explanation of psychological problems (Hofmann et al., 2010). Despite the contributions the

biopsychosocial model makes for helping clinicians and researchers understand topographies and the etiology of mental health problems, in addition to behavioral strategies maintaining and increasing these problems, the college lifestyle represents a context where unique factors warrant consideration (i.e., within the biopsychosocial model framework) for understanding mental health problems.

The transition from high school to college is a major adjustment from adolescence to emerging adulthood that contributes to the expression of psychological problems in college students. For example, neuroticism is prevalent in college students with mental health problems (Embacher Martin et al., 2017), and high neuroticism is a strong predictor of college maladjustment (Kurtz et al., 2012). Higher levels of neuroticism also facilitate negative functional outcomes, such as lower academic achievement (Olmstead et al., 2016). Of course, psychological factors such as classical conditioning are pervasive across contexts (Norton & Paulus, 2017) and therefore likely contribute to the development of psychological problems in college students. In terms of social factors specific to the college setting, the stigmatization of mental health is a salient contributor to poor mental health. For example, individuals who believe that mental health problems are static stigmatize others with emotional difficulties, thereby reinforcing the maintenance of social distances and contributing further to mental health problems for affected students (Lyndon et al., 2016). Potential patients referred to mental health treatment also frequently report feeling ashamed, nervous (Fitzsimmons-Craft et al., 2019), and fearful (Meyer et al., 2016) at the prospect of speaking to a mental health professional. There are many different barriers that the college culture creates that may prevent students from seeking mental health treatment, which are likely exacerbating the mental health burden in college students.

Specific subgroups of college students are also at an increased risk for mental health problems, such as students endorsing lower socioeconomic status (Weitzman, 2004) or international students, the latter frequently experiencing acculturation-related difficulties (Jackson et al., 2019) due to the discrepancy between home and host cultures (Berry, 1997; Tkachuck et al., 2021). International students less successful at integrating current cultural values with home cultural values report increased psychological distress (Sullivan & Kashubeck-West, 2015), and international students unable to assimilate to Westernized educational systems also report increased psychological difficulties (Ruzek et al., 2011). While beginning college is often considered a time for growth, positive development, and opportunity, college students are prone to the development of different mental health problems at alarming rates due to biological, psychological, and social factors specific to both the college setting and etiology of mental health problems more generally. Mental health problems in college students, then, facilitate various downstream consequences after individuals have left college. Identifying effective and feasible psychological treatments for college students is critical to addressing the high prevalence rates of mental health problems in this population.

Psychological Treatment Seeking in College Students

Despite the high prevalence rates of mental health problems and associated consequences in college students, a small percentage of students affected by emotional difficulties seek treatment. Auerbach et al. (2016) described that, among students with at least one 12-month *DSM-IV-TR* psychological disorder, only 16.4% received 'minimally adequate' treatment for mental health care. In a separate review, 22.3% of students with mental health problems reported that they would not seek help (McLafferty et al., 2017). Low mental health treatment seeking rates are also common in the general population, as approximately 70 to 85% of citizens in the

United States do not receive mental health care despite needing it (Kazdin, 2019). Clearly, there is a large discrepancy between those affected by mental health problems and those who seek treatment in college students (among other settings), and college students face unique difficulties that warrant the delivery of accessible, evidence-based interventions to improve mental health and promote psychological well-being.

Some theoretical explanations offer an understanding as to why treatment seeking for mental health problems in college students is low, and these explanations covary with etiological explanations of psychological problems in college students. In a qualitative study of 21 college men diagnosed with depression or self-identifying as depressed, the overarching themes identified as barriers to treatment seeking were (1) denying weakness, (2) limiting self-disclosure and mustering autonomy, and (3) redefining strength (i.e., indicative of a gender difference in those who seek services; Tang et al., 2014). Gender differences in treatment seeking are not a new trend; college males with mental health problems report a lower likelihood of obtaining mental health treatment compared to females (Ennis et al., 2019). Personal stigma is also a common factor associated with lower levels of treatment seeking (Lipson et al., 2018). Negative attitudes alone represent a unique factor associated with a decreased likelihood of seeking treatment in college students (Jennings et al., 2017). In addition to different forms of stigma, maladaptive coping strategies contribute to low treatment seeking rates in college students (Komiya et al., 2000), providing support for the biopsychosocial model of mental health problems. Logistical barriers, such as limited financial resources (Givens & Tijua, 2002) and/or cultural factors such as gender (Kuhlman et al., 2019), also prevent students in higher education from seeking treatment. Perhaps a more salient contributor to low treatment seeking rates, many university-based mental health providers are typically understaffed and hold long wait lists (see

Xiao et al., 2017, for a review), which makes it difficult for students to access treatment. Taken together, there is a range of factors that contribute to low treatment seeking rates or otherwise serve as barriers to treatment in college student samples, which makes it difficult to disseminate evidence-based services and exacerbates mental health problems in this population.

Technological Self-Monitoring in College Students

Due to the various barriers contributing to low treatment seeking rates and a lack of access to treatment, college students (i.e., including adult populations more generally) choose alternative methods to self-monitor and improve their mental health. These alternative methods do not necessarily involve face-to-face interaction with a mental health provider (Heron & Smith, 2010; Levin et al., 2018). The use of self-help methods is not an uncommon trend; there are a variety of free mobile applications for different psychological problems, such as trauma- and stressor-related disorders, as well as anxiety and mood disorders (Van Ameringen et al., 2017). Individualized, technologically based interventions may address barriers and low treatment seeking rates in individuals who may not have access to effective forms of treatment. Developing time-efficient, cost-effective, and ecologically valid interventions for the college student population will provide opportunities to disseminate evidence-based services to a population that prefers to participate in treatment using online formats compared to in-person formats (Levin et al., 2018). Considering the high prevalence rates of psychological problems and low treatment seeking rates, as well as the various logistical, financial, and cultural/gender-based barriers that perpetuate limited access to in-person mental health treatment, identifying useful and effective ways to disseminate evidence-based services to college students is imperative for addressing mental health problems in this population. One approach that offers such an opportunity is Ecological Momentary Intervention.

Ecological Momentary Intervention

Ecological Momentary Intervention (EMI; Shiffman et al., 2008) incorporates technology (e.g., smartphones) to administer psychological treatments and/or collect data in social science research. The premise of EMI is rooted in Ecological Momentary Assessment (EMA), and EMI is one variant of EMA that affords opportunities for in-time, cost-effective data collection in naturalistic environments to understand between- and within-person differences in psychological constructs over time (Affleck et al., 1999; Moore et al., 2016; Pavlacic et al., 2021; Runyan & Steinke, 2015) and how these differences may be accounted for by environmental changes or interventions (Finkelstein-Fox et al., 2020; Nezlek, 2001; Pavlacic et al., 2021). As discussed in Pavlacic et al. (2021), assessing patients or research participants in naturalistic environments addresses sources of error that commonly confound cross-sectional assessment methods or even interventions (Moore et al., 2016), such as a lack of sleep the night before a therapy or research session, an inability to recall information over a given period of time (e.g., the past week), and lower levels of effort when completing surveys (Lenze & Wetherell, 2009; Trull & Ebner-Priemer, 2009). Cellular phones, specifically, are one example of a useful platform for disseminating treatments that have been shown to be effective using an EMI format (Kaplan & Stone, 2013) and could be a useful treatment alternative for college students to address barriers to accessing treatment (Lipson et al., 2018).

In addition to enhanced validity within the context of data collection, lower costs for EMI interventions, and the potential of EMA/EMI to limit confounding variables that facilitate measurement error in commonly used psychological assessment techniques, EMIs are widely applied and generally effective in heterogeneous samples and across different psychological problems. Technology-based interventions show increased utility and applicability for substance

use disorders (Marsch & Ben-Zeev, 2012), as well as for improving different health care outcomes (Krishna et al., 2009). Smith et al. (2019) implemented a Cognitive-Behavioral text messaging EMI to decrease body-checking behaviors with different evidence-based treatment techniques delivered to individual smartphones, and text-messaging EMI interventions supporting moderate alcohol consumption through text messages promoted moderate drinking for college women (Riordan et al., 2015). In a study examining the effectiveness of an EMI intervention on smoking cessation (i.e., the intervention consisted of tips for quitting tobacco and coping with urges to use tobacco), Businelle et al. (2016) showed that the EMI was well-liked, helpful, and useful for maintaining smoking cessation. Wenze et al. (2014) examined the acceptability of a mobile intervention to improve treatment adherence in individuals diagnosed with bipolar disorder and reported improvements in treatment adherence as well as reductions in depression symptoms, and Agyapong et al. (2012) found that supportive text messages enhanced treatment outcomes for individuals with co-occurring depression and alcohol use problems.

For more severe difficulties related to emotion dysregulation, Rizvi et al. (2011) characterized the implementation of a smartphone application (i.e., Dialectical Behavior Therapy Coach) as a helpful tool for teaching emotion regulation skills. Other applications of EMI include fruit and vegetable intake in young adults (Brookie et al., 2017), addressing early psychosis (Vaessen et al., 2019), and intervening in instances of non-suicidal self-injury (Armey, 2012), among many others. Standalone EMI interventions are widely applied and effective across contexts and modalities (Lucas-Thompson et al., 2019).

In a meta-analytic review of EMI interventions, Heron and Smyth (2010) reported that, across 27 different computer and mobile interventions for a variety of health and psychological outcomes, EMIs were effective and accepted by patients. The interventions included were

heterogeneous, ranging from text-messaging interventions that offered supportive comments and motivation to programs providing individualized feedback and goal setting for physical activity interventions. In a separate systematic review and meta-analysis examining both mental health and positive psychological outcomes (e.g., well-being) for EMI interventions, Versluis et al. (2016) described a medium effect size for these interventions (i.e., smartphones or personal digital assistant methods) across different outcomes, such as anxiety, depression, perceived stress, acceptance, relaxation, and quality of life. However, more than half of these interventions also had supplementary aid from a mental health professional that moderated treatment outcomes. Even though supplementary aid from a mental health provider led to larger effect sizes, standalone EMI interventions still exhibited a medium effect. EMI interventions included in this systematic review and meta-analysis were also variable, ranging from interventions rooted in Acceptance and Commitment Therapy, Behavioral Activation for Depression, relaxation techniques, Interpersonal Therapy, Dialectical Behavior Therapy, and self-management.

Together, individual studies, systematic reviews, and meta-analytic reviews illustrate the utility and effectiveness of EMI interventions for different psychological problems; these interventions are widely administered in various modalities, generally effective, and accepted by patients. EMI interventions offer a unique way to disseminate evidence-based techniques to populations who may not choose to seek in-person treatment or have limited access to treatment due to different barriers, such as college students. Designing specific, evidence-based interventions to meet the needs of college students is one way to effectively ameliorate psychological distress and improve psychological well-being in this population, thereby addressing the high prevalence rates of mental health problems. One area of clinical psychology that has burgeoned in recent years for addressing mental health problems, offering a

transdiagnostic intervention method for different psychological problems, is mindfulness-based interventions.

Mindfulness-Based Interventions

Mindfulness is operationally defined as a "form of nonjudgmental attention to present-moment experiences; these include internal phenomena, such as sensations, cognitions, emotions, and urges, as well as environmental stimuli such as sights, sounds, and scents" (Baer, 2018, p. 389). Within the context of third-wave behavioral and existential therapeutic approaches, mindfulness techniques involve maintaining contact with the present moment, accepting and distancing from difficult emotions, and perspective taking, all of which relate to higher levels of psychological well-being and meaning in life (Fletcher & Hayes, 2005; Kashdan & Ciarrochi, 2013; Langer & Ngnoumen, 2018). Mindfulness techniques are central to transdiagnostic (i.e., evidence-based procedures and factors applied to various domains of psychological problems simultaneously) treatments (Barlow et al., 2014). Conceptually, mindfulness is a critical skill and practice hypothesized to decrease psychological suffering (Hanh, 2010; Hofmann & Gómez, 2017).

While mindfulness practices originated from Buddhist traditions (Hofmann & Gómez, 2017), its practices and theoretical foundations have expanded to Western countries and are infused in different psychological treatments. Indeed, heterogeneous forms of mindfulness-based therapies have been developed that can be administered as standalone interventions or combined with other techniques, a few of which are Mindfulness-Based Stress Reduction (Kabat-Zinn, 2011), Mindfulness-Based Cognitive Therapy (Segal & Teasdale, 2018), Acceptance and Commitment Therapy (Hayes et al., 1999), Dialectical Behavior Therapy (Linehan, 1987), Cognitive Behavioral Therapy (Boswell et al., 2014), and Mindfulness-Based Strengths Practice

(Niemiec, 2013). Mindfulness-Based Strengths Practice, as an example, focuses on increasing nonjudgmental awareness of behavioral repertoires surrounding strengths, which theoretically produces positive outcomes (Ruch et al., 2020) and allows individuals to achieve idiographic goals (Craig & Furman, 2018; Niemiec, 2018, 2019). Mindfulness-Based Strengths Practice utilizes the Values in Action Survey (Peterson & Seligman, 2004), which measures 24 different character strengths. Strengths-based interventions (Schutte & Malouff, 2019; Seligman et al., 2005), therefore, can be employed concurrently with mindfulness-based interventions. Unified, Cognitive-Behavioral protocols also incorporate mindfulness-based practice elements from different interventions to treat a spectrum of psychological problems (Barlow et al., 2017). Together, these therapeutic approaches demonstrate the breadth and wide applicability of mindfulness-based interventions. For a review of other psychotherapeutic approaches that incorporate mindfulness-based practices, see Baer (2018).

In terms of processes or mechanisms that facilitate effective change from mindfulness interventions, there are different theoretical perspectives to consider (see Pavlacic & Young, 2020, for a more detailed discussion on the mechanisms mentioned below). For example, Brown et al. (2007) discussed distancing from thoughts and exposure as two potential mechanisms by which mindfulness promotes positive psychological and physical changes. Contemporary Cognitive-Behavioral perspectives implicate inhibitory learning as the primary mechanism that facilitates positive outcomes for mindfulness practices (Craske et al., 2008; Roemer et al., 2015). The inhibitory learning model suggests that new learning is the core mechanism of change resulting from competing excitatory and inhibitory associations, which signal danger and safety respectively (Davies & Craske, 2018; Pavlacic & Young, 2020). Mindfulness allows individuals to better tolerate difficult thoughts, physiological sensations, and environmental experiences,

which could contribute to successful inhibitory learning and positive change (while simultaneously addressing behavioral avoidance maintaining psychological problems). The psychological flexibility model, similarly, suggests that a willingness to notice and tolerate difficult thoughts and emotions in the service of values is the core mechanism of change (Hayes et al., 2011; Pavlacic & Young, 2020). Emotion regulation, a primary mechanism for various psychological disorders, may also be impacted by mindfulness-based interventions (Gratz & Tull, 2010; Pavlacic & Young, 2020). Specifically, mindfulness techniques allow one to better tolerate and manage difficult emotions, which prevents avoidance and the downregulation of aversive emotions in certain situations and leads to positive outcomes. These various mechanisms of change are not necessarily mutually exclusive (Pavlacic & Young, 2020) and can all be targeted in clinical contexts with mindfulness-focused interventions. These mechanisms offer explanations as to why and how mindfulness-based interventions work to reduce psychological problems and promote well-being.

In terms of both applicability and effectiveness of mindfulness-based interventions, they have been applied widely and are effective for treating different psychological problems (i.e., much like EMI interventions), such as anxiety and depression (Hofmann et al., 2010), substance use disorders (Bowen et al., 2009), insomnia (Ong et al., 2014), and psychosis (Khoury et al., 2013a), among others. In a comprehensive meta-analytic review of mindfulness interventions for different psychological problems, Khoury et al. (2013b) showed that mindfulness is an effective form of psychotherapy for anxiety, depression, and stress. Specific variants of mindfulness interventions in this meta-analysis, such as Mindfulness-Based Stress Reduction and Mindfulness-Based Cognitive Therapy, were also effective for improving physical and mental well-being (Chiesa & Serretti, 2011; Grossman et al., 2004; Khoury et al., 2013b). Mindfulness-

Based Strengths Practice facilitates higher levels of well-being and flourishing in adults (i.e., higher levels of positive emotionality and positive social functioning; Ivtzan et al., 2016). Further, Acceptance and Commitment Therapy and Dialectical Behavior Therapy, two third-wave treatment approaches that incorporate mindfulness-based techniques as part of a larger treatment package consisting of other therapeutic procedures, are effective for mental and physical health outcomes in various populations (A-Tjak et al., 2015; DeCou et al., 2019). Based on the available outcome literature, mindfulness-based interventions are effective as standalone approaches but can also be successfully implemented with other treatment protocols or packages. Applying mindfulness-based techniques to populations who frequently report suffering from psychological problems, such as college students, could be a useful approach for addressing the surge of mental health problems in this group.

Much like meta-analytic reviews and trials examining the effectiveness of mindfulness-based interventions for clinical populations, there is a strong literature base addressing both the feasibility and effectiveness of mindfulness-based interventions in college students reporting different levels of psychological duress. In a five-week Mindfulness-Based Stress Reduction program integrated into a college course, students made significant improvements in psychological health (Bergen-Cico et al., 2013). Mindfulness-Based Cognitive Therapy, too, is effective for reducing depression, anxiety, and stress (Taylor et al., 2014) and improving life satisfaction in college students (Dvorakova et al., 2017). Mindfulness-Based Strengths Practice (Niemiec, 2013, 2018), an eight-week program that utilizes different mindfulness techniques (e.g., body scans, sitting meditations, mindful walking, mindful eating, breathing spaces) adapted from Mindfulness-Based Stress Reduction and Mindfulness-Based Cognitive Therapy to build mindful awareness, illustrates how mindfulness procedures can be employed synergistically to

improve well-being and reduce psychological problems (Baer, 2015; Fialkov & Haddad, 2012; Wingert et al., 2020). Wingert et al. (2020) examined the effectiveness of Mindfulness-Based Strengths Practice on psychological well-being and retention in a sample of undergraduate students across an eight-week intervention in a preliminary randomized controlled trial, and students assigned to the Mindfulness-Based Strengths Practice condition reported higher levels of well-being, meaning in life, health, and retention following treatment. Meta-analytic reviews for mindfulness interventions in college students also support the notion that these treatment approaches are effective for different outcomes (Bamber & Morpeth, 2019; Chiodelli et al., 2020).

Overall, mindfulness-based interventions are a useful and effective form of treatment for different populations, including college students; mindfulness-based techniques may be combined with other psychological treatment components to improve mental and physical health and positively affect well-being outcomes. In college students specifically, incorporating mindfulness-based techniques could potentially alleviate the common occurrence of college student distress and improve well-being. Identifying ways to disseminate mindfulness-based practices is likely to be useful and efficient for college students. As mentioned, one opportunity that allows for delivering interventions efficiently is EMI. There are no studies to our knowledge that have applied techniques from mindfulness-based practices into an easily delivered text-messaging EMI format that could potentially be widely accessible for college students, despite a smaller literature base for delivering mindfulness-based interventions using these formats in different samples.

Mindfulness-Based Smartphone Interventions

While mindfulness-based treatments have been applied widely in an in-person format, there are far fewer studies and programs of research implementing online or EMI-based mindfulness interventions. However, using mobile phones to cultivate mindfulness skills is an appropriate next step for this area of research (Lucas-Thompson et al., 2019). Mobile phones are becoming increasingly utilized in social science research to deliver texting interventions (Pew Research Center, 2022), which also supports the potential utility of mindfulness-based interventions delivered using smartphones or mobile technology. Given that these interventions are delivered in real time, patients or participants may be more likely to notice behavioral patterns, develop insight into how thoughts and physiological sensations influence such patterns, and implement relevant skills to change behaviors and potentially alleviate psychological suffering and improve psychological well-being (Lucas-Thompson et al., 2019). Developing mindfulness-based interventions that can be delivered using an EMI format could also potentially address mental health concerns, helping individuals in populations that may not have access to, or choose not to seek, mental health treatment cultivate skills that are effective for improving life satisfaction and reducing psychological symptoms.

In terms of existing mindfulness-based interventions that have been applied using smartphones or online programs, there are a few trials and programs of research warranting discussion. Lim et al. (2015) implemented a three-week, app-based training program by assigning participants to engage in either mindfulness-based or cognitive skills practice. The mindfulness group reported more compassionate responding to a confederate compared to a cognitive skill condition. In a three-arm trial employing a 15-lesson, smartphone-based intervention, Lindsay et al. (2018) discussed how participants assigned to a smartphone-based intervention consisting of 20-minute daily audio lessons plus brief homework for practice

reported decreased cortisol and systolic blood pressure reactivity. Cavanagh et al. (2013) administered a brief, 14-day, online self-guided mindfulness-based intervention with a waitlist control condition in college students reporting both clinical and subclinical levels of psychological distress. This mindfulness-based intervention, termed 'Learning Mindfulness Online,' was delivered through a virtual learning platform. Psychoeducation on how to practice mindfulness skills was also provided, and participants were given access to this online platform for 14 days. Participants reported increased utilization of mindfulness skills, lower perceived stress, lower anxiety, and lower levels of depression. In a similar study in adults with differing levels of psychological distress, Gluck and Maercker (2011) randomized adult participants to a two-week mindfulness treatment that was 13 days in duration and consisted of two major modules. Each module lasted six days and approximately 20 minutes per day. Results indicated medium effect size benefits for perceived stress, with nonsignificant effects for mindfulness.

Similar app-based mindfulness interventions, such as 'Mindful Messaging,' have also been shown to be effective for reducing risky behavior and texting while driving and are widely accepted by college student participants (Trub & Starks, 2017). 'Mindful Messaging,' specifically, consists of a 21-day psychoeducational intervention designed to teach participants how to implement mindfulness in their daily lives, in addition to monitoring related to mindfulness skills (Trub & Starks, 2017). In adolescents, an existing mindfulness program called 'Learning to BREATHE' (L2B) was developed by Broderick and Metz (2009). The program was built specifically for adolescents and is rooted in the philosophy of Mindfulness-Based Stress Reduction. The L2B program centers on focused attention, open awareness, and compassion and has been distributed widely (Broderick & Metz, 2009; Shomaker et al., 2017).

Despite the applicability of EMI mindfulness interventions, there appear to be no published studies that use psychoeducational text messages rooted in mindfulness practices for college students, with most of the available literature using app-based communication within the context of mindfulness interventions. These interventions could potentially provide a way to efficiently disseminate evidence-based services to individuals, such as college students, who may not otherwise have the opportunity, capability, or motivation to access these services.

Present Study

Mental health problems are common and projected to increase in college students. College students report low utilization of treatment due to various environmental, financial, and psychological barriers. It is therefore critical to identify and disseminate evidence-based interventions that can be easily and effectively delivered to alleviate mental health problems and increase aspects of psychological well-being in this population. EMI, which involves the delivery of psychosocial interventions using smartphone devices, is one approach that may address mental health difficulties and barriers to treatment access that college students are facing. Based on the existing literature, mindfulness-based interventions show utility in college students for both reducing psychological problems and increasing psychological well-being and could readily be incorporated into an EMI format. Therefore, the current study adapted evidence-based treatment techniques from mindfulness practice into a text-messaging smartphone intervention for college students reporting varying levels of psychological distress. In addition, the study examined the perceived utility of the intervention and solicited qualitative feedback from participants. Finally, the current study examined the within- and between-person relationships in specific constructs over time. Consistent with the available literature, the following hypotheses were offered:

1) Compared to individuals assigned to an EMA condition (i.e., monitoring psychological problems and aspects of well-being only without the text-message intervention), individuals assigned to an EMI condition receiving mindfulness-based text messages will report greater reductions in negative affectivity and emotion dysregulation across the study period (i.e., 21 days).

2) Compared to individuals assigned to an EMA condition, individuals assigned to an EMI condition receiving mindfulness-based text messages will report greater increases in components of psychological well-being (i.e., mindfulness, positive affect) across the study period.

3) Participants in the EMI condition will find the text messages useful and helpful for building awareness of thoughts, physiological sensations, and behaviors.

4) Within- and between-person daily mindfulness will be positively associated with positive affect and negatively associated with negative affect, above and beyond the effects of within- and between-person negative and positive affect and time. Within- and between-person daily emotion dysregulation will be negatively associated with positive affect and positively associated with negative affect across both conditions, above and beyond the effects of negative affect, positive affect, and time.

CHAPTER 2: METHOD

Participants

Undergraduate psychology student participants were 18 years of age or older and recruited from SONA, an online study tool for data collection. Participants were also recruited from different social media outlets. Institutional Review Board approval was obtained prior to beginning data collection, and the study was consistent with appropriate Helsinki standards. There were no stringent inclusion criteria, as students were recruited with differing levels of psychological distress to capture the full spectrum of psychological functioning and well-being in college students. Students currently receiving any form of psychotherapy or pharmacological treatment for mental health problems were eligible to participate and randomized.

Procedure

Recruitment. Participants were recruited at a medium-sized southeastern university in the United States, and undergraduate student status was also a requirement for those recruited through social media avenues. Participants completed a demographics questionnaire and were then randomly assigned to either the EMI + EMA condition or the EMA only condition through Qualtrics. Participants received course credit for participation in the study, and participants completing the study through social media platforms were entered into a drawing for an Amazon gift card. Given that the daily measures were expected to take approximately 10 minutes each day for 21 days, and the baseline and follow-up measures were expected to take approximately 15 minutes, participants completing the study from SONA were granted five course-related

credits for study participation. From the 161 final participants, nine were recruited from social media, with the remaining 152 recruited from SONA.

Randomization and Allocation. Participants were randomized to one of two groups (EMI + EMA or EMA) using Qualtrics. Qualtrics was instructed to randomly present either the EMA instructions or EMI instructions with evenly presented elements to ensure relatively equal group sizes, and instruction assignment determined the condition. Participants were unaware of the randomization and allocation sequence but were informed that they would be either completing brief mindfulness activities in addition to completing surveys or simply completing surveys. Therefore, it is likely that some participants discovered which condition they were in once they began completing either the EMA or EMI + EMA activities. After completion of randomization to one of two groups (i.e., EMI + EMA or EMA) and baseline measures, participants completed the study for 21 consecutive days. Specifically, questionnaire completion text messages and psychoeducational messages were sent at 5:00 PM by the primary researcher (who was thus not blind to randomization), and the primary researcher enrolled participants for specified messages (see below) based on the randomization from Qualtrics. Time was controlled for in all analyses by calculating the specific number of days from the first survey completed. After the 21-day study period, participants completed a follow-up survey on the 22nd day and were debriefed. Participants who did not receive the text message interventions were afforded the opportunity to receive these messages if they desired, but no participants expressed an interest in receiving them.

Outcome Assessment. The primary outcome assessment measures to assess changes in both the EMI + EMA and EMA conditions were the Positive and Negative Affect Scale for

positive and negative affect, the Daily Mindfulness Scale for daily mindfulness, and the State Difficulties in Emotion Regulation Scale for daily emotion regulation.

Power

An *a priori* power analysis was conducted to determine an adequate sample size based on the primary hypotheses pertaining to examination of group differences, which utilized Multilevel Modeling (MLM). We simulated power at increasing numbers of participants and selected a sample size that achieved approximately 90% power (75 participants per group, simulated power = .88). This number was relatively consistent when simulating 70-80 participants per group, as average power was .86.

Baseline and Follow-Up Measures

Demographics. Participants completed a demographics questionnaire during the initial baseline assessment and prior to completing daily surveys (i.e., described in further detail below) to provide background information. Questions regarding age, parent education, income, gender, sex, ethnicity, race, socioeconomic status, and current psychological treatment and medication for mental health difficulties were administered. See Appendix A for the demographics questionnaire.

Depression Anxiety Stress Scale-21. The Depression Anxiety Stress Scale (DASS-21; Lovibond & Lovibond, 1995) is a 21-item self-report measure that uses a 0-3 Likert-type scale format. The DASS-21 consists of three factors, Depression, Anxiety, and Stress, with each consisting of seven items. The Depression subscale assesses dysphoric mood symptoms over the past week, and Anxiety assesses both physiological and cognitive components of anxiety. The Stress scale assesses irritability and perceived ability to cope with stressors over the past week. Scores for each subscale range from 0-21, with higher scores on each subscale indicative of

increased psychological problems in respective areas. Scores are classified in terms of increasing severity, and the following represent the different ranges for each subscale: Normal, Mild, Moderate, Severe, and Extremely Severe. The DASS-21 has garnered extensive psychometric support, with the original articles (Antony et al., 1988; Lovibond & Lovibond, 1995) reporting alpha levels ranging from .78 to .94 across each of the three factors. More recent studies also show strong psychometric support, with alpha levels ranging from .76 to .91 (Le et al., 2017). The DASS-21 is a well-validated and commonly used measure of psychological distress (Lee, 2019). In the present study, the DASS-21 was utilized to provide both baseline and follow-up data (completed after the 21-day daily messages) on psychological functioning, although daily measures (not the DASS-21) were used for the primary hypothesis and analysis (i.e., MLM). See Appendix B for the DASS-21.

Five Facet Mindfulness Questionnaire. The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006; Baer et al., 2008) is a 39-item self-report measure that uses a 1-5 Likert-type scale format. The FFMQ consists of five different factors: Observing is the degree to which an individual notices emotional changes; Describing is the degree to which an individual can identify emotions; Acting with Awareness measures perceived awareness of emotions; Nonjudging assesses the degree to which an individual allows emotions to be experienced in an accepting manner; and Nonreactivity measures the degree to which individuals allow emotions to influence behaviors. A total score ranging from 39 to 195 can be derived to assess trait mindfulness, with higher scores indicative of greater levels of trait mindfulness after reverse scoring relevant items. The FFMQ has strong psychometric properties, with alpha levels of the five factors ranging from .75 to .91 (Baer et al., 2006). In terms of validity, the FFMQ significantly and negatively correlates with measures of psychological symptoms and is

significantly and positively associated with different domains of psychological well-being (Goldberg et al., 2016). The FFMQ was utilized in the present study to provide both baseline and follow-up data on perceptions of mindfulness, although daily measures were used for the primary hypothesis and analysis. See Appendix C for the FFMQ.

Difficulties in Emotion Regulation Scale. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report measure that utilizes a 1-5 Likert-type scale format. Factor analyses support a six-factor measure, and the six factors are as follows: (1) deficits related to goal-directed behaviors; (2) nonacceptance of emotional experiences; (3) deficits in the ability to control impulsive behaviors; (4) limited access to emotion regulation strategies; (5) a lack of emotional awareness; and (6) a lack of clarity related to emotional experiences. The goal-directed behavior subscale assesses the degree to which emotions prevent individuals from engaging in behaviors directed by goals, while the nonacceptance subscale is the perceived degree to which individuals blame themselves for experiencing an emotion. The impulsive behaviors subscale assesses emotionally driven behaviors in response to aversive emotions, and the emotion regulation strategies subscale is the degree to which an individual perceives that they can impact the emotional experience positively. The emotional awareness subscale measures the degree to which an individual attends to emotions, while the clarity subscale assesses whether an individual understands what emotions they are experiencing. Scores are typically derived for each subscale (Gratz & Roemer, 2004), although a total score can also be calculated. The DERS exhibits strong psychometric properties, with alphas ranging from .80 to .89 and associations with related constructions such as emotional expression (Gratz & Roemer, 2004). The DERS was utilized in the present study to provide both baseline and

follow-up data on perceptions of emotion regulation abilities, although daily measures were used for the primary hypothesis and analysis. See Appendix D for the DERS.

Meaning in Life Questionnaire. The Meaning in Life Questionnaire (MLQ; Steger et al., 2006) is a 10-item self-report measure that uses a 1-7 Likert-type scale format. The MLQ consists of two factors, Presence and Search, with each factor consisting of five items. The Presence subscale assesses the degree to which an individual perceives their life to be meaningful and purposeful, while the Search subscale assesses the degree to which an individual is searching for meaning in their life. Scores from each subscale range from 5-35, with higher scores on each subscale indicative of increased meaning in life or increased motivation to search for meaning in life, respectively. The MLQ has accumulated extensive and strong psychometric support, with internal consistency coefficients ranging from .80 to .90 (Steger et al., 2006). Contemporary studies show similar alpha levels, with coefficients ranging from .72 (Chan, 2016) to .91 (Boullion et al., 2020). Increased meaning in life is frequently positively associated with various aspects of well-being and negatively associated with psychopathology (Boullion et al., 2020). The MLQ was utilized to provide both baseline and follow-up data on meaning in life and is included despite not being relevant to any specific hypotheses detailed in the Introduction. See Appendix E for the MLQ.

Level of Engagement and Likeability. To assess level of engagement and likeability in the EMI condition to determine whether participants found psychoeducational text messages useful and helpful, several questions adapted from Businelle et al. (2016) were developed to assess satisfaction and general engagement. Participants were asked how often they used information in the text messages in their daily lives on a 5-point scale ranging from “Never” to “Always.” Participants also answered if the number of text messages sent was “Too many,”

"About right," or "Not enough." Additionally, participants were asked the degree to which they were more aware of thoughts, feelings, and behaviors because of the text messages on a 4-point scale ranging from "Definitely yes" to "Definitely not." The final question related to engagement and likeability measured whether participants will be likely to recommend learned skills to a friend on a 5-point scale ranging from "Extremely likely" to "Extremely unlikely." Finally, participants were provided the opportunity to offer qualitative feedback on the text messages sent throughout the course of the study. This engagement and likeability survey was *only* completed by participants randomized to the EMI condition at the end of the study. See Appendix F for the engagement and likeability questions in addition to the qualitative question.

Daily Measures

Positive and Negative Affect Scale. The Positive and Negative Affect Scale (PANAS; Watson et al., 1988) is a 20-item self-report measure that assesses both positive and negative affectivity using a 5-point Likert-type scale format. Scores for questions related to both positive and negative affect can be summarized to derive a total score for each respective scale, or scores can be examined across individual domains of affect. Positive affect questions assess the following facets of affect: interested, excited, strong, enthusiastic, proud, inspired, determined, attentive, alert, and active, while negative affect questions assess the following domains of affect: distressed, upset, scared, guilty, hostile, irritable, ashamed, nervous, jittery, and afraid. Scores for each subscale range from 10-50, with higher scores indicative of higher levels of positive and negative affect, respectively. The PANAS has garnered strong psychometric support, with internal consistency coefficients ranging from .86 to .90 for the positive affect items and .84 to .87 for the negative affect items (Watson et al., 1988). Recent studies also show similar trends when administering the PANAS across five days, with alpha levels ranging from

.88 to .92 (Merz & Roesch, 2011). The PANAS was used to assess positive and negative affect each day, and participants were able to report how they were feeling at the present moment about the specific domains assessed. See Appendix G for the PANAS that was administered daily.

State Difficulties in Emotion Regulation Scale. The daily measure used to assess daily emotion regulation was the State Difficulties in Emotion Regulation Scale (S-DERS; Lavender et al., 2017). The S-DERS consists of 21-items that measure different dimensions of emotion regulation. The nonacceptance subscale measures the degree to which individuals are upset at themselves for experiencing current emotions. A second subscale (i.e., modulate) assesses an individual's ability to manage emotions, while the third subscale (i.e., awareness) measures an individual's ability to understand and pay attention to how they feel. The final subscale, clarity, measures the degree to which an individual understands what they are emotionally experiencing. The S-DERS utilizes a 5-point scale ranging from 'Not at all' to 'Completely.' While individual scale scores can be calculated, an overall score was calculated for purposes of the current study. Total scores range from 21-105, with higher scores indicative of *increased* difficulties regulating emotions. The S-DERS demonstrates strong psychometric properties, with an alpha level of .86 for the total scale and comparable alpha levels for individual subscales. The S-DERS is significantly, positively associated with trait-oriented measures of emotion dysregulation and significantly, negatively associated with strategies such as mindfulness (Lavender et al., 2017). The S-DERS was used to assess emotion regulation each day, and participants were able to report how they were feeling in that moment. Further, an attention check item was embedded into daily S-DERS surveys (i.e., "Please select 'Moderately.'") to screen out participants who simply clicked through the survey in random fashion. See Appendix H for the S-DERS.

Daily Mindfulness Scale. The Daily Mindfulness Scale (DMS; Brockman et al., 2017) is a three-item measure incorporating items from the Mindful Attention Awareness Scale (MASS; Brown & Ryan, 2003) designed to measure mindfulness awareness across a short time frame. The DMS (named for purposes of the current study to encompass these three items) utilizes a 6-point Likert-type format. Scores for the DMS range from 3-18, with higher scores indicative of higher levels of daily mindfulness after reverse scoring one item. To provide examples, one item measures the ability to focus on the present moment (i.e., "I found myself preoccupied with the future or the past"). A second item measures the ability to focus on daily experiences i.e., "I found myself doing things without paying attention," while the third and final item assesses acceptance using the following question: "I accepted my feelings, thoughts, and bodily sensations without judging or trying to change them." Regarding reliability, psychometric support is limited due to the novelty of the measure, but the original article reported an internal consistency coefficient of .92 (Brown & Ryan, 2003). Higher levels of mindfulness were significantly associated with lower negative affect and higher positive affect (Brockman et al., 2017) based on the DMS scores. The DMS was used to assess mindfulness each day throughout the course of the study, and participants reported on mindfulness since completing the most recent survey. See Appendix I for the DMS administered each day.

Mindfulness EMI Condition

Participants assigned to the EMI + EMA condition received psychoeducational text messages to their phone three times per week for three weeks (i.e., the 21-day study period; Trub & Starks, 2017) at 5:00 PM each evening, for a total of nine mindfulness messages. Phone numbers were provided on the demographic questionnaire so that surveys and messages could be sent each day. Messages were sent to participants at the same time as the daily survey

completion, and participants receiving mindfulness messages for that day received 1) the Qualtrics link to monitor daily behaviors and 2) a mindfulness-related message at the end of the survey. Messages were rooted in mindfulness-based practices, specifically body scans, sitting meditations, emotional awareness, and nonjudgmentally observing emotions. More specifically, mindfulness text messages were adapted from the Unified Protocol (with permission received from the authors via email; Barlow et al., 2017). Surveys were administered using TellMyCell, an automated texting service. The weekly sequence of messages and detailed descriptions are presented below.

EMI Week One

Mindfulness Message One. The initial mindfulness message, sent on the second day of the 21-day data collection period, focused primarily on the role that mindful awareness has within the context of emotional experiences. After completing the survey, the message read as follows: *"Sometimes as humans, we react to emotions with a harsh and judgmental tone. We might feel guilty for experiencing certain emotions. One strategy that has been shown to work for managing difficult emotions as they come up throughout the day is mindfulness. Mindfulness is accepting emotional experiences as they are and noticing thoughts and physical sensations as they unfold throughout the day. This practice has been shown to decrease stress and improve well-being. Throughout the course of the study, in addition to receiving text messages each day to track different thoughts, feelings, and behaviors, you will also be sent strategies and tips for incorporating mindfulness into daily life a few times per week located at the end of the surveys."* The concepts explained in the initial message are consistent with building emotional awareness and tenets of mindfulness-focused interventions (Barlow et al., 2017; Niemiec & Lissing, 2016).

Mindfulness Message Two. The second message, sent on the fourth day of the 21-day data collection period and occurring after survey completion, focused primarily on practicing mindfulness using a guided meditation and body scan (Barlow et al., 2017; Niemiec, 2013, 2018). The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."*

Mindfulness Message Three. The third message, sent on the sixth day of the 21-day data collection period and occurring after survey completion, focused primarily on practicing mindfulness using a guided meditation and body scan. The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."*

EMI Week Two

Mindfulness Message One. The initial message, sent on the second day of week two (day nine) and occurring after survey completion, focused primarily on reminding participants of the role that mindful awareness has within the context of emotional experiences. The message

read as follows: *"Sometimes as humans, we react to emotions with a harsh and judgmental tone. We might feel guilty for experiencing certain emotions. One strategy that has been shown to work for managing difficult emotions as they come up throughout the day is mindfulness. Mindfulness is accepting emotional experiences as they are and noticing thoughts and physical sensations as they unfold throughout the day. This practice has been shown to decrease stress and improve well-being. Throughout the course of the study, in addition to receiving text messages each day to track different thoughts, feelings, and behaviors, you will also be sent strategies and tips for incorporating mindfulness into daily life a few times per week located at the end of the surveys."*

Mindfulness Message Two. The second message for this week, sent on the fourth day of week two (day 11) and occurring after survey completion, focused on practicing mindfulness using a guided meditation and body scan. The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."*

Mindfulness Message Three. The third message for this week, sent on the sixth day of week two (day 13), focused on practicing mindfulness using a guided meditation and body scan. The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and*

noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."

EMI Week Three

Mindfulness Message One. The initial message, sent on the second day of week three (day 16) and occurring after survey completion, focused primarily on reminding participants of the role that mindful awareness has within the context of emotional experiences. The message read as follows: *"Sometimes as humans, we react to emotions with a harsh and judgmental tone. We might feel guilty for experiencing certain emotions. One strategy that has been shown to work for managing difficult emotions as they come up throughout the day is mindfulness. Mindfulness is accepting emotional experiences as they are and noticing thoughts and physical sensations as they unfold throughout the day. This practice has been shown to decrease stress and improve well-being. Throughout the course of the study, in addition to receiving text messages each day to track different thoughts, feelings, and behaviors, you will also be sent strategies and tips for incorporating mindfulness into daily life a few times per week located at the end of the surveys."*

Mindfulness Message Two. The second message for this week, sent on the fourth day of week three (day 18) and occurring after survey completion, focused on practicing mindfulness using a guided meditation and body scan. The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body*

scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."

Mindfulness Message Three. The third message for this week, sent on the sixth day of week three (day 20) and occurring after survey completion, focused on practicing mindfulness using a guided meditation and body scan. The message read as follows: *"Sometimes we might feel guilty for experiencing certain emotions or judge certain emotions. Today's message is going to link you to a strategy for practicing mindfulness using what is called a body scan. Body scans focus on checking in with yourself and noticing your thoughts and feelings, and how these thoughts and feelings impact your behaviors. Please hit play directly below to complete a body scan exercise for today in audio format. Or, you can access the body scan link in written format below. Please use whichever you prefer."*

Ecological Momentary Assessment Condition

Participants assigned to the EMA condition received daily surveys sent to their smartphone once a day at 5:00 PM for 21 days. The single difference between participants in the EMA condition is that they did not receive the nine psychoeducational messages detailed above at the end of the surveys for those in the EMI conditions. Surveys for the EMA condition were also administered using TellMyCell.

Data Analyses

Data Screening. Data were screened for accuracy errors, missing data, outliers, and multivariate assumptions of linearity, normality, homogeneity, and homoscedasticity. Data were not imputed, given that MLM is a robust analysis that controls for missing data (Field et al., 2012). Data were screened and analyzed from the intent-to-treat sample (i.e., those who were randomized), and participants who were not randomized were not included in any analyses.

Attention checks were incorporated into the daily surveys, and individualized surveys failing the attention checks were removed from final analyses. Time was controlled for as a continuous variable to address variability in completion times between days (in addition to testing effects of quadratic and cubic time). Phone numbers were collected on the baseline survey so that surveys could be sent out to participants each day. Unique participant identifiers (i.e., last four digits of phone number plus first two digits of birth month) were used to match participant data throughout the study. Participants who did not complete any of the first seven surveys were considered non-completers and not provided with any additional surveys. Further, these individuals were excluded from further analyses.

Group Equality. Given that randomization is expected to produce equal groups across the EMA and EMI conditions, no tests were conducted to ensure group equality given the lack of problems associated with randomization in the current study (Roberts & Torgerson, 1999).

Multilevel Modeling. MLM was used to examine between- and within-group differences throughout both conditions from the intent-to-treat sample (i.e., those who were randomized) for the four major outcomes (i.e., daily positive affect, daily negative affect, state emotion regulation, daily mindfulness). MLM controls for the nested nature of participant data (Field et al., 2012), as well as differences in scores during the daily assessments. Initially, a random intercept model was compared to a fixed intercept model to determine whether nesting by participant was warranted for each outcome. Random intercept models assume that individual scores vary across the outcome throughout the duration of the study. Data were nested by participant for the remaining analyses and outcomes based on the results obtained from the random intercept models. An intraclass correlation coefficient (ICC) was calculated from the random intercept model for each major outcome to determine the level of variability accounted

for at the between- and within-person level. Then, time and group were added as main effects. The next step consisted of testing the random slope of time (linear or cubic depending on separate MLMs). After testing the random slope of time, the time X group (i.e., EMI + EMA or EMA dummy coded) interaction was added to the model. Importantly, given a visual inspection of the data (see below), cubic polynomials were used to model time for all outcomes except daily mindfulness after comparing linear time to both quadratic and cubic polynomials in separate MLMs. The time variable for daily mindfulness was modeled as a linear variable. In cases where cubic polynomials were used as fixed effects, the random slope of cubic time was also tested for consistency.

Outcomes included mindfulness (i.e., as assessed by the DMS), emotion regulation (i.e., measured by the S-DERS), positive affect (i.e., measured by the PANAS each day), and negative affect (i.e., measured by the PANAS each day). We planned to follow up significant interactions, but no significant interactions were observed. Model fit was assessed at *each* step using Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion (BIC), log-likelihood, and *p* values (Bentler, 1990; Field et al., 2012). Lower AIC and BIC values are indicative a better fitting model. While AIC and BIC values were compared across models, a chi-square test was also conducted (thus allowing for the assessment of differences between two models; Field & Wright, 2011). Post-hoc analyses were conducted to determine if level of engagement assessed at follow-up interacted with time in predicting daily outcomes (i.e., like the MLM procedure mentioned above for each outcome). Level of engagement was also examined in terms of relationships with daily outcomes for mindfulness, positive affect, negative affect, and emotion dysregulation. MLM was also used to test hypothesized associations between within- and between-person mindfulness, positive affect, negative affect, and emotion dysregulation across both conditions

(with positive and negative affect as the outcomes). Analyses were conducted using the *nlme* package in *R* (Pinheiro et al., 2017).

Means and Descriptive Statistics. For the questions assessing whether participants found the interventions helpful, means were calculated and interpreted at face value based on specific item responses. Means and correlations were also calculated for baseline and follow-up measures to describe the sample. In addition, reliability coefficients were calculated for baseline measures and follow-up measures.

Analysis of Covariance. In addition to the primary analyses detailed above, an Analysis of Covariance (ANCOVA) was calculated to determine differences across the conditions for relevant follow-up measures (i.e., FFMQ, DERS, DASS-21, MLQ), controlling for baseline differences in respective constructs.

CHAPTER 3: RESULTS

Participants

Initially, 213 participants entered the Qualtrics survey from both SONA and social media avenues. Individual rows of data were excluded for various reasons, including participants not completing beyond the consent form, participants who were not randomized at the end of the baseline survey (and thus not considered a part of the study and analyses per the intent-to-treat approach), participants who did not consent to participate, participants who completed the baseline survey more than once by mistake, and those who did not complete one of the first seven daily surveys despite being randomized (n = 10 individuals). One participant also completed one daily survey but did not complete the attention check item, and this individual was also removed. Of the 161 participants who were randomized and completed both the baseline survey and at least one daily survey (prior to screening daily data for missing data), most (n = 113; 70.19%) self-identified as female. Self-reported biological sex was also predominantly female (n = 116; 72.05%). Participants were primarily young adults aged 18 (n = 99; 61.49%), 19 (n = 29; 18.01%), or 20 (n = 21; 13.04%). Regarding race, participants were able to select multiple options and list preferences if their preferred race was not available. Many participants (n = 130; 80.75%) identified as White, with most others (n = 17; 10.56%) identifying as Black/African American. For ethnicity, almost all (n = 150; 93.17%) participants were not Hispanic/Latino(a). Religiosity was equally distributed, and many participants reported being either moderately religious (n = 54; 33.54%) or slightly religious (n = 47; 29.19%). The most endorsed religion was Christianity (n = 125; 77.64%). Regarding current living situation

and relevant contextual factors, many participants noted living in a dormitory (n = 121; 75.16%), and most were unemployed (n = 119; 73.91%). For parental education, 50 (31.06%) participants indicated that their parent(s)/guardian(s) had obtained a 4-year degree, and participants reported annual incomes of mostly $0 - $24,999 ($n$ = 108; 67.08%). Sixteen (9.94%) participants were receiving some form of counseling or therapy for a mental health problem, and 16 also reported taking a medication for a mental health problem.

Baseline Data Screening

After screening baseline surveys for incomplete surveys and randomization (and prior to calculating demographic information listed above), baseline data were screened for accuracy issues (i.e., incorrect coding of Likert-type scales in Qualtrics, reverse scoring), missing data, multivariate outliers, and common multivariate assumptions. Qualtrics coded the DASS-21 scale data from 1-4, which was adjusted to 0-3. All other Likert-type scales were coded correctly. Then, specific items were reverse coded consistent with scoring procedures. For the FFMQ, the following items were reverse scored: 3, 5, 8, 10, 12, 13, 14, 16, 17, 18, 22, 23, 25, 28, 30, 34, 35, 38, and 39. The following items were reverse scored for the DERS: 1, 2, 6, 7, 8, 10, 17, 20, 22, 24, and 34. Finally, for the MLQ, item 9 was reverse scored. Accordingly, higher scores on the FFMQ reflect greater perceived trait mindfulness, while higher scores on the DERS reflect increased trait emotion *dysregulation*. Higher scores on the MLQ reflect greater perceived meaning in life. For the DASS-21, higher scores on the Depression, Anxiety, and Stress subscales reflect greater levels of perceived depression, anxiety, and stress. Adhering to guidelines from Lovibond and Lovibond (1995), scores were multiplied by two to guide interpretation and derive total scores for the DASS-21 subscales.

After screening baseline data for accuracy errors, these data were screened for missingness. Of the 161 participants, 158 were not missing data on the DASS-21, FFMQ, DERS, *and* the MLQ, though some participants were missing data on specific measures. For the three participants missing data, they were missing greater than 5% across all measures combined (i.e., 10.38%, 11.32%, and 100%). Thus, no data were imputed or replaced using multivariate imputation techniques, and those with missing data were retained for correlational analyses given that data were missing on different measures across the three participants. No participants were classified as multivariate outliers using Mahalanobis distance. Upon examination of item-level correlations and a visual inspection of a Q-Q plot and histogram of standardized residuals and a Q-Q plot of fitted values, baseline data met assumptions of additivity, linearity, normality, homogeneity, and homoscedasticity. All baseline correlations are presented in Table 1.

Daily Data Screening

After screening baseline data and calculating baseline correlations and demographic statistics, the daily data were screened. Daily surveys were excluded for a variety of reasons, including 1) an inability to match specific daily survey ID numbers to ID numbers reported in baseline surveys and 2) failing the attention check question on daily surveys (n = 75 surveys). After ensuring that each daily ID number matched to a corresponding baseline survey using the cleaned baseline dataset (and vice versa) and omitting surveys failing the attention check, the sample consisted of 2817 surveys across 161 participants (consistent with the number of participants completing the baseline measures). There were 80 participants in the EMA group and 81 in EMI, and the average number of surveys completed in the EMA group ($M_{surveys}$ = 17.53, $SD_{surveys}$ = 4.88) was comparable to the number of surveys completed in the EMI group ($M_{surveys}$ = 17.47, $SD_{surveys}$ = 5.59). Participants completed approximately 17 daily surveys on

average when examining trends across both groups ($M_{surveys}$ = 17.50, $SD_{surveys}$ = 5.24). Like the data screening procedure for baseline survey data, the daily data were screened for accuracy errors, missingness, and multivariate assumptions. Given that variability in daily surveys is expected using the EMA/EMI design, data were not screened for multivariate outliers using Malahanobis distance. Multivariate outliers would represent expected variability in the dataset using a longitudinal and EMA/EMI design, as opposed to a true outlier. On the S-DERS, the following items were reverse scored: 2, 6, 11, 16, and 19. The third item on the DMS scale was also reverse scored. Accordingly, higher scores on the PANAS subscales reflect higher levels of daily positive and negative affect for each respective subscale, with higher scores on the DMS indicative of higher daily mindfulness. Higher scores on the S-DERS demonstrate higher emotion *dysregulation* as opposed to *regulation*.

After correcting accuracy errors, missing data were screened by individual surveys. Most (n = 2812 surveys) had no missing data, with some participants missing 2.22% (n = 2 surveys), and others missing greater than 5% (n = 3 surveys). These five surveys were excluded from further analyses, resulting in 2812 surveys across 160 individuals ($M_{surveys}$ = 17.58, $SD_{surveys}$ = 5.08). After excluding the five surveys, 80 individuals were in the EMI group, and 80 individuals were in the EMA group. Residuals appeared linear based on visual inspection, with a slight positive skew for multivariate normality upon visually viewing a histogram of residuals. Data also met assumptions of homogeneity and homoscedasticity based on visual inspection.

Linear, Quadratic, and Cubic Effects of Time

Prior to running MLMs with the daily data to test hypotheses, a visual inspection of the data over time by construct was conducted to examine trends. Throughout the entirety of the study, data appeared non-linear (see *Figures 1 – 4*) and, as such, quadratic and cubic effects of

time were tested for each of the four outcomes (i.e., daily mindfulness, daily positive affect, daily negative affect, and daily state emotion dysregulation). Using guidelines from Field et al. (2012), MLMs were calculated that compared the quadratic effects of time and the cubic effects of time to the linear effect of time in subsequent models. Model 1 consisted of the linear effect of time, while model 2 consisted of the linear and quadratic effects of time. Model 3, then, consisted of the linear, quadratic, and cubic effects of time for each outcome (i.e., these models also nested data with participants and incorporated a random slope of time). For daily mindfulness, addition of the quadratic term in the model (AIC = 10993.52, BIC = 11035.11) did not significantly improve model fit over the model with just the linear term ($\Delta\chi^2(1) = 3.72$, $p = .054$, AIC = 10995.24, BIC = 11030.89). Addition of the cubic term ($\Delta\chi^2(1) = 1.02$, $p = .313$, AIC = 10994.50, BIC = 11042.03) also did not improve model fit for daily mindfulness. For daily positive affect, addition of the quadratic term (AIC = 18094.00, BIC = 18135.59) did significantly improve fit over the model with the linear term ($\Delta\chi^2(1) = 55.74$, $p < .001$, AIC = 18147.74, BIC = 18183.38). Further, the cubic term model (AIC = 18085.21, BIC = 18132.75) significantly improved model fit above and beyond the model with the linear term and the quadratic term ($\Delta\chi^2(1) = 10.78$, $p = .001$). Regarding daily negative affect, the quadratic term model (AIC = 16426.41, BIC = 16468.00) significantly improved model fit over the linear term ($\Delta\chi^2(1) = 19.20$, $p < .001$, AIC = 16443.61, BIC = 16479.26). Addition of the cubic term (AIC = 16422.75, BIC = 16470.28) improved model fit over the linear and quadratic term ($\Delta\chi^2(1) = 5.66$, $p = .017$). And finally, for state emotion dysregulation, addition of the quadratic term (AIC = 19121.77, BIC = 19163.37) did not improve model fit in the model with the linear term ($\Delta\chi^2(1) = 1.75$, $p = .186$, AIC = 19121.52, BIC = 19157.17). Addition of the cubic term (AIC = 19118.81, BIC = 19166.34) significantly improved model fit above both the linear term and the

quadratic term ($\Delta\chi^2(1) = 4.97$, $p = .026$), however. Taken together, time was treated as a linear predictor in models for daily mindfulness. For daily positive affect, daily negative affect, and daily state emotion regulation, time was treated as a cubic polynomial in future MLMs. It should be noted that these analyses were also calculated with change scores used for each main outcome (see below), and significance did not differ at any step compared to simply using total scores. Further, in excluding individual surveys above the 21 completed daily surveys by participant, significance levels did not differ (and these individuals were thus retained to increase power to detect proposed effects).

Intraclass Correlation Coefficients

ICCs were also calculated to gather an understanding of between- and within-individual fluctuations prior to running MLMs to test the main hypotheses. High ICC values are indicative of a large proportion of variability accounted for by the level 2 factor (in this case participants; Field et al., 2012) and suggest that a lower percentage of the variability is attributed to the level 1 factor (i.e., data points nested within participants). For daily positive affect, the ICC was .67, indicating that approximately 67% of the variability is accounted for by participants, with 33% varying within individuals. Similarly, the daily negative affect ICC was .62, with 38% varying within individuals. The state emotion dysregulation ICC was .72, with 28% of the variability considered within individuals. Finally, for daily mindfulness, the ICC was .64, with 36% of the variability attributed to scores within individuals. In addition to calculating ICC coefficients for each of the major outcomes, daily raw scores were *z*-scored to provide a visual representation of fluctuations in daily mindfulness, daily positive affect, daily negative affect, and daily state emotion dysregulation across individuals throughout the study (see *Figure 5*).

Follow-Up Data Screening

After screening the baseline and daily data, testing effects of time with daily data, and calculating ICCs across the major outcomes, the follow-up data were also screened for accuracy errors, missing data, outliers, and multivariate assumptions. Initially, Qualtrics coding of follow-up measures was adjusted to ensure the correct ranges of Likert-type scales, which only required adjustment for DASS-21 scores. Items were also reverse coded (i.e., see the Baseline Data Screening section for a list of reverse-scored items for the baseline and follow-up measures). For the follow-up data, 142 participants provided complete data, and most of the missing data for the remaining eight participants who completed the follow-up survey was at 30% or higher (with varying levels of missingness across the different measures). There were no multivariate outliers in the follow-up dataset. Follow-up data met multivariate assumptions of additivity, linearity, normality, homogeneity, and homoscedasticity. See Table 2 for correlations from the follow-up measures (including those with missing data given that data were missing across different measures).

Reliability and Descriptive Statistics of Baseline Measures

Means and standard deviations were calculated for the DASS-21 subscales (i.e., Depression, Anxiety, and Stress), the DERS total score, the MLQ-Presence total score, and the FFMQ subscale and total score baseline measures. Consistent with scoring guidelines from Lovibond and Lovibond (1995), participants were in the 'Normal' range on the Depression subscale (n = 160; M = 8.51, SD = 8.39), the 'Mild' range on the Anxiety subscale (n = 160; M = 8.88, SD = 7.57), and the 'Normal' range on the Stress subscale (n = 160; M = 12.58, SD = 8.12). For the DERS, the mean total score (n = 158; M = 87.18, SD = 21.50) was slightly higher than the DERS mean in an undergraduate sample from the seminal psychometric DERS paper (M = 80.66, SD = 18.79; Gratz & Roemer, 2004). For FFMQ scores, means and standard

deviations were relatively consistent to means and standard deviations reported in the seminal FFMQ paper from Baer et al. (2008) and are reported as follows compared to the undergraduate sample in the initial psychometric paper: Observing (n = 160; M = 23.61, SD = 5.38 compared to M = 24.32, SD = 4.84 from the psychometric paper), Describing (n = 160; M = 24.06, SD = 6.43 compared to M = 26.46, SD = 6.01), Acting with Awareness (n = 160; M = 25.01, SD = 5.97 compared to M = 25.31, SD = 5.77), Nonjudging (n = 160; M = 26.36, SD = 6.72 compared to M = 27.75, SD = 5.90), and Nonreactivity (n = 160; M = 20.53, SD = 4.00 compared to M = 20.50, SD = 3.82). Finally, for the MLQ – Presence subscale (M = 25.28, SD = 6.67), scores were comparable to data obtained from an undergraduate sample in the original MLQ psychometric paper (M = 23.50, SD = 6.60; Steger et al., 2006). Reliability coefficients were excellent for the Depression subscale (α = .90) and good for the Anxiety subscale (α = .81), the Stress subscale (α = .80), the FFMQ (α = .86), and the MLQ-Presence subscale (α = .89). Reliability was excellent for the DERS (α = .93). Internal consistency interpretive guidelines were used based on those from DeVellis (2003).

Reliability and Descriptive Statistics of Follow-Up Measures

Like the procedures used to calculate descriptive statistics for the baseline measures, the same descriptive and reliability statistics for follow-up data were calculated. For Depression (n = 148; M = 9.70, SD = 8.98), Anxiety (n = 148; M = 9.28, SD = 7.28), and Stress (n = 148; M = 13.60, SD = 8.14), scores were within the 'Normal,' 'Mild,' and 'Normal' ranges, respectively. For the FFMQ, subscale means for Observing (n = 146; M = 23.54, SD = 5.46), Describing (n = 146; M = 24.30, SD = 6.27), Acting with Awareness (n = 146; M = 25.30, SD = 6.08), Nonjudging (n = 146; M = 28.13, SD = 6.42), and Nonreactivity (n = 145; M = 20.26, SD = 4.44) were comparable to other psychometric papers (see Baer et al., 2006). Means and standard

deviations were similarly consistent to psychometric paper data for the DERS (n = 143; M = 85.01, SD = 23.00; Gratz & Roemer, 2004) and the MLQ – Presence subscale (n = 143; M = 24.47, SD = 6.50; Steger et al., 2006). Regarding reliability (DeVellis, 2003), the internal consistency coefficient was excellent for the Depression subscale (α = .90), acceptable for the Anxiety subscale (α = .77), and good for the Stress subscale (α = .80). For the FFMQ and the DERS, internal consistency was good (α = .87) and excellent (α = .95), respectively. Finally, internal consistency was good for the MLQ-Presence subscale (α = .89).

Intervention Effects

Daily Mindfulness. For a visual representation of model calculations across the study (including previously explained screening procedures), see *Figure 6*. Time was calculated as a continuous variable, in particular the amount of time elapsed since 1/1/1900 12:00 AM (which is the default in Microsoft Excel). For example, if one participant completed the first survey on 9/9/2021, the corresponding calculation would be 44446.00 days between 1/1/1900 and 9/9/2021. By converting completion time to days for each time point, time between two data points can be both calculated and controlled for. If one participant completed the first daily survey at 44442.71 days and the second survey at 44444.71 days, the continuous time variable for day 1 would be 0 and for day 2 would be 2 (reflective of completing two daily surveys two days apart). This time estimation method provides a precise estimate of the passage of time across the study and controls for expected variability in daily survey completion times given the methodology (see Finkelstein-Fox et al., 2020, for an additional description of this method). Controlling for time also allows for the inclusion of individual surveys outside of the required completion time, which increases power to detect effects and prevents unnecessary exclusion of data given that differences in completion time are sufficiently accounted for. Regarding scoring,

given the variability in daily mindfulness (i.e., *Figure 3*), the daily mindfulness outcome was centered around individual participant time one *daily* mindfulness scores (i.e., participant level centering) in attempt to best account for non-linear fluctuations in daily mindfulness (in addition to the random slope of time). It is important to note that daily mindfulness scores on the first survey completion day for the DMS were used as a basis for centering the data, not baseline mindfulness scores as assessed by the FFMQ. As is also discussed below, the daily mindfulness outcome was also explored with non-centered scores as the outcome.

After calculating the time variable, comparing a linear variable of time to quadratic and cubic polynomials (see above), and centering scores around time one, a random intercept model was compared to a fixed intercept model for each outcome. It is important to note that the random intercept model was calculated across all time points and not with any specific time point to examine variability throughout the course of the study (which is especially relevant since scores were based off change from day one daily mindfulness of the 21-day data collection period for daily mindfulness and *not* baseline FFMQ scores), so this score should be interpreted as variability across *all* participant scores as opposed to scores at one individual time point. In comparing the fixed intercept model (AIC = 12977.83, BIC = 12989.71) to the random intercept model (AIC = 11113.35, BIC = 11131.18) for daily mindfulness, the random intercept model was a significant improvement ($\Delta\chi^2(1) = 1866.48$, $p < .001$). As such, mindfulness scores were nested within individuals for the remainder of the analyses with daily mindfulness as the outcome. The fixed effects of time and group (i.e., EMA vs. EMI) were then added to the model. Neither time ($t[2651] = -0.57$, $b = -0.003$, $p = .567$) nor group ($t[158] = -0.69$, $b = -0.20$, $p = .492$) predicted daily mindfulness, and additions of these fixed effects did not improve model fit ($\Delta\chi^2(2) = 0.81$, $p = .669$) in this model (AIC = 11116.55, BIC = 11146.26). Then, the random

slope of linear time was tested. Addition of a random slope of linear time (AIC = 10954.98, BIC = 10996.57) within participants did improve model fit ($\Delta\chi^2(2) = 165.57$, $p < .001$) and, as such, the random slope of time was included in the next step with the interaction. The time X group interaction was added as the final fixed effect. The interaction model (AIC = 10956.49, BIC = 11004.02) was not significant ($\Delta\chi^2(1) = 0.49$, $p = .485$). Taken together, time, group, and the time X group interaction did not account for significant variance in daily mindfulness scores throughout the study while modeling random intercepts and the random slope of linear time. Fixed effects in the final model accounted for approximately .2% of the variance in daily mindfulness scores. The same model was also tested with non-centered daily mindfulness as the outcome, and no significance levels changed at any step. Additionally, the same model was tested after excluding individual surveys completed above 21 by participant, which did not lead to any change in significance levels at any of the steps described above.

Daily Positive Affect. For daily positive affect models, time was treated as a cubic polynomial (given the MLMs explained above demonstrating the best-fitting model after adding the cubic polynomial of time). Like models for daily mindfulness, the daily positive affect score was centered around time one *daily* positive affect in attempt to best fit the model to the non-linear data trends (in addition to a random intercept and random slope of cubic time).

The random intercept model was compared to a fixed intercept model (AIC = 20126.97, BIC = 20138.86), and the random intercept model (AIC = 18260.06, BIC = 18277.88) significantly improved model fit ($\Delta\chi^2(1) = 1868.92$, $p < .001$). Positive affect scores were therefore nested within individuals for remaining analyses with daily positive affect as the outcome. After adding the cubic polynomial of time and the fixed effect of group (i.e., EMA vs. EMI) into the analysis ($\Delta\chi^2(2) = 44.12$, $p < .001$, AIC = 18219.94, BIC = 18249.65), cubic time

significantly and negatively predicted daily positive affect (t[2651] = -6.65, b < 0.001, p < .001). Group did not predict daily positive affect (t[158] = -0.49, b = -0.52, p = .624). The random slope of cubic time (AIC = 18179.62, BIC = 18221.21) significantly improved model fit ($\Delta\chi^2(2) = 44.32$, p < .001), and as such, the random slope of cubic time was included in further analyses. The addition of the interaction term of time X group (AIC = 18181.61, BIC = 18229.14) was not significant (t[2650] = 0.11, b < 0.001, p = .912) and did not improve model fit ($\Delta\chi^2(1) = 0.01$, p = .913). Overall and consistent with daily mindfulness results, effects were null for the group and interaction fixed effects, with a significant effect of time (modeled as a cubic polynomial). In the final model, fixed effects accounted for approximately .7% of the variance in daily positive affect scores. Upon visual inspection of averages of the PANAS-P, cubic effects appear to represent a slight decrease in positive affect with variability across the study (see *Figure 7*), consistent with the main effect of cubic time in positive affect models. Like the mindfulness outcome, non-centered positive affect scores were explored as the outcome with the same modeling procedures, and no significance levels varied when comparing to the procedure detailed above with person-centered change scores from time one. In calculating the same model excluding individual rows above 21 daily surveys completed within individuals, significance levels also did not differ.

Daily Negative Affect. For daily negative affect models, time was treated as a cubic term, and the outcome of daily negative affect was centered around *daily* scores at time one to account for non-linear fluctuations in the data. The random intercept model (AIC = 16626.05, BIC = 16643.88) demonstrated significantly better fit than the fixed intercept (AIC = 18797.36, BIC = 18809.24) model ($\Delta\chi^2(1) = 2173.31$, p < .001). As such, data for daily negative affect were nested by participant for remaining analyses with negative affect as the outcome. After

adding the cubic polynomial of time and group (AIC = 16628.68, BIC = 16658.38), neither time (t[2651] = 1.09, b < 0.001, p = .276) nor group (t[158] = 0.43, b = 0.37, p = .671) significantly predicted daily negative affect. The random slope of cubic time (AIC = 16467.96, BIC = 16509.55) significantly improved model fit ($\Delta\chi^2(2) = 164.72$, $p < .001$), and the random slope of cubic time was therefore added into further analyses. Like other models, the addition of the interaction with time and group (AIC = 16466.79, BIC = 16514.32) was not significant (t[2650] = 1.79, b < 0.001, p = .074) and did not significantly improve model fit ($\Delta\chi^2(1) = 3.17$, p = .075). Consistent with models of daily mindfulness and positive affect, models for negative affect were largely null except for the effects of cubic time in the model without other fixed effects (which indicates that individual fluctuations perhaps best account for these changes). When modeling other aspects of the model mentioned above, this main effect of cubic time was no longer significant. Fixed effects accounted for approximately .2% of the variance in daily negative affect scores. When exploring the same model using overall negative affect as the outcome instead of scores centered around time one within individuals, significance levels did not change. Further, when calculating the same model with individual surveys above 21 excluded within participants, the interaction was significant (albeit *not* significant with the full sample).

State Emotion Regulation. For state emotion regulation models, time was treated as a cubic term, and outcome data for state emotion regulation were centered around time one scores to account for variability throughout the course of the study. The random intercept (AIC = 19279.04, BIC = 19296.87) demonstrated significantly better fit than the fixed intercept (AIC = 21451.72, BIC = 21463.60) model ($\Delta\chi^2(1) = 2174.68$, $p < .001$) and, as such, data for state emotion regulation were nested within individuals for all MLMs. After adding the cubic polynomial of time and group (AIC = 19282.24, BIC = 19311.95), neither cubic time (t[2651] =

0.40, $b < 0.001$, $p = .693$) nor group ($t[158] = -0.80$, $b = -1.07$, $p = .423$) significantly predicted daily state emotion regulation. Accordingly, model fit was not improved ($\Delta\chi^2(2) = 0.80$, $p = .671$). The random slope of cubic time (AIC = 19063.57, BIC = 19105.16) significantly improved model fit ($\Delta\chi^2(2) = 222.67$, $p < .001$), which warranted the inclusion of the random slope of time in remaining analyses. The addition of the cubic time X group interaction (AIC = 19063.76, BIC = 19111.29) was not significant ($t[2650] = 1.35$, $b < 0.001$, $p = .176$) and did not improve model fit overall ($\Delta\chi^2(1) = 1.82$, $p = .178$). Models were null for the effects of state emotion regulation. Again, cubic effects were no longer significant when entering other fixed effects into the model, which appears to suggest that fluctuations are better accounted for by individual differences and fluctuations as opposed to a true cubic trend. Fixed effects accounted for approximately .3% of the variance in state emotion regulation scores. When exploring the same model with non-centered state emotion regulation as the outcome, significance levels did not change. Further, when excluding individual surveys above the 21 first surveys completed in individuals, significance levels did not differ at any of the steps mentioned above.

Within- and Between-Individual Effects on Positive and Negative Affect

In addition to examining effects of time and the intervention, the daily relationships between daily positive affect, daily negative affect, daily mindfulness, and daily state emotion regulation were investigated. Given the primary interest in examining changes in aspects of emotionality (i.e., positive affect and negative affect), effects of daily mindfulness and daily emotion regulation were tested as predictors of both daily positive affect and daily negative affect in separate MLMs. The outcomes for daily positive affect and daily negative affect were *not* centered around time one completion in these cases. Overall, predictors consisted of the following: 1) cubic time, 2) between- and within-individual negative or positive affect

(depending upon the outcome), 3) within- and between-individual state emotion regulation, and 4) within- and between-individual daily mindfulness (while also modeling the random intercept and random slope of cubic time).

Models for Positive Affect. For daily positive affect, the random intercept model (AIC = 18325.76, BIC = 18343.58) demonstrated significantly better fit than the fixed intercept (AIC = 20856.10, BIC = 20867.98) model ($\Delta\chi^2(1) = 2532.34$, $p < .001$), and daily positive affect data were nested within individuals. Initially, cubic time and within- and between-individual negative affect scores were added as predictors. Within-individual predictor scores were person mean centered and are based on individual participant scores throughout the entirety of the study (i.e., each individual's scores reflect idiographic variability centered around their unique overall mean that is an average of daily scores). Between-person scores, rather, reflect overall participant means and do not account for within-individual variability (i.e., each participant has one overall score for positive affect). Cubic time did significantly and negatively predict daily positive affect ($t[2650] = -6.61$, $b < 0.001$, $p < .001$), consistent with the intervention analyses detailed above. Within-individual negative affect significantly predicted daily positive affect ($t[2650] = -7.71$, $b = -0.20$, $p < .001$). On days when individuals reported higher levels of negative affect compared to averages centered at 0 across the study, positive affect decreased. The random slope of cubic time (AIC = 18185.94, BIC = 18233.47) was then added to the model, which significantly improved model fit ($\Delta\chi^2(2) = 46.51$, $p < .001$). Next, within- and between-individual daily emotion regulation scores and within- and between-individual daily mindfulness scores were added to the model. In the *final* model, cubic time significantly and negatively predicted daily positive affect ($t[2648] = -4.46$, $b < 0.001$, $p < .001$). Between-person negative affect predicted positive affect ($t[156] = 4.64$, $b = 0.84$, $p < .001$). As negative affect increased across

participants, daily positive affect also increased. Both within- (t[2648] = -14.50, b = -0.28, p < .001) and between- (t[156] = -4.75, b = -0.48, p < .001) person emotion regulation negatively predicted negative affect. On days when individuals reported higher levels of daily emotion *dysregulation* compared to their own averages, positive affect decreased. Further, higher levels of overall daily emotion dysregulation were associated with lower levels of positive affect. Within-person mindfulness scores positively predicted daily positive affect, t(2648) = 2.13, b = 0.14, p = .033. On days when individuals reported greater mindfulness, positive affect also increased. Fixed effects accounted for approximately 16% of the variance in daily positive affect. All coefficients from the final daily positive affect model are presented in Table 3.

Models for Negative Affect. For daily negative affect, the random intercept model (AIC = 16633.51, BIC = 16651.33) demonstrated significantly better fit than the fixed intercept (AIC = 18640.10, BIC = 18651.98) model ($\Delta\chi^2(1) = 2008.59$, p < .001), and data were nested within individuals for the remaining negative affect models. First, between- (i.e., overall mean scores for each participant) and within- (i.e., person mean centered scores across the duration of the study) positive affect and the cubic polynomial of time were entered as predictors. Cubic time did not significantly predict daily negative affect, (t[2650] = -0.03, b = < 0.001, p = .973). Within-individual positive affect significantly predicted daily negative affect (t[2650] = -7.71, b = -0.11, p < .001). On days when individuals reported higher than average positive affect, negative affect decreased. Next, the random slope of cubic time was added to the model. Addition of the random slope of cubic time (AIC = 16409.78, BIC = 16457.32) significantly improved model fit ($\Delta\chi^2(2) = 173.81$, p < .001), and the random slope of cubic time was therefore included in additional models for daily negative affect. Then, within- and between-individual daily mindfulness and within- and between-individual daily state emotion regulation

were added as predictors, along with cubic time, between-person positive affect, and within-person positive affect. Cubic time did not significantly predict daily negative affect (t[2648] = 0.72 b < 0.001, p = .470). Between-person positive affect positively predicted daily negative affect scores (t[156] = 4.78, b = 0.14, p < .001). As positive affect scores increased across participants, so did negative affect in this model. Within-person positive affect scores were not significant in predicting daily negative affect (t[2648] = 0.60, b = 0.01, p = .547) in the final model. Both within- (t[2648] = 31.32, b = 0.35, p < .001) and between-person (t[156] = 17.11, b = 0.44, p < .001) daily emotion regulation scores significantly predicted negative affect. Higher levels of state emotion dysregulation were associated with higher levels of negative affect. Further, on days when individuals reported higher levels of state emotion dysregulation compared to their own averages, they also reported higher levels of negative affect. Neither within- or between-person mindfulness scores predicted daily negative affect. In the final model, fixed effects accounted for approximately 55% of the variance in negative affect scores. All coefficients for negative affect models for the final model are presented along with positive affect models in Table 3.

Moderator Analyses and Participant Preferences

Considering the null effects for the EMI intervention on daily positive affect, daily negative affect, daily mindfulness, and daily state emotion regulation, moderator analyses were also conducted to see if level of engagement in the mindfulness activities moderated the effects of time on the different outcomes for the EMI group specifically (i.e., those who reported follow-up data and could be matched to daily surveys).

Daily Mindfulness. First, the effects of level of engagement and the interaction with time were tested in predicting daily mindfulness using random intercepts and the random slope of

linear time. Specifically, four separate engagement questions (see Method for more details) administered to participants in the EMI group assessed 1) how often participants used the daily messages in their life, 2) whether the amount of mindfulness activities was appropriate, 3) the level of awareness that participants reported because of the mindfulness messages, and 4) how likely they would be to recommend learned mindfulness skills to a friend. After entering each of these items into the MLM along with linear time, usage of mindfulness messages (t[67] = 0.48, b = 0.13, p = .635), appropriateness of the activities (t[67] = -0.33, b = -0.27, p = .741), level of awareness (t[67] = -1.34, b = -0.55, p = .185), and likelihood of recommending these skills to a friend (t[67] = 0.48, b = 0.14, p = .635) did not predict daily mindfulness. Fixed effects accounted for approximately 2% of the variance in mindfulness scores. Additionally, time did not significantly interact with usage (t[1274] = 1.61 b = 0.02, p = .107), appropriateness (t[1274] = 0.38, b = 0.02, p = .703), awareness (t[1274] = -0.73, b = -0.01, p = .468), or likelihood of recommending skills to a friend (t[1274] = -0.69, b = -0.01, p = .492) in predicting daily mindfulness. When calculating these same models with change scores, significance values did not change for fixed effects.

Daily Positive Affect. For positive affect models, a similar method was followed for examining whether engagement predicted daily positive affect using random intercepts and a random slope of cubic time. After entering each of the engagement items along with cubic time, a random intercept, and the random slope of cubic time, usage of mindfulness messages (t[67] = 2.79, b = 2.66, p = .007) positively predicted positive affect. As overall usage of mindfulness messages increased, so did positive affect scores. Appropriateness of the activities (t[67] = 0.08, b = 0.21, p = .940), level of awareness (t[67] = 0.57, b = 0.82, p = .570), and likelihood of recommending the skills to a friend (t[67] = -0.52, b = -0.52, p = .605) did not predict positive

affect scores. Fixed effects accounted for approximately 8% of the variance in daily positive affect. Additionally, cubic time did not significantly interact with usage (t[1274] = 0.43, b < 0.001, p = .668), appropriateness (t[1274] = -0.08, b < 0.001, p = .935), level of awareness (t[1274] = 0.55, b = < 0.001, p = .580), or likelihood of recommending the skills to a friend (t[1274] = 0.79, b < 0.001, p = .427) in predicting daily positive affect. When calculating these models with positive affect change scores, appropriateness of mindfulness messages predicted positive affect (t[67] = 2.06, b = 4.78, p = .043).

Daily Negative Affect. After calculating a random intercept of daily negative affect and a random slope of cubic time, usage of mindfulness messages (t[67] = 0.49, b = 0.31, p = .625), appropriateness of the activities (t[67] = -0.33, b = -0.61, p = .743), level of awareness (t[67] = 0.73, b = 0.69, p = .470), and likelihood of recommending the skills to a friend (t[67] = 1.52, b = 1.01, p = .133) did not predict daily negative affect scores. Fixed effects accounted for approximately 3% of the variance in daily negative affect scores. Cubic time did not significantly interact with usage (t[1274] = 0.91, b < 0.001, p = .363), appropriateness (t[1274] = 0.40, b < 0.001, p = .686), level of awareness (t[1274] = 1.09, b < 0.001, p = .276), or likelihood of recommending the skills to a friend (t[1274] = 1.41, b < 0.001, p = .157) in predicting daily negative affect. When exploring the same model with change scores as the outcome instead of overall scores, significance levels did not vary from any of the results reported above.

Daily State Emotion Regulation. After calculating a random intercept of daily state emotion regulation and a random slope of cubic time, usage of mindfulness messages (t[67] = -0.06, b = -0.07, p = .954), appropriateness of the activities (t[67] = 0.09, b = 0.31, p = .931), and likelihood of recommending the skills to a friend (t[67] = 0.90, b = 1.16, p = .369) did not significantly predict daily state emotion regulation. Level of awareness (t[67] = 2.07, b = 3.81, p

= .043) did significantly relate to daily state emotion regulation. As participants reported a higher lack of awareness because of the mindfulness messages, state emotion dysregulation across the study also increased. Fixed effects accounted for approximately 7% of the variance in state emotion regulation. Regarding interactions, time did not significantly interact with usage (t[1274] = -0.67, b < 0.001, p = .501), appropriateness of the activities (t[1274] = 0.05, b < 0.001, p = .964), level of awareness (t[1274] = 1.10, b < 0.001, p = .270), or likelihood of recommending the skills to a friend (t[1274] = 1.67, b < 0.001, p = .095) in predicting daily state emotion regulation. When exploring the same model with change scores, awareness was no longer related to changes in daily state emotion regulation. All other significance levels did not change.

Participant Preferences. Regarding usage of mindfulness messages, participants in the EMI completing the follow-up survey reported that they used the mindfulness messages "About half the time" (M = 3.01, SD = 0.94) and that the number of mindfulness messages was "About right" (M = 2.10, SD = 0.30). For the awareness item, participants reported that they were "Probably yes" more aware of thoughts, feelings, and behaviors because of the messages (M = 1.76, SD = 0.66) and that they were "Likely" (M = 2.15, SD = 0.94) to recommend mindfulness skills to a friend (thus supporting the hypothesis that participants in the intervention condition would find the EMI helpful and useful).

Exploratory Analyses of Covariance

Exploratory Analyses of Covariance (ANCOVA) were conducted to examine whether follow-up constructs (i.e., DASS Depression, DASS Anxiety, DASS Stress, FFMQ, DERS, MLQ) were significantly different across the EMI and EMA conditions, controlling for baseline

levels of depression, anxiety, stress, trait mindfulness, trait emotion regulation, and meaning in life using the same measures.

Depression. Homogeneity was met, Levene's $F(1, 146) = 0.58$, $p = .448$. Baseline depression was a significant adjustor of follow-up depression, $F(1, 145) = 143.81$, $p < .001$, $\eta_p^2 = .498$, and baseline depression and follow-up depression were also correlated ($r = .71$, $p < .001$). Baseline depression was positively associated with follow-up depression, which suggests that follow-up depression increased as baseline depression increased. After controlling for the effects of baseline depression, the main effect of group (i.e., EMA vs. EMI) was not significant, $F(1, 145) = 0.22$, $p = .641$, $\eta_p^2 = .002$, which suggests that participants in the EMA condition ($M = 9.46$) had similar depression symptoms as participants in the EMI condition ($M = 9.95$) at the end of the study using marginal means.

Anxiety. For the ANCOVA related to anxiety symptoms, homogeneity was not met, Levene's $F(1, 146) = 4.69$, $p = .032$, although this was not significant at $p < .001$. Thus, the anxiety ANCOVA should be interpreted cautiously. Baseline anxiety was a significant adjustor of follow-up anxiety, $F(1, 145) = 116.17$, $p < .001$, $\eta_p^2 = .445$, and baseline anxiety and follow-up anxiety were correlated ($r = .67$, $p < .001$). After controlling for the effects of baseline anxiety, the main effect of group did not predict follow-up anxiety scores, $F(1, 145) = 0.11$, $p = .741$, $\eta_p^2 < .001$. After controlling for baseline anxiety symptoms, follow-up scores did not vary across groups for the EMA ($M = 9.14$) and the EMI ($M = 9.43$) conditions at the end of the study using marginal means.

Stress. The homogeneity assumption was not met for stress, Levene's $F(1, 146) = 4.81$, $p = .03$ (although not at $p < .001$). Thus, results for stress should be interpreted cautiously. Baseline stress was a significant adjustor of follow-up stress, $F(1, 145) = 67.45$, $p < .001$, $\eta_p^2 =$

.317, and baseline and follow-up stress were significantly correlated (r = .56, p < .001). After controlling for the effects of baseline stress, the main effect of group did not predict follow-up stress scores, F(1, 145) = 1.18, p = .279, η_p^2 = .008. After controlling for baseline stress symptoms, follow-up scores did not vary across groups for the EMA (M = 12.99) and the EMI (M = 14.20) conditions at the end of the study using marginal means.

Mindfulness. The homogeneity assumption was met for mindfulness, Levene's F(1, 143) = 0.64, p = .424. Baseline mindfulness was a significant adjustor of follow-up mindfulness, F(1, 142) = 162.19, p < .001, η_p^2 = .533, and baseline and follow-up mindfulness were significantly correlated (r = .73, p < .001). After controlling for the effects of baseline mindfulness, the main effect of group did not predict follow-up mindfulness scores, F(1, 142) = 0.10, p = .747, η_p^2 < .001. After controlling for baseline mindfulness scores, follow-up scores did not vary across the groups for the EMA (M = 121.15) and the EMI (M = 121.78) conditions at the end of the study.

Emotion Regulation. The homogeneity assumption was met for emotion regulation, Levene's F(1, 139) = 0.03, p = .858. Baseline emotion regulation was a significant adjustor for follow-up emotion regulation, F(1, 138) = 114.31, p < .001, η_p^2 = .453, and baseline and follow-up emotion regulation were significantly correlated (r = .67, p < .001). After controlling for the effects of baseline emotion regulation, the main effect of group did not predict follow-up emotion regulation scores, F(1, 138) = 0.79, p = .375, η_p^2 = .006. Follow-up scores were not different for the EMA (M = 85.94) and the EMI (M = 83.37) conditions at the end of the study.

Meaning in Life. The homogeneity assumption was met for meaning in life, Levene's F(1, 141) = 1.04, p = .309. Baseline meaning in life was a significant adjustor for follow-up meaning in life, F(1, 140) = 145.11, p < .001, η_p^2 = .509, and baseline meaning in life and follow-up meaning in life were positively correlated (r = .71, p < .001). After controlling for the

effects of baseline meaning in life, the main effect of group did not predict follow-up meaning in life scores, $F(1, 140) = 0.003$, $p = .960$, $\eta_p^2 < .001$. Follow-up scores were not different for the EMA ($M = 24.45$) and EMI ($M = 24.49$) conditions. Taken together, results from the ANCOVAs are largely consistent with MLMs, indicative of largely null effects for the intervention (despite controlling for baseline characteristics and within-individual sources of variability).

Overall Results Summary

In succinctly summarizing the results, the data were non-linear (see *Figures 1 – 4*), and a cubic polynomial of time improved model fit for daily positive affect, daily negative affect, and state emotion regulation. There was significant variability in assessed outcomes throughout the course of the study (see *Figure 5*). Baseline and follow-up correlations were meaningful and in the expected directions (see Table 1 and Table 2), such that higher levels of depression, anxiety, and stress were related to lower trait mindfulness, higher trait emotion dysregulation, and lower meaning in life. Meaning in life was positively associated with mindfulness but negatively associated with emotion dysregulation, while emotion dysregulation was negatively associated with mindfulness.

Regarding individual differences across the study, cubic polynomials best represented changes in daily positive affect, daily negative affect, and daily state emotion regulation over time, while quadratic and cubic polynomials did not improve model fit for daily mindfulness. When entering other fixed effects, cubic effects remained significant for positive affect (indicative of an overall decrease over time with some fluctuations). If anything, findings for negative affect and state emotion dysregulation are indicative of the relatively random fluctuations in daily negative affect and daily state emotion regulation throughout the study. As evidenced by the ICCs, approximately 30% of the variability in daily mindfulness, daily positive

affect, daily negative affect, and daily state emotion dysregulation is accounted for by within-individual fluctuations, and these fluctuations are presented and contextualized using *z*-scores in *Figure 5*. These scores indicate within-individual variability throughout the study, and there is convergent evidence supporting this assertion across the results.

For the EMI and EMA conditions, effects were null when comparing main effects across groups (except for the main effect of cubic time for positive affect). However, within- and between-individual differences predicted fluctuations in positive and negative affect (see Table 3). Within- and between-individual increases in state emotion dysregulation predicted lower positive affect and higher negative affect, and within-individual mindfulness scores positively predicted positive affect. Greater usage of the mindfulness messages in the EMI condition at follow-up was related to increased levels of positive affect throughout the study. As participants reported decreased awareness of thoughts, feelings, and behaviors related to receiving the text messages, state emotion dysregulation increased. Participants subjectively reported using the messages half the time, noted that the number of messages was about right, and stated that they were probably more aware of thoughts and feelings and likely to recommend the messages to a friend.

CHAPTER 4: DISCUSSION

The current study examined the effectiveness of an EMI intervention with mindfulness-based text messages for promoting daily positive affect and daily mindfulness and reducing daily negative affect and daily emotion dysregulation in a college student sample with varying levels of psychological distress. Using an intensive longitudinal design, we identified within- and between-individual predictors of daily positive affect and daily negative affect, namely daily state emotion regulation, daily mindfulness, and time (modeled as a cubic polynomial for daily positive affect, daily negative affect, and daily emotion dysregulation and a linear variable for daily mindfulness). Finally, we asked participants in the EMI group about engagement and preferences regarding EMI messages using Likert-type scales and open-ended questions. Participants in the EMI group did not report greater increases in daily positive affect and daily mindfulness throughout the study compared to the EMA condition, controlling for the effects of time and participant variability using random intercepts, random slopes of time, and a fixed effect of time. Further, participants in the EMI condition did not report greater reductions in negative affect and emotion dysregulation compared to the EMA condition, again controlling for time and sources of individual variability (i.e., random intercepts and random slopes of time). Exploratory analyses of covariance corroborated null effects for the EMI.

For the EMI condition, level of engagement in mindfulness messages was positively associated with daily positive affect, and higher lack of emotional awareness due to the mindfulness messages was positively associated with increased emotion dysregulation

throughout the study. Within- and between-individual daily emotion dysregulation positively predicted daily negative affect and negatively predicted daily positive affect. Within-individual mindfulness positively predicted positive affect, and between-individual positive and negative affect predicted daily negative and daily positive affect, respectively. There was significant within-individual variability in daily constructs. In general, participants found the survey messages to be useful and helpful for building emotional awareness. While effects were largely null for the EMI compared to the EMA condition, results have implications for future longitudinal research incorporating experience sampling methods and clinical practice efforts, given the recent proliferation of idiographic approaches to longitudinal research methodologies and evidentiary interventions in the field of clinical psychology.

Idiographic Variability in Mindfulness, Mood, and Emotion Regulation

Approximately 30% of the variability in daily mindfulness, daily positive affect, daily negative affect, and daily emotion regulation was attributed to within-individual differences. Idiographic variability was also demonstrated through visual representations of the data, which were indicative of significant fluctuations for primary outcomes. Further, random intercept models and MLMs incorporating a random slope of time significantly improved model fit, indicative of significant participation variation in both overall constructs and slopes across time. Finally, cubic polynomials of time improved model fit significantly for daily positive affect, daily negative affect, and daily state emotion dysregulation. These findings regarding individual variability were expected, given the extant literature demonstrating intra-individual variability across heterogeneous constructs using EMA designs (e.g., Finkelstein-Fox et al., 2020; Pavlacic et al., 2021). Further, the cubic effect of time for the positive affect outcome appears to indicate an overall downward trend with some fluctuations across the study, which could perhaps be

attributed to the stressful climate in which participants completed the study (i.e., given the uncertainty surrounding the COVID-19 pandemic and consistently fluctuating policies and regulations). In other cases where cubic effects were significant in models with no other predictors, these effects were no longer significant when entering other fixed effects (and are perhaps better accounted for by relevant fixed effects and fluctuations within individuals).

Examination of idiographic differences in psychopathology and facets of psychological well-being within the context of longitudinal modeling and individualized clinical intervention has gained traction in the past decade (see Finkelstein-Fox et al., 2020; Hayes et al., 2020; Hofmann & Hayes, 2019; Pavlacic et al., 2021). The surge of idiographic research designs and individualized interventions directly challenges the notion that between-individual analytic methods and nomothetic approaches to ameliorating psychopathology are the best available methods in clinical psychology to help alleviate psychological suffering and promote well-being (Hayes et al., 2020; Hofmann & Hayes, 2019; Pavlacic & Young, 2020). As an example, if aggregating data from a clinical trial at the between-person level, mean scores used to compare groups may not actually encompass the score of a specific individual (and as such mean-aggregated scores may not fully capture trajectories or patterns of symptoms for specific individuals). Rather, process-oriented, individualized approaches allowing for idiographic application of nomothetic knowledge consider unique contextual variables and individual differences (Hayes et al., 2020).

Examples of mainstream, process-based approaches include Acceptance and Commitment Therapy (Hayes et al., 1999; Hayes et al., 2011), Process-Based Cognitive Behavioral Therapy (Hofmann & Hayes, 2019), Logotherapy (Schulenberg et al., 2008; Southwick et al., 2016), strengths-based interventions considering individual strengths to

facilitate behavioral activation targets (Niemiec, 2013, 2018), and other Cognitive-Behavioral treatment packages that apply evidence-based strategies to the individual (see Finkelstein-Fox et al., 2019, or Pavlacic et al., 2021, for an overview). Idiographic clinical intervention approaches distill nomothetic principles of behavior change (i.e., practice elements) and apply them to individual contexts (Chorpita et al., 2005). The within-individual variability in daily mindfulness, daily positive affect, daily negative affect, and daily state emotion regulation adds to the rapidly developing literature base examining: 1) within-individual differences in biological, psychological, and social factors, 2) how daily level factors predict changes in various aspects of psychopathology and psychological well-being (e.g., valued living; Finkelstein-Fox et al., 2020; Pavlacic et al., 2020, 2021), and 3) implications of idiographic data-analytic strategies and conceptualization efforts for clinical intervention (Pavlacic & Young, 2020).

In addition to informing idiographic approaches to intervention and challenging between-person analytic approaches, constructs typically assessed cross-sectionally fluctuated across participants and time on a daily level, which also has implications for EMA/EMI research and provides further support for the benefits that EMA/EMI methodologies have above and beyond cross-sectional or retrospective assessments of behavior at a single time point (Littlewood et al., 2019; Pavlacic et al., 2021). Cross-sectional assessments of a psychological or behavioral construct may not fully capture contextually driven variability or idiographic differences over time (Pavlacic et al., 2021; Trull & Ebner-Priemer, 2009), particularly if environmental factors confound reports of such constructs using cross-sectional methodologies (Moore et al., 2016; Pavlacic et al., 2021). EMA/EMI methodologies have been increasingly utilized in the past decade for understanding antecedents and consequences of behavioral processes and mechanisms (Colombo et al., 2020), while simultaneously controlling for environmental confounds and

illustrating the dynamic nature of how heterogeneous constructs unfold over time (aan het Rot et al., 2012; Pavlacic et al., 2021). The results of the current study are no exception; we show daily fluctuations in components of positive and negative emotionality (i.e., positive and negative affect) and procedures and abilities contributing to psychological difficulties and well-being (i.e., mindfulness and emotion dysregulation; Chambers et al., 2009) in a college student sample at the daily level. While external validity is inherently limited given the college sample, precise estimates of daily mindfulness, daily positive affect, daily negative affect, and daily emotion regulation add to the growing body of EMA/EMI literature examining idiographic differences using a large, well-powered sample and a rigorous longitudinal design.

The importance of examining idiographic differences can be further contextualized by understanding limited treatment access and systemic barriers preventing certain populations from accessing evidence-based treatments or participating in research trials. In college students, systemic barriers to seeking and receiving mental health treatment include exceedingly long wait times at university mental health clinics (see Xiao et al., 2017, for a review), cultural factors (Kuhlman et al., 2019), and personal factors (e.g., fear of being negatively appraised for seeking mental health services; Ennis et al., 2019), among numerous other barriers and factors. Further, mental health needs of non-White students are not met compared to White students (Lipson et al., 2018), which speaks to disparities in treatment access for students not identifying with the majority. Unfortunately, lack of representation is not a new finding; non-White racial and ethnic groups are not well-represented in randomized clinical trials (Mak et al., 2007), which limits generalizability of findings and conclusions garnered from such trials to non-White populations (Polo et al., 2019) and speaks to systemic issues regarding inclusive practices in research.

EMA/EMI methods are one way to disseminate interventions and research protocols to those who may not otherwise choose to participate in research or intervention trials (particularly those unwilling or unable to access in-person services due to systemic barriers), while simultaneously affording an understanding of how individual constructs fluctuate within a specific person as opposed to across a group of individuals. While the sample in the present study was predominantly White and female and therefore does not afford generalizability to non-White groups, the results provide a foundation for the expansion of EMA/EMI methodologies with diverse college students. Further, while the sample was predominantly White and female, participants were equally distributed regarding religiosity, and most participants were unemployed. Some participants were also receiving concurrent pharmacological or psychotherapeutic mental health treatments. Thus, while not ideal in terms of racial or ethnic representation, the current study provides some variability in demographic characteristics that, at minimum, sufficiently represent a college sample.

Within- and Between-Individual Predictors of Affectivity

In addition to the importance of understanding idiographic variability in behavioral constructs across time for promoting innovations in research methodologies and clinical interventions, identification of antecedents and consequences of psychological factors and how within- and between-individual fluctuations in these psychological factors predict changes in positive and negative psychological outcomes is also essential for clinical intervention (Colombo et al., 2020), research (Finkelstein-Fox et al., 2020) and college student mental health (Pavlacic et al., 2021). For example, mindfulness is a core therapeutic procedure promoting reductions in psychological suffering and increases in psychological well-being (Baer, 2018; Brown & Ryan, 2003). Trait-level mindfulness is positively associated with greater levels of positive affect and

negatively associated with lower levels of negative affect (Finkelstein-Fox et al., 2019; Jislin-Goldberg et al., 2012). Conceptually, mindful awareness promotes elevated attention to positive emotional experiences in an individual's context, experiences that might otherwise be masked or negatively appraised with maladaptive emotion regulation strategies (e.g., behavioral or cognitive avoidance, negative appraisal of environmental experiences; Jislin-Goldberg et al., 2012) that ultimately maintain and perpetuate psychological difficulties (Bentley et al., 2018).

Within the context of the present study, the theoretical link between mindfulness and positive emotional experiences at the trait level could explain daily-level associations between daily mindfulness and daily positive affectivity, as individuals could have had more difficulty noticing positive emotional experiences on days when they were less mindful. As a covarying explanation, deficiencies in abilities and strategies to modulate emotions, accept emotions, foster awareness surrounding emotions, and garner emotional clarity could also contribute to limited positive affect and heightened negative affect (see below). Given that mindfulness is commonly considered an emotion regulation strategy (Chiesa et al., 2013), the link between daily mindfulness and positive affect is not entirely surprising. Positive emotion regulation science also implicates other emotion regulation strategies as important to positive and negative emotionality, such as attentional biases towards negative stimuli, biased interpretations of neutral stimuli, and attempting to downregulate negative emotions. These strategies theoretically contribute to deficits in the experience of positive emotions (Carl et al., 2013), with mindfulness being one example of such a strategy. The current study supports the relationship between a positive emotion regulation strategy (i.e., daily mindfulness) and daily positive affect across a 21-day time frame, controlling for the effects of cubic time and within-individual sources of variability (i.e., random intercepts and random slopes). These findings corroborate related studies

examining daily-level associations between daily mindfulness, rumination, and affective changes (Blanke et al., 2020; Brockman et al., 2017) and extend other studies examining biological, psychological, sociocultural, and environmental factors predicting changes in components of psychological well-being, such as valued living, at a longitudinal level (e.g., Finkelstein-Fox et al., 2020; Pavlacic et al., 2021). Given the longitudinal design and daily assessments, a more nuanced appraisal of the daily level relationships between mindfulness and positive affect is possible.

In addition to within-individual mindfulness predicting daily positive affect, within- and between-individual emotion dysregulation predicted daily negative and positive affect. An inability to effectively regulate emotional experiences, as detailed earlier, underlies different psychological disorders (see Chambers et al., 2009; Compas et al., 2017; or Hofmann et al., 2012, for overviews), and greater difficulties regulating emotions predict affective instability (Chambers et al., 2009; Koenigsberg et al., 2002) and exacerbate psychopathology (Cludius et al., 2020). Emotion regulation, like mindfulness, is a critical construct and treatment target for different psychological difficulties (Hayes & Hofmann, 2018). The current study extends the relationship between emotion dysregulation and affective states to the daily level, specifically as emotion dysregulation pertains to components of positive and negative emotionality. On days when individuals reported greater difficulty accepting, modulating, and fostering awareness of the emotions they were experiencing (utilizing a total score encompassing questions from each of these domains), they also reported lower positive mood and greater negative mood (controlling for the opposite type of affect, time, and within-individual variability). Like the results for daily mindfulness, the associations between daily emotion dysregulation and positive

and negative affect allow for an understanding of how fluctuations in behavioral processes relate to mood states throughout the day.

In synthesizing the results for daily emotion dysregulation with results for daily mindfulness, specific emotion regulation strategies, such as mindfulness, cognitive reappraisal, and emotional suppression, are uniquely related to affective states depending on the regulation strategy employed (Brockman et al., 2017). The current findings regarding daily mindfulness and daily emotion regulation are consistent with the broader literature, which suggest that changes in state-level emotion regulation abilities (Gratz & Roemer, 2004), in addition to specific daily regulatory strategies (i.e., mindfulness; Aldao et al., 2010), relate to experiences in daily positive and negative affective states. Consistent with theoretical models of emotion regulation (Carl et al., 2013; Gratz & Roemer, 2004; Jislin-Goldberg et al., 2012), an inability to effectively regulate or manage emotional experiences could mask the experience of positive emotionality and heighten negative affectivity, while mindful awareness may promote positive emotionality even during the experience of aversive thoughts or physiological sensations. Of course, within- and between-individual findings cannot be interpreted causally. However, understanding within- and between-person differences and relations to positive and negative emotionality sheds light on the role of construct stability (or lack thereof) and how these changes relate to various outcomes, particularly within the context of emotion regulation abilities and specific emotion regulation strategies (e.g., mindful awareness).

Intervention Effects and Moderator Analyses

Unexpectedly, effects of the mindfulness EMI messages on daily positive affect, daily negative affect, daily emotion dysregulation, and daily mindfulness were null compared to the EMA condition by examining a time X group interaction. Many mindfulness-based, technology-

driven interventions are typically longer than the EMI employed in the current study (e.g., Mindful Messaging; L2B; Web-based Mindfulness Virtual Community; Ahmad et al., 2020; Broderick & Metz, 2009; Trub & Starks, 2017), which involved sending brief mindfulness messages nine times total throughout a 21-day time frame that were likely not perceived as time consuming. While the present study sought to disseminate mindfulness strategies as efficiently as possible and in a way that was not perceived as burdensome by participants, it could be that null effects are attributed to a relatively innocuous, low-dose intervention that was simply not strong enough to promote meaningful change in positive affect, negative affect, mindfulness, or emotion dysregulation. The intervention may not have been intensive enough to be effective, which seems reasonable given the literature base showing the efficacy and effectiveness of mindfulness-based interventions across different populations, psychological difficulties, and aspects of psychological well-being (e.g., Grossman et al., 2004).

Another reasonable, perhaps co-occurring explanation regarding null effects of the EMI is level of engagement and variability across participants' engagement in the EMI messages. Engagement did not interact with time in predicting reductions in any of the constructs for the EMI condition with any item. However, higher engagement in the EMI messages was positively associated with daily positive affect, which suggests that the more participants engaged with the mindfulness messages, the higher their positive affect was overall across individuals in the EMI condition. Further, a higher lack of awareness was positively related to emotion dysregulation for participants in the EMI condition, suggesting that limited insight and awareness into the text messages related to an inability to effectively regulate emotions. While correlational, these findings suggest that engagement could be a factor limiting the effectiveness of the EMI intervention.

Alternatively, the associations between engagement in the EMI, daily positive affect, and daily state emotion dysregulation could be explained by deficits in emotion regulation abilities overall (as opposed to lack of engagement with the EMI specifically), wherein those who were unaware of emotional experiences may simply not have surmised any benefit from the EMI messages because of deficits in underlying regulatory abilities. Given the correlational nature of these results, it is not possible to pinpoint whether the relationships between the engagement variables and primary outcomes reflect a true lack of engagement or emotion regulation ability deficiencies. However, these two theoretical justifications may help to explain the null results.

A third explanation as to the null effects is the immediate context in which participants completed the surveys and mindfulness activities. For example, if a participant received the mindfulness message while socializing with friends, participating in a time-consuming activity (e.g., exercise or schoolwork), or in a situation where utilizing a phone may not have been allowed (e.g., while in class) they may have: 1) ignored the survey, 2) participated at a later time, or 3) decided to not fully participate in the mindfulness activity and/or survey for that day. While EMA/EMI studies have numerous benefits, the context in which the study is completed could be considered a prominent limitation. With EMA/EMI studies, the researcher has limited control of a participant's environment compared to a study conducted in a controlled laboratory environment. However, ecological validity is enhanced with EMA/EMI studies, so context effects and their impact on responding could also be considered a strength in that they allow for reduced error in participant responding (given the naturalistic environment in which the study occurs and the opportunity to examine behaviors in real-world contexts). While methodological limitations are ubiquitous across any given methodological approach, the aforementioned factors

are important to consider when interpreting the results from the current study and drawing meaningful conclusions.

Importantly, retention rates and incompletion are also common problems in intensive longitudinal designs, and retention typically and expectedly decreases as study length increases (Burke et al., 2017). Boredom or regression to the mean effects could have also masked the impact of the EMI, since the study asked for participation in a daily survey each day for 21 days. Relatedly, time constraints around survey completion times could have inadvertently pressured participants to complete the survey while participating in other activities (see examples above), which could have limited participant focus and thus prevented accurate responding. In cases where participation in a mindfulness activity was required, participants simply may have chosen not to complete it if they were not able to within the requested time frame.

Overall, while it is difficult to pinpoint the exact reason for the null results when comparing the EMI group to the EMA group, these findings could be attributed to a combination of: 1) the relatively low dose of the intervention compared to other mindfulness-based interventions, 2) the level of engagement with the EMI for participants in the EMI condition, 3) preexisting emotion regulation ability deficits that prevented some participants from obtaining true benefit from the EMI, and 4) the environmental contexts in which daily surveys were completed. Considering the demonstrable evidence base regarding the efficacy and effectiveness of mindfulness-based interventions (Bamber & Morpeth, 2019; Chiodelli et al., 2020), these reasons appear to be plausible explanations for the null findings.

Limitations

Several factors limit external validity, the ability to derive solidified conclusions from the present study, and confidence in interpretation of the findings. Most saliently, the current sample

was exclusively college students who primarily identified as White and female. We explicitly targeted college students given barriers to accessing mental health care faced by this population, as well as unique biopsychosocial difficulties that college students have regarding treatment in university contexts. Thus, while our sample is representative of a typical college population, the results do not generalize to community samples, diverse samples of university students that are predominantly non-White, and, importantly, clinical samples experiencing higher levels of psychological distress than those reported in the current sample. Additionally, while the study design allows for causal interpretation regarding EMI effects by establishing temporal precedence and eliminating alternative explanations with randomization and inclusion of a control group, analyses examining within- and between-individual predictors of daily positive and negative affect cannot and should not be interpreted as causal. Rather, these findings reflect daily, correlational relationships between daily positive affect, daily negative affect, daily mindfulness, and daily state emotion regulation.

Regarding assessments of daily mindfulness, daily positive affect, daily negative affect, and daily state emotion regulation, participants were repeatedly assessed over a 21-day time frame. While the length of the study could be considered a strength given the intensive longitudinal design that allows for examination of idiographic differences, repeatedly assessing constructs over extended time periods could have also confounded results. Participants may have simply clicked through the survey or not provided their full attention on certain surveys, especially for days administered later in the 21-day time frame. Attention checks were implemented to address random responding with a single item on each survey, but these attention checks may not have captured all random responding. Regarding timing of survey completion, we promoted flexibility in data analyses by controlling for time to include participants who

completed surveys outside of the requested time frame (i.e., 5:00 PM to 10:00 AM), and our retention rate was relatively high in terms of number of daily surveys completed compared to studies with similar designs (Burke et al., 2017). One could also argue that daily emotion dysregulation and daily mindfulness are similar constructs (Lavender et al., 2017), but the opposite argument could be made that emotion dysregulation constitutes a set of underlying abilities that manifest with the use of specific regulatory strategies (i.e., mindfulness) dependent upon the context (Tull & Aldao, 2015).

Randomization is also imperative to discuss. The main researcher was not blind to the randomization sequence, as knowledge of participant condition was required to enroll participants in the daily surveys through TellMyCell (i.e., participant phone numbers had to be enrolled to a specific group in TellMyCell based on assignment to ensure participants were distributed the accurate messages each day with the automated software). Ideally, all investigators would have been completely blind to the randomization and allocation sequence (as is commonly the case with randomized controlled trials), but blind randomization was simply not feasible given the complexities of enrolling participants into the daily surveys.

Conceptually, the S-DERS and DMS only allowed for a limited assessment of emotion regulation abilities and strategies, respectively. Aside from measuring states of emotion dysregulation as opposed to trait emotion dysregulation, the S-DERS (Lavender et al., 2017) is a consolidated version of the DERS (Gratz & Roemer, 2004) and only assesses four major subscales (i.e., nonacceptance of emotions, modulation of emotions, awareness of emotions, emotional clarity) compared to the six subscales (i.e., deficits in goal-directed behaviors, nonacceptance of emotions, impulsivity, limited emotion regulation strategies, lack of emotional awareness, limited clarity) assessed by the DERS. Thus, the present study only measured a

relatively small number of abilities and strategies related to emotion regulation, with many others (e.g., avoidance, problem solving, reappraisal, rumination, suppression) remaining unassessed (Aldao et al., 2010). Of course, this difference in subscales is also attributed to factor analytics used in psychometric studies. We assessed a limited number of constructs primarily since participants completed surveys each day for 21 days, and we wanted to limit participant fatigue as much as possible to gather meaningful and accurate data. Still, the limited regulatory constructs assessed does not allow for generalization to other emotion regulation abilities or constructs, which is an area needing further study.

Despite these limitations, the current study shows that constructs assessed cross-sectionally fluctuate across days, and these fluctuations predict components of positive and negative emotionality. We identify within- and between-individual regulatory factors predicting changes in daily positive affect and daily negative affect using an intensive longitudinal design. Importantly, we also elucidate factors (i.e., level of awareness and engagement in the EMI) that could have confounded results and thus may be important to consider in future mindfulness based EMIs and experience sampling research more generally.

Future Research

Building upon EMA/EMI literature and based on the results of the present study, we have several recommendations for future research. At a broader level, continued efforts to examine constructs assessed cross-sectionally in multilevel frameworks will provide greater insight into within-individual/idiographic fluctuations in respective constructs (Finkelstein-Fox et al., 2020), whether that be through treatment studies with EMI components or observational EMA studies with diverse samples. For the former, incorporating EMA and/or EMI methods into clinical research trials could help researchers understand processes of change within intervention

conditions, providing clinicians with a more solidified understanding of the processes promoting positive change from a given intervention (and thus elucidating clearer intervention targets). Models incorporating idiographic analytic methods will also allow for individually tailored treatment programs. For example, in trauma- and stressor-related disorder literature, one individual may report a longitudinal trajectory of resilience that involves the experience of subclinical symptoms after experiencing a traumatic event. Another individual, however, might develop clinical levels of symptomatology after a traumatic event. A third individual might not develop symptoms until well after a traumatic event (Galatzer-Levy et al., 2018). Trajectory studies illustrate the heterogeneity in pathways and predictors of psychological functioning and are just one of many examples of individual variations in psychopathology or aspects of psychological well-being using longitudinal methods.

Overall, identifying social, environmental, and psychological factors unique to individual pathways of symptomatology or that predict fluctuations in psychological well-being or psychological difficulties will inform the flexible application of evidence-based principles and intervention protocols. Longitudinal studies allowing for assessment of such psychological differences are a step in the direction of more individualized treatments. In the present study, emotion regulation abilities and mindfulness were two daily level factors associated with daily positive affect and daily negative affect. Given that mindful emotion regulation is critical to psychological well-being and suffering (Chambers et al., 2009), understanding how these constructs vary within individuals will allow for more tailored treatments (particularly within a college context but also more broadly with future studies in clinical samples).

Relatedly, we also recommend that future research consider additional daily level strategies that could predict various aspects of emotionality. As mentioned above, use of emotion

regulation strategies assessed in the present study was limited to mindfulness due to the intensive longitudinal nature of the study. So, future studies examining daily level relationships between other components of emotion regulation (e.g., rumination, suppression, avoidance; see Blanke et al., 2020 or Brockman et al., 2017, for examples) and their relationships to positive and negative affectivity could also prove useful for designing individualized interventions.

Most importantly, like other studies with similar samples (Pavlacic et al., 2021), the sample recruited in the present study was predominantly White and female. Efforts to diversity recruitment for non-White populations within the context of research and clinical intervention are sorely needed but were not possible with the present study due to limited funding mechanisms at the time study data collection began. Future EMA/EMI efforts that target diverse, non-White samples could provide greater insight as to within-individual fluctuations for diverse individuals specifically, and whether these fluctuations and trajectories differ as a function of demographic variability (thus having divergent implications for treatment when comparing White individuals to non-White individuals).

And finally, surveys were sent only once per day for 21 days due to limited funding mechanisms. While this could be considered a strength (i.e., given the intensive longitudinal design) or a limitation (i.e., given the mundane repeated assessments that could have elicited repetitive responding or boredom), sending surveys multiple times per day utilizing a burst design would allow for a more nuanced appraisal of fluctuations within specific days as opposed to within-individual fluctuations across days. Further, more frequent EMI messages would also increase the dose of the mindfulness intervention, potentially leading to meaningful change in well-being or psychopathology. Together, these directions for future research are directly based on the results of the current study and would be justifiable expansions to the EMA/EMI literature

base, particularly for mindfulness-based interventions that can be disseminated to populations with limited access to evidence-based services.

Clinical Implications

In terms of the clinical implications and as mentioned above, within-individual fluctuations provide support for idiographic conceptual and intervention models that consider the individual context as opposed to just nomothetic principles. Said differently, application of nomothetic principles at the idiographic level will allow the field of clinical psychology to become more individualized and tailored to individuals not in the majority, and the results of the present study identify constructs that do fluctuate at the daily level. Increased daily mindfulness was related to higher positive affect, which supports the link between daily mindfulness behaviors and mood at the within-individual level.

Relatedly, the findings regarding state emotion dysregulation were also not surprising. On days when individuals were less effective at regulating emotions, they reported less positive mood and increased negative mood. Assessing and targeting daily emotion regulation strategies (e.g., mindfulness) and underlying emotion regulation abilities may be effective for promoting both positive outcomes and reduction of negative outcomes. If clinicians were to incorporate EMA/EMI methods into clinical practice, this could involve identifying days on which individuals reported more difficulty regulating emotions and discussing environmental and/or psychological factors that could have impacted these reports (thus elucidating targets for modifying contexts and implementing evidence-based procedures consistent with Cognitive-Behavioral interventions).

In terms of clinical implications of the EMI, the results suggest that EMI with a mindfulness component should ideally be delivered at a higher frequency and with a higher dose

for similar interventions to promote meaningful change. Qualitative results were mostly positive, and participants generally reported that the EMI allowed them to become more aware of emotions using Likert-type scales. Some participants indicated that they desired additional activities, which also provides support for the recommendation to lengthen and diversify the EMI for future studies (or when integrating EMI approaches into clinical interventions). Accordingly, there is promising support for the future development of technology-driven, mindfulness-based interventions with college students at higher doses, which could be used as adjuncts or standalones to traditional evidence-based treatments.

Summary Conclusion

Despite the limitations of the present study, we shed insight on the within-individual nature of behavioral constructs across time and identify within- and between-individual factors predicting fluctuations in positive and negative emotionality, in addition to factors related to the mindfulness messages that were associated with higher levels of emotional dysregulation and positive affect. We also demonstrate significant within-individual variability in constructs that researchers typically assess cross-sectionally and/or using between-individual statistical methods (i.e., aggregating individual scores using means as opposed to calculating within-individual scores). We identify next steps for designing stronger EMI interventions, consistent with extant literature demonstrating the effectiveness and efficacy of web-based and app-based programs using mindfulness techniques for ameliorating psychological distress and promoting psychological well-being. Future research should continue developing and disseminating technology-driven interventions as standalones or adjuncts to traditional in-person approaches, given the unique logistical barriers faced by college students in terms of accessing treatment.

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LIST OF APPENDICES

APPENDIX A: DEMOGRAPHICS QUESTIONNAIRE

1. With which gender do you identify?
    ____ Male
    ____ Female
    ____ Non-binary
    ____ Other (please list)

2. What is your biological sex?
    ____ Male
    ____ Female

3. Please enter your age in numbers: ____

4. With which race do you identify? Please mark all that apply.
    ____ Native American
    ____ Asian/Pacific Islander
    ____ Black/African American
    ____ White/Caucasian
    ____ Other (please list)
    ____ Prefer not to answer

5. With which ethnicity do you identify?
    ____ Hispanic/Latino(a)
    ____ Not Hispanic/Latino(a)

6. To what extent do you consider yourself a religious person?
    ____ Not religious at all
    ____ Slightly religious
    ____ Moderately religious
    ____ Very religious

7. With which religion do you identify, if any?
    ____ Buddhism
    ____ Christianity
    ____ Confucianism
    ____ Hinduism
    ____ Inter/non-denominational
    ____ Islam
    ____ Jainism
    ____ Judaism
    ____ Native American
    ____ Neo-Pagan
    ____ Scientology
    ____ Shintoism
    ____ Sikhism
    ____ Taoism

____ Zoroastrianism
____ No religion
____ Other
____ Do not wish to answer

8. To what extent do you consider yourself a spiritual person?
____ Not spiritual at all
____ Slightly spiritual
____ Moderately spiritual
____ Very spiritual

9. Identify which best represents your housing situation:
____ Dormitory
____ Greek Housing
____ Apartment/Condominium
____ House
____ Other

10. How is your housing paid for:
____ Scholarship
____ Student Loans
____ Outside Employment
____ Parents/Family
____ Other (please list)

11. Are you employed? (yes/no)
How many hours per week are you employed? ____

How stressful is this job for you?
____ Not stressful at all
____ Slightly stressful
____ Moderately stressful
____ Very stressful

How important is this job to you?
____ Not important at all
____ Slightly important
____ Moderately important
____ Very important

12. What's the highest level of education your parent(s)/guardian(s) have achieved?
____ No high school
____ Some high school
____ Graduated high school
____ Some college, but did not graduate

____ Graduated with 2-year degree or technical school
____ Graduated with 4-year degree
____ Some graduate school but no graduate degree
____ Attained Master's degree (i.e., M.A., M.S., M.B.A., etc.)
____ Attained Professional or Doctoral degree (i.e., Ph.D., J.D., M.D., etc.)

13. What is your annual income?
____ $0 - $24,999
____ $25,000 - $49,999
____ $50,000 - $74,999
____ $75,000 - $99,999
____ $100,000 - $124,999
____ $125,000 - $149,999
____ $150,000 - $174,999
____ $175,000 - $199,999
____ $200,000 or higher

14. Are you currently receiving any form of counseling or therapy for mental health problems?
____ Yes
____ No

15. Are you currently taking any type of medication for mental health problems?
____ Yes
____ No

16. Please enter your cell phone number, beginning with the area code (so that we are able to send you daily surveys for the next 21 days): _____

17. So that we can match your data throughout the study, please enter the last four digits of your phone number and the two digits of your birth month. For example, if the last four digits of your phone number were 3554 and you were born in January (01), your participant ID would be 355401: _____

APPENDIX B: DEPRESSION ANXIETY STRESS SCALES – 21

INSTRUCTIONS: Please read each statement and choose the number which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. The rating scale is as follows:

0 = Did not apply to me at all

1 = Applied to me to some degree, or some of the time

2 = Applied to me to a considerable degree, or a good part of the time

3 = Applied to me very much, or most of the time

1. I found it hard to wind down. _____

2. I was aware of dryness in my mouth. _____

3. I couldn't seem to experience any positive feeling at all. _____

4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion). _____

5. I found it difficult to work up the initiative to do things. _____

6. I tended to over-react to situations. _____

7. I experienced trembling (e.g., in the hands). _____

8. I felt that I was using a lot of nervous energy. _____

9. I was worried about situations in which I might panic and make a fool of myself. _____

10. I felt that I had nothing to look forward to. _____

11. I found myself getting agitated. _____

12. I found it difficult to relax. _____

13. I felt down-hearted and blue. _____

14. I was intolerant of anything that kept me from getting on with what I was doing. _____

15. I felt I was close to panic. _____

16. I was unable to become enthusiastic about anything. _____

17. I felt I wasn't worth much as a person. _____

18. I felt that I was rather touchy. _____

19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of

heart rate increase, heart missing a beat). _____

20. I felt scared without any good reason. _____

21. I felt that life was meaningless. _____

APPENDIX C: FIVE FACET MINDFULNESS QUESTIONNAIRE

5-FACET Mindfulness Questionnaire: Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	**rarely true**	**sometimes true**	**often true**	**very often or always true**

_____ 1. When I'm walking, I deliberately notice the sensations of my body moving.

_____ 2. I'm good at finding words to describe my feelings.

_____ 3. I criticize myself for having irrational or inappropriate emotions.

_____ 4. I perceive my feelings and emotions without having to react to them.

_____ 5. When I do things, my mind wanders off and I'm easily distracted.

_____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.

_____ 7. I can easily put my beliefs, opinions, and expectations into words.

_____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

_____ 9. I watch my feelings without getting lost in them.

_____ 10. I tell myself I shouldn't be feeling the way I'm feeling.

_____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

_____ 12. It's hard for me to find the words to describe what I'm thinking.

_____ 13. I am easily distracted.

_____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

_____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.

_____ 16. I have trouble thinking of the right words to express how I feel about things

_____ 17. I make judgments about whether my thoughts are good or bad.

_____ 18. I find it difficult to stay focused on what's happening in the present.

_____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.

_____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

_____ 21. In difficult situations, I can pause without immediately reacting.

_____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

_____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.

_____24. When I have distressing thoughts or images, I feel calm soon after.

_____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.

_____ 26. I notice the smells and aromas of things.

_____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 28. I rush through activities without being really attentive to them.

_____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.

_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

_____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

_____ 32. My natural tendency is to put my experiences into words.

_____ 33. When I have distressing thoughts or images, I just notice them and let them go.

_____ 34. I do jobs or tasks automatically without being aware of what I'm doing.

_____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

_____ 36. I pay attention to how my emotions affect my thoughts and behavior.

_____ 37. I can usually describe how I feel at the moment in considerable detail.

_____ 38. I find myself doing things without paying attention.

_____ 39. I disapprove of myself when I have irrational ideas.

APPENDIX D: DIFFICULTIES IN EMOTION REGULATION SCALE

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item:

1	**2**	**3**	**4**	**5**
Almost never (0-10%)	Sometimes (11-35%)	About half the time (36-65%)	Most of the time (66-90%)	Almost always (91-100%)

1) I am clear about my feelings.
2) I pay attention to how I feel.
3) I experience my emotions as overwhelming and out of control.
4) I have no idea how I am feeling.
5) I have difficulty making sense out of my feelings.
6) I am attentive to my feelings.
7) I know exactly how I am feeling.
8) I care about what I am feeling.
9) I am confused about how I feel.
10) When I'm upset, I acknowledge my emotions.
11) When I'm upset, I become angry with myself for feeling that way.
12) When I'm upset, I become embarrassed for feeling that way.
13) When I'm upset, I have difficulty getting work done.
14) When I'm upset, I become out of control.
15) When I'm upset, I believe that I will remain that way for a long time.
16) When I'm upset, I believe that I'll end up feeling very depressed.
17) When I'm upset, I believe that my feelings are valid and important.
18) When I'm upset, I have difficulty focusing on other things.
19) When I'm upset, I feel out of control.
20) When I'm upset, I can still get things done.
21) When I'm upset, I feel ashamed with myself for feeling that way.
22) When I'm upset, I know that I can find a way to eventually feel better.
23) When I'm upset, I feel like I am weak.
24) When I'm upset, I feel like I can remain in control of my behaviors
25) When I'm upset, I feel guilty for feeling that way.
26) When I'm upset, I have difficulty concentrating.
27) When I'm upset, I have difficulty controlling my behaviors.
28) When I'm upset, I believe that there is nothing I can do to make myself feel better.
29) When I'm upset, I become irritated with myself for feeling that way.
30) When I'm upset, I start to feel very bad about myself.
31) When I'm upset, I believe that wallowing in it is all I can do.
32) When I'm upset, I lose control over my behaviors.
33) When I'm upset, I have difficulty thinking about anything else.
34) When I'm upset, I take time to figure out what I'm really feeling.
35) When I'm upset, it takes me a long time to feel better.
36) When I'm upset, my emotions feel overwhelming.

APPENDIX E: MEANING IN LIFE QUESTIONNAIRE

Please take a moment to think about what makes your life feel important to you. Please respond to the following statements as truthfully and accurately as you can, and also please remember that these are very subjective questions and that there are no right or wrong answers. Please answer according to the scale below:

1	2	3	4	5	6	7
Absolutely untrue	Mostly untrue	Somewhat untrue	Can't say true or false	Somewhat true	Mostly true	Absolutely true

1. _____I understand my life's meaning.
2. _____I am looking for something that makes my life feel meaningful.
3. _____I am always looking to find my life's purpose.
4. _____My life has a clear sense of purpose.
5. _____I have a good sense of what makes my life meaningful.
6. _____I have discovered a satisfying life purpose.
7. _____I am always searching for something that makes my life feel significant.
8. _____I am seeking a purpose or mission for my life.
9. _____My life has no clear purpose.
10. _____I am searching for meaning in my life.

APPENDIX F: LEVEL OF ENGAGEMENT AND LIKEABILITY

1. How often did you use the information provided in the text messages in your daily life throughout the course of the study?

a. Never
b. Seldom
c. About half the time
d. Usually
e. Always

2. Was the number of mindfulness activities:

a. Too many
b. About right
c. Not enough

3. Because of the text messages, how often would you say that you were more aware of thoughts, feelings, and behaviors?

a. Definitely yes
b. Probably yes
c. Probably not
d. Definitely not

4. How likely would you be to recommend learned mindfulness skills to a friend

a. Extremely likely
b. Likely
c. Neutral
d. Unlikely
e. Extremely unlikely

5. What other feedback do you have on the text messages or survey in general?

APPENDIX G: POSITIVE AND NEGATIVE AFFECT SCALE

Instructions: This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate to what extent you feel this way right now, that is, at the present moment.

Interested
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Distressed
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Excited
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Upset
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Strong
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Guilty
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Scared
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Hostile
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Enthusiastic
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Proud
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Irritable
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Alert
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Ashamed
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Inspired
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Nervous
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Determined
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Attentive
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Jittery
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Active
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

Afraid
1 - Very slightly or not at all
2 - A little
3 - Moderately
4 - Quite a bit
5 - Extremely

APPENDIX H: STATE DIFFICULTIES IN EMOTION REGULATION SCALE

Please read each statement and indicate how much it applies to **YOUR EMOTIONS RIGHT NOW.**

1	2	3	4	5
Not at all	Somewhat	Moderately	Very much	Completely

1. I feel guilty for feeling this way.
2. I am paying attention to how I feel.
3. I feel out of control.
4. I am embarrassed for feeling this way.
5. I am feeling very bad about myself.
6. I am acknowledging my emotions.
7. I have no idea how I am feeling.
8. I feel ashamed with myself for feeling this way.
9. I am having difficulty doing the things I need to do right now.
10. I believe that I will continue feeling this way for a long time.
11. I care about what I am feeling.
12. I am angry with myself for feeling this way.
13. I am having difficulty controlling my behaviors.
14. I am confused about how I feel.
15. I believe that I am going to end up feeling very depressed.
16. I am taking time to figure out what I am really feeling.
17. My emotions are out of control.
18. I am irritated with myself for feeling this way.
19. I believe that my feelings are valid and important.
20. I feel like I'm a weak person for feeling this way.
21. My emotions feel overwhelming.

APPENDIX I: DAILY MINDFULNESS SCALE

Please rate the extent to which each of these questions was true for you over the past day since you completed the last survey:

1- almost always
2- often
3- sometimes
4- seldom
5- never
6- almost never

1. I found myself preoccupied with the future or the past.
2. I found myself doing things without paying attention.
3. I accepted my feelings, thoughts, and bodily sensations without judging or trying to change them.

LIST OF TABLES

Table 1.

Baseline Correlations of the DASS-21 (Depression, Anxiety, Stress), FFMQ (Mindfulness), DERS (Emotion Dysregulation), and MLQ-Presence (Meaning) Subscale

Variable		1	2	3	4	5	6
1. Depression	Pearson's r	—					
	p-value	—					
2. Anxiety	Pearson's r	0.548	—				
	p-value	< .001	—				
3. Stress	Pearson's r	0.591	0.614	—			
	p-value	< .001	< .001	—			
4. Mindfulness	Pearson's r	-0.469	-0.354	-0.497	—		
	p-value	< .001	< .001	< .001	—		
5. Regulation	Pearson's r	0.533	0.425	0.551	-0.734	—	
	p-value	< .001	< .001	< .001	< .001	—	
6. Meaning	Pearson's r	-0.502	-0.290	-0.305	0.435	-0.376	—
	p-value	< .001	< .001	< .001	< .001	< .001	—

Table 2.

Follow-Up Correlations of the DASS-21 (Depression, Anxiety, Stress), FFMQ (Mindfulness), DERS (Emotion Dysregulation), and MLQ-Presence (Meaning) Subscale

Variable		1	2	3	4	5	6
1. Depression	Pearson's r	—					
	p-value	—					
2. Anxiety	Pearson's r	0.630	—				
	p-value	< .001	—				
3. Stress	Pearson's r	0.706	0.617	—			
	p-value	< .001	< .001	—			
4. Mindfulness	Pearson's r	-0.440	-0.424	-0.412	—		
	p-value	< .001	< .001	< .001	—		
5. Regulation	Pearson's r	0.584	0.559	0.509	-0.734	—	
	p-value	< .001	< .001	< .001	< .001	—	
6. Meaning	Pearson's r	-0.468	-0.363	-0.270	0.446	-0.468	—
	p-value	< .001	< .001	< .001	< .001	< .001	—

Table 3.

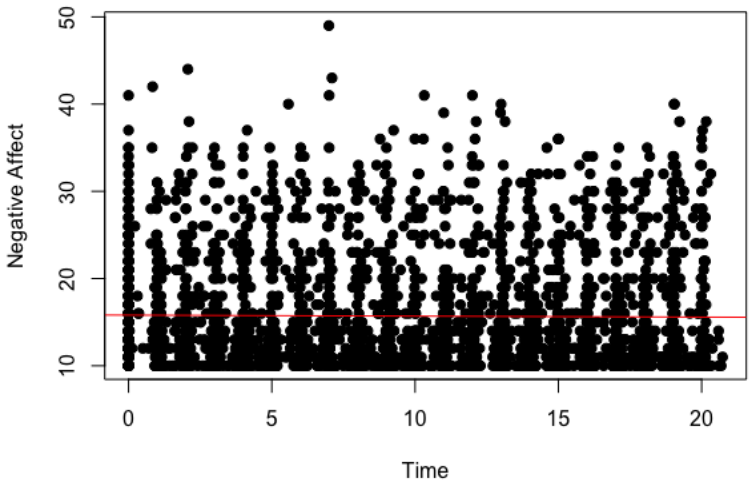
Multilevel Models for Predictors of Positive Affect and Negative Affect

		Outcome: Positive Affect					Outcome: Negative Affect				
Predictor		*b*	*SE*	*df*	*t*	*p*	*b*	*SE*	*df*	*t*	*p*
Intercept		**26.14**	**5.46**	**2648**	**4.79**	**< .001**	**-5.47**	**2.25**	**2648**	**-2.43**	**.02**
Cubic Time		**< 0.01**	**< 0.01**	**2648**	**-4.46**	**< .001**	< 0.01	< 0.01	2648	0.72	.47
Negative Affect & Positive Affect	**Between**	**0.84**	**0.18**	**156**	**4.64**	**< .001**	**0.14**	**0.03**	**156**	**4.78**	**< .001**
	Within	0.02	0.03	2648	0.61	.54	0.01	0.01	2648	0.60	.55
Emotion Dysregulation	**Between**	**-0.48**	**0.10**	**156**	**-4.75**	**< .001**	**0.44**	**0.03**	**156**	**17.11**	**< .001**
	Within	**-0.28**	**0.02**	**2648**	**-14.50**	**< .001**	**0.35**	**0.01**	**2648**	**31.32**	**< .001**
Mindfulness	Between	0.42	0.32	156	1.30	.20	0.05	0.13	156	0.38	.71
	Within	**0.14**	**0.07**	**2648**	**2.13**	**.03**	-0.04	0.04	2648	-0.97	.33

Note: For models with positive affect as the outcome, between- and within-person negative affect were predictors and vice versa for negative affect. Bold text indicates significant findings.

Figure 1

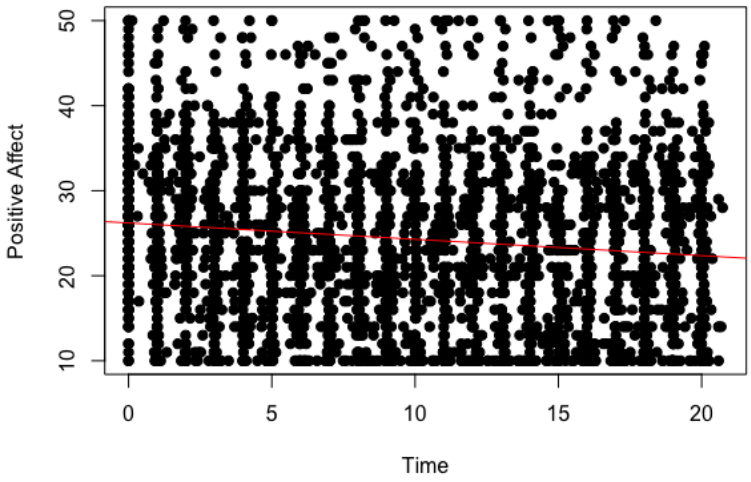
Raw data for daily negative affect



Note. The red line represents the line of best fit.

Figure 2

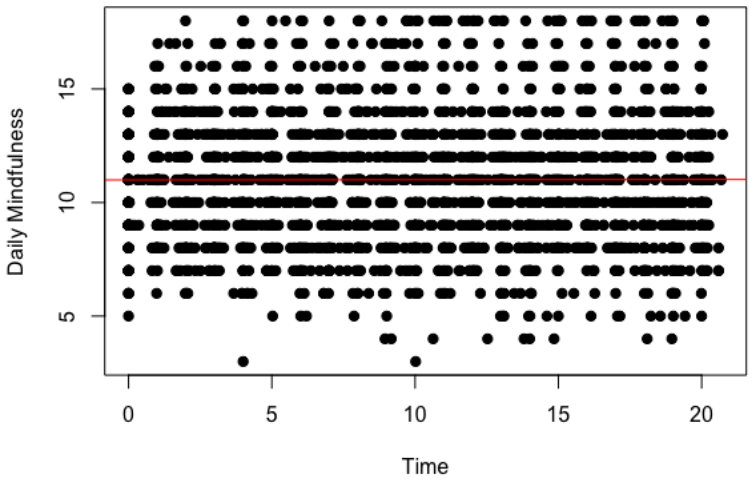
Raw data for daily positive affect



Note. The red line represents the line of best fit.

Figure 3

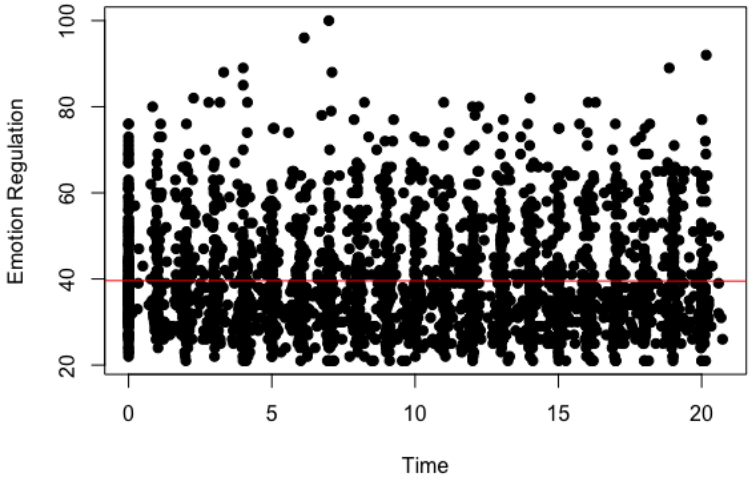
Raw data for daily mindfulness



Note. The red line represents the line of best fit.

Figure 4

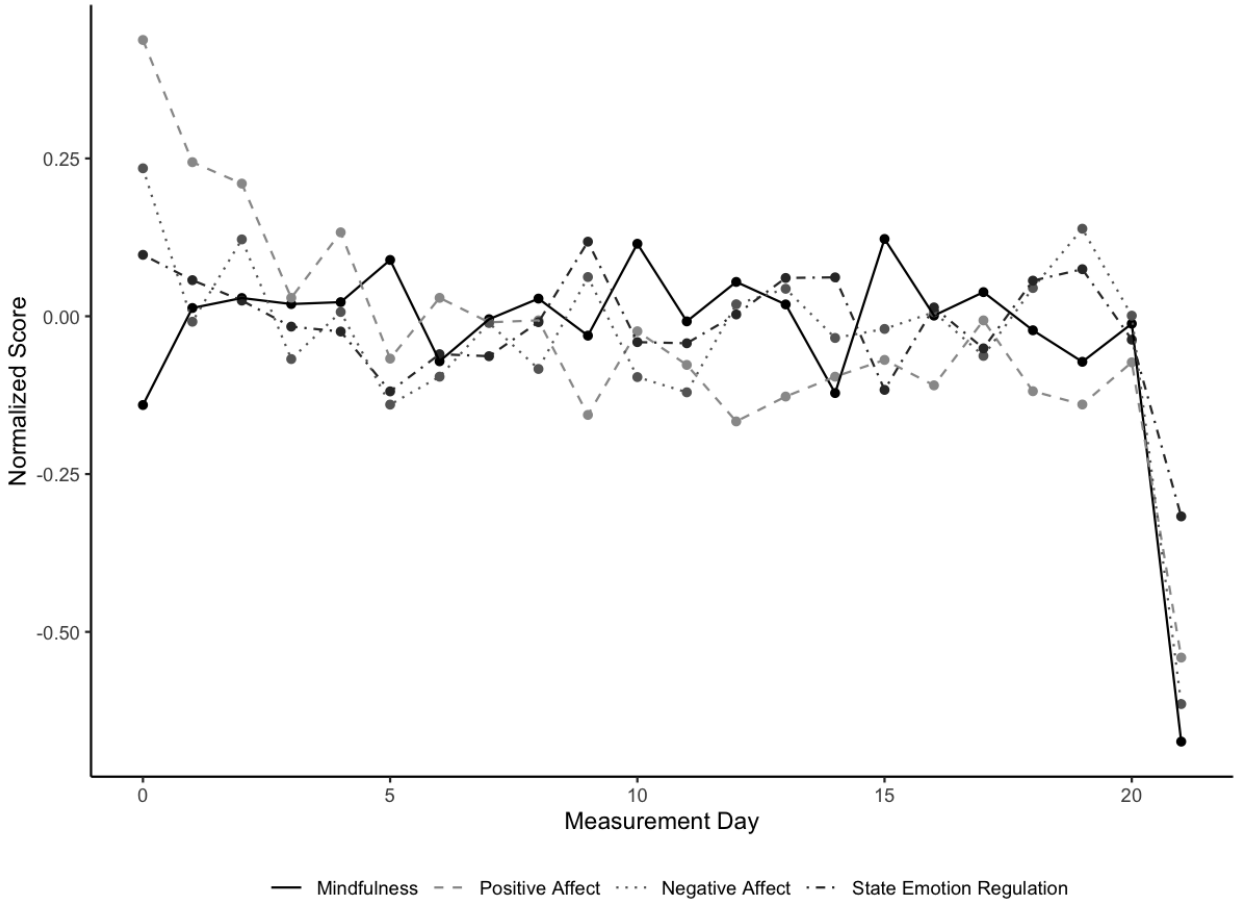
Raw data for daily state emotion regulation



Note. The red line represents the line of best fit.

Figure 5

Variability across days for respective outcomes



Note. These scores are *z*-scored over the study period (mean is 0). Negative *z*-scores are indicative of lower-than-average scores, while positive *z*-scores indicate higher-than-average scores. A few participants completed surveys on 22 days instead of 21, thus explaining the stark deviation reflected at the end of the study (i.e., the sample on this day was considerably smaller than previous days).

Figure 6

Participant flow

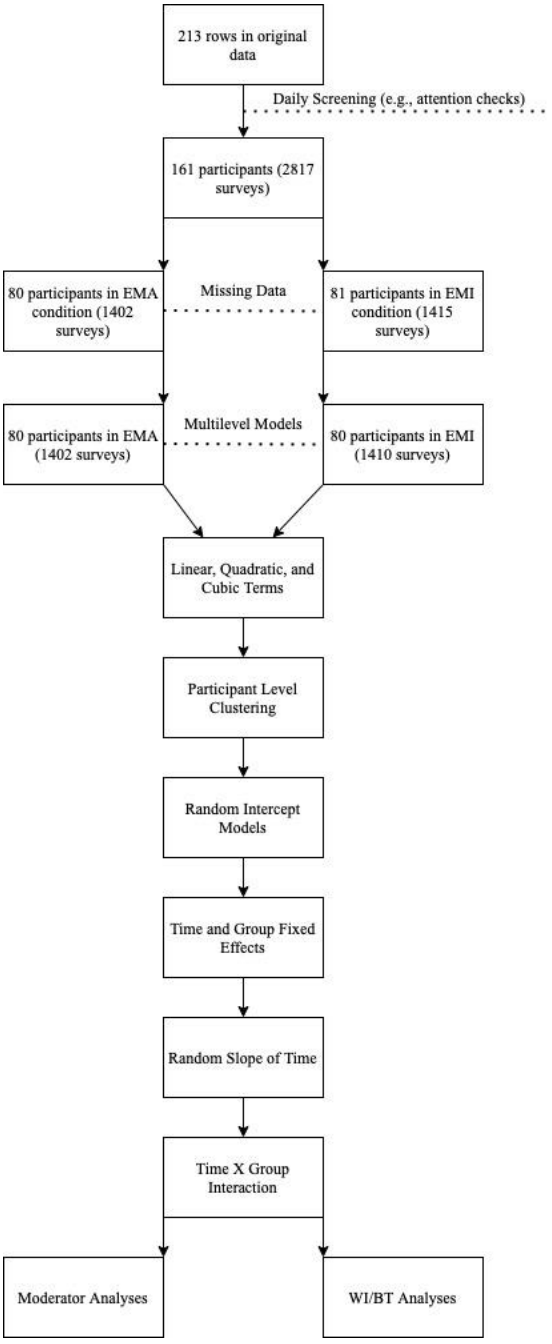
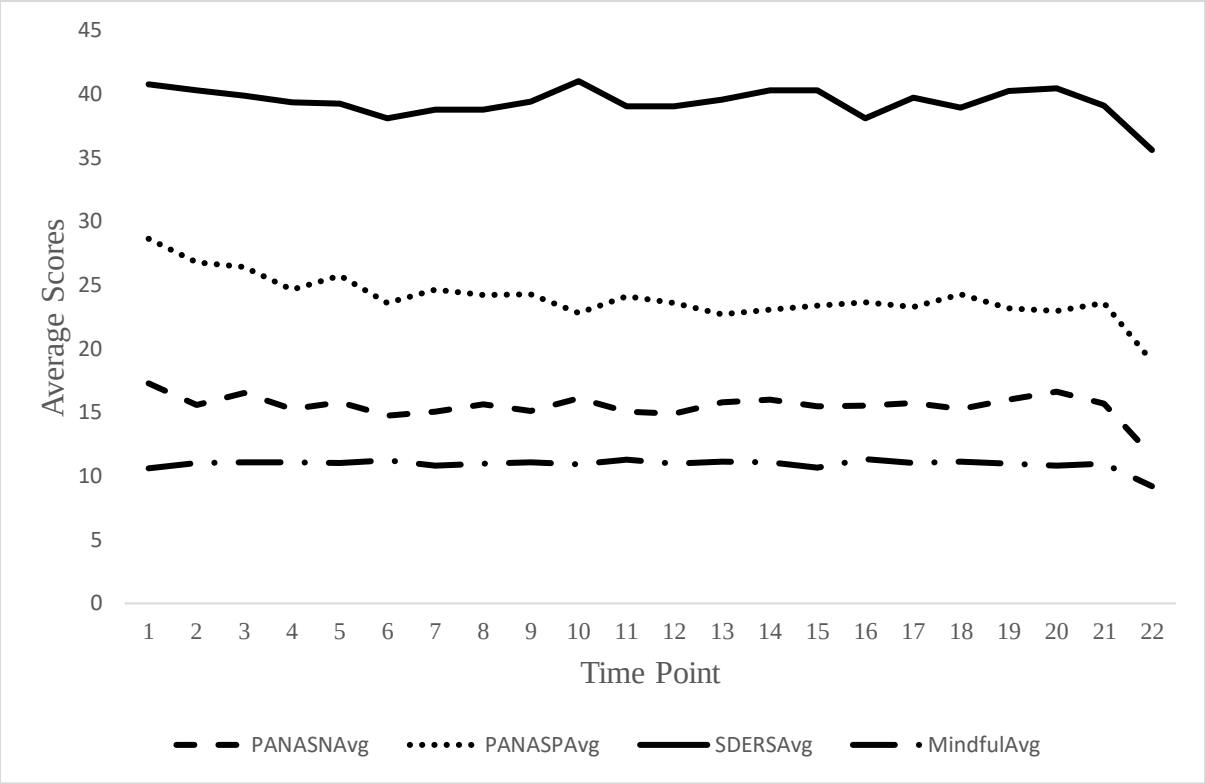


Figure 7

Non-centered, raw averages for negative affect, positive affect, emotion regulation, and mindfulness



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Education

2017-present	**Doctor of Philosophy, Clinical Psychology (expected August 2023)** University of Mississippi; University, Mississippi (APA Accredited) Dissertation: *Assessing the effectiveness and utility of a mindfulness-based ecological momentary intervention in college students* (Defended February 2022) Chair: Stefan Schulenberg, Ph.D.
2017-2019	**Master of Arts, Clinical Psychology** University of Mississippi; University, Mississippi (APA Accredited) Thesis: *Meaning, purpose, and experiential avoidance as predictors of valued behavior: An application of ecological momentary assessment* Chair: Stefan Schulenberg, Ph.D.
2013-2017	**Bachelor of Science, Psychology, Summa Cum Laude** Missouri State University; Springfield, Missouri Honors Thesis: *The effects of expressive writing on risky health behaviors, avoidance, and valued living* Chair: Ann Rost, Ph.D.

Peer-Reviewed Publications

16. Bago, B., Kovacs, M., Protzko, J., Nagy, T., Kekecs, Z., Palfi, B., Adamkovič, M., Adamus, S., Albalooshi, S., Albayrak-Aydemir, N., Alper, S., Álvarez Solas, S., Alves, S., Amaya, S., Andresen, P., Anjum, G., Ansari, D., Arriaga, P., Aruta, J. J. B.,…**Pavlacic, J. M.**…Aczel, B. (in press). Situational factors shape moral judgments in the trolley dilemma in Eastern, Southern, and Western countries in a culturally diverse sample. *Nature Human Behaviour.*
15. **Pavlacic, J. M.,** Buchanan, E. M., McCaslin, S. E., Schulenberg, S. E., & Young, J. (in press). A systematic review of posttraumatic stress and resilience trajectories: Identifying predictors for future treatment of Veterans and service members. *Professional Psychology: Research and Practice.*
14. **Pavlacic, J. M.,** Kellum, K. K., & Schulenberg, S. E. (2021). Advocating for the use of

restorative justice practices: Examining the overlap between restorative justice and behavior analysis. *Behavior Analysis in Practice.* Advance online publication. https://doi.org/10.1007/s40617-021-00632-1

13. Tkachuck, M. A., **Pavlacic, J. M.,** Raley, M. J., McCaslin, S. E., & Schulenberg, S. E. (2021). Validating military culture: The factor analysis of a military-related adaptation of acculturation in Veterans. *Psychological Services.* Advance online publication. https://doi.org/10.1037/ser0000558
12. Wang, K., Goldenberg, A., Dorison, C. A., Miller, J. K., Uusberg, A., Lerner, J. S., Gross, J. J., Agesin, B. B., Bernardo, M., Campos, O., Eduave, L., Grzech, K., Ozery, D. H., Jackson, E. A., Luis Garcia, E. O., Drexler, S. M., Jurković, A. P., Rana, K., Wilson, J. P.,…**Pavlacic, J. M.**…Moshontz, H. (2021). A multi-country test of brief reappraisal interventions on emotions during the COVID-19 pandemic. *Nature Human Behaviour.* Advance online publication. https://doi.org/10.1038/s41562-021-01173-x
11. Buchanan, E. M., Valentine, K. D., & **Pavlacic, J. M.** (2021). Hypothesize once, plan twice. *Academia Letters, 1274*. https://doi.org/10.20935/AL1274
10. **Pavlacic, J. M.,** Schulenberg, S. E., & Buchanan, E. M. (2021). Experiential avoidance and meaning in life as predictors of valued living: A daily diary study. *Journal of Prevention and Health Promotion, 2*(1), 135-139. https://doi.org/10.1177/2632077021998261
9. **Pavlacic, J. M.,** Schulenberg, S. E., Pan, C., Payne, T. J., Williams, D. C., & Mann, J. R. (2021). Psychological correlates of smoker's identity in adults reporting mental health diagnoses. *Journal of Substance Use*, *26*(5), 558-565. https://doi.org/10.1080/14659891.2020.1862324
8. **Pavlacic, J. M.,** & Young, J. (2020). Process-Based Cognitive Behavioral Therapy: A framework for conceptualization and treatment. *Clinical Case Studies*, *19*(6), 456-472. https://doi.org/10.1177/1534650120951858
7. **Pavlacic, J. M.,** Dixon, L. J., Schulenberg, S. E., & Buchanan, E. M. (2020). Examining daily-level associations between nightly alcohol use and next-day valued living in college students. *Journal of American College Health.* Advance online publication. https://doi.org/10.1080/07448481.2020.1785473
6. Boullion, G. Q., **Pavlacic, J. M.,** Schulenberg, S. E., Steger, M. F., & Buchanan, E. M. (2020). Meaning, social support, and resilience predict posttraumatic growth among survivors of the August 2016 Louisiana flooding. *American Journal of Orthopsychiatry*, *90*(5), 578-585. https://doi.org/10.1037/ort0000464
5. Finkelstein-Fox, L., **Pavlacic, J. M.,** Schulenberg, S. E., Buchanan, E. M., & Park, C. L. (2020). Valued living in daily experiences: Relations with meaning, mindfulness, psychological flexibility, and stressors. *Cognitive Therapy and Research*, *44*, 300-310. https://doi.org/10.1007/s10608-019-10062-7
4. Weber, M. C., **Pavlacic, J. M.,** Gawlik, E. A., Schulenberg, S. E., & Buchanan, E. M. (2020). Modeling resilience, meaning in life, posttraumatic growth, and disaster preparedness with two samples of tornado survivors. *Traumatology*, *26*(3), 266-277. https://doi.org/10.1037/trm0000210
3. **Pavlacic, J. M.,** Buchanan, E. M., Maxwell, N. P., Hopke, T. G., & Schulenberg, S. E. (2019). A meta-analysis of expressive writing on posttraumatic stress, posttraumatic growth, and quality of life. *Review of General Psychology*, *23*(2), 230-250. https://doi.org/10.1177/1089268019831645

2. Buchanan, E. M., Foreman, R. E., Johnson, B. N., **Pavlacic, J. M.,** Swadley, R. L., & Schulenberg, S. E. (2018). Does the delivery matter? Examining randomization at the item level. *Behaviormetrika, 45*(2), 295-316. https://doi.org/10.1007/s41237-018-0055-y
1. **Pavlacic, J. M.,** Harvey, S., Culp, M., Cathey, C. L., & Buchanan, E. M. (2018). A historical perspective of undergraduate learning assistants at Missouri State University. *Modern Psychological Studies, 23*(2), 1-18.

Manuscripts Under Review

2. **Pavlacic, J. M.,** Weber, M. C., Torres, V. A., Ho, L. Y., Buchanan, E. M., & Schulenberg, S. E. (2021). *Discrimination, meaning, self-efficacy, and social support predict trajectories of peri-pandemic growth and resilience for marginalized university students.* [Manuscript submitted for publication]. Department of Psychology, University of Mississippi.
1. Legate, N., Nguyen, T. T., Weinstein, N., Moller, A. C., Legault, L., Maniaci, M. R., Ebersole, C. R., Adamkovič, M., Adetula, G. A., Agesin, B. B., Ahlgren, L., Akkas, H., Almeida, I. A. T., Anjum, G., Antoniadi, M., Arinze, A. I., Arvanitis, A., Rana, K., Badalyan, V.,…**Pavlacic, J. M.**…Žuro, B. (2021). *A global experiment on motivating social distancing during the COVID-19 pandemic* [Manuscript submitted for publication and invited for resubmission with revisions]. Department of Psychology, Illinois Institute of Technology.

Manuscripts In Preparation

3. **Pavlacic, J. M.,** Schulenberg, S. E., Witcraft, S. M., & Buchanan, E. M. *Assessing the effectiveness and utility of a mindfulness-based ecological momentary intervention in college students.* Department of Psychology, University of Mississippi
2. Weber, M. C., **Pavlacic, J. M.,** Ho, L. Y., Torres, V. A., Buchanan, E. M., & Schulenberg, S. E. *Collective and self-efficacy facilitate disaster and pandemic preparedness or mitigation behaviors, but fear does not.* Department of Psychology, University of Mississippi.
1. Buchanan, E. M., Lewis, S., Paris, B., Forscher, P., **Pavlacic, J. M.,** & Bashears, J. *PSACR: The psychological science accelerator's COVID-19 rapid-response dataset*. Harrisburg University of Science and Technology.

Book Chapters

2. Liberto, A. K., **Pavlacic, J. M.,** & Schulenberg, S. E. (2018). The Great Atlanta Fire (1917). In D. H. McElreath, D. A. Doss, R. Nations, J. M. Van Slyke, C. J. Jensen, B. R. Russo, R. C. Tesiero, S. E. Schulenberg, L. S. McElreath, A. Wellman, & A. M. Lindsley (Eds.), *Disasters that shaped emergency management: Case studies for the homeland security/emergency management professional* (pp. 135-140). Kendall Hunt.
1. **Pavlacic, J. M.,** Gawlik, E. A., & Schulenberg, S. E. (2018). The 1995 Chicago Heat Wave. In D. H. McElreath, D. A. Doss, R. Nations, J. M. Van Slyke, C. J. Jensen, B. R. Russo, R. C. Tesiero, S. E. Schulenberg, L. S. McElreath, A. Wellman, & A. M. Lindsley (Eds.), *Disasters that shaped emergency management: Case studies for the homeland security/emergency management professional* (pp. 53-59). Kendall Hunt.

Grant/Research Funding Experience

2022-present **Misophonia Research Fund Grant**
Role: Protocol Assessor
Title: Advancing the characterization and assessment of Misophonia through laboratory and populations-based research
Direct Costs: $399986 (project ongoing)

2019-present **Disaster Resilience Flagship Constellation**
University of Mississippi
Role: Graduate Research Assistant
Title: Researching the effectiveness of a community-based psychological first aid model at the University of Mississippi
Direct Costs: $9000 (project ongoing)

2020-2021 **Natural Hazards Center/National Science Foundation Quick Response Grant**
National Science Foundation Award #1635593
University of Colorado Boulder/National Science Foundation
Role: Co-Principal Investigator
Title: Trajectories of international student psychological functioning and pandemic preparedness during COVID-19
Direct Costs: $3240 (project completed)

2018 **Disaster Resilience Flagship Constellation**
University of Mississippi
Role: Graduate Research Assistant
Title: Building self-efficacy and collective efficacy, and accurate threat perception to increase individual disaster preparedness actions
Direct Costs: $10,000 (project not funded)

Symposia and Oral Presentations

8. Weber, M. C., **Pavlacic, J. M.,** Torres, V. A., Schulenberg, S. E., & Buchanan, E. M. (2021, July 15-17). *Collective efficacy and accurate threat perception facilitate pandemic preparedness and prevention efforts among international students during COVID-19* [Paper presentation]. The International Positive Psychology Association 7th World Congress on Positive Psychology.
7. **Pavlacic, J. M.,** Schulenberg, S. E., & Buchanan, E. M. (2020, November 17-22). Meaning, purpose, and experiential avoidance as predictors of valued behavior: A daily diary study. In S. C. Hayes & T. B. Kashdan (Discussant & Chair), *New research directions at the interface of values and psychopathology* [Symposium]. Association for Behavioral and Cognitive Therapies 54th Annual Convention, Philadelphia, PA, United States.
6. **Pavlacic, J. M.,** Weber, M. C., Torres, V. A., Schulenberg, S. E., & Buchanan, E. M. (2020, July 12-15). *Trajectories of psychological functioning and pandemic preparedness for*

students quarantined during the COVID-19 pandemic [Paper presentation]. Hazards Workshop and Research Meeting of the Natural Hazards Center 45th Annual Meeting.

5. **Pavlacic, J. M.,** Kellum, K. K., & Schulenberg, S. E. (2019, May 23-27). Restorative justice within the context of professional organizations; Is RJ the way? In E. K. Sandoz (Discussant), *Behavior analysis and restorative justice: Birds of a feather?* [Symposium]. Association for Behavior Analysis International 45th Annual Convention, Chicago, IL, United States.
4. Finkelstein-Fox, L., **Pavlacic, J. M.,** Schulenberg, S. E., Buchanan, E. M., & Park, C. L. (2019, May 23-26). Daily stressors and values adherence: Protective effects of coping and emotion regulation resources. In C. L. Park (Chair), *Integrating perspectives on stress processes: The overlapping and unique roles of coping and emotion regulation* [Symposium]. Association for Psychological Science 31st Annual Convention, Washington, DC, United States.
3. Weber, M. C., Gawlik, E. A., March, K. E., **Pavlacic, J. M.,** Schulenberg, S. E., & Buchanan, E. M. (2018, April 29). *Gender differences in resilience, meaning, and purpose using factor-analytic techniques and scale scores* [Paper presentation]. ResilienceCon Annual Convention, Nashville, TN, United States.
2. **Pavlacic, J. M.,** Schulenberg, S. E., Buchanan, E. M., & Boullion, G. Q. (2018, April 13). *Predicting mindfulness behaviors from values progression using ecological momentary assessment* [Paper presentation]. University of Mississippi Psychology Research Day 5th Annual Convention, Oxford, MS, United States.
1. **Pavlacic J. M.,** Culp, M., & Harvey, S. (2015, November 8). *Using undergraduate learning assistants to personalize the large class size* [Paper presentation]. Missouri Undergraduate Psychology Conference Annual Meeting, St. Louis, MO, United States.

Poster Presentations

*denotes mentored undergraduate student presenter

21. **Pavlacic, J. M.,** Schulenberg, S. E., Ramachandran, S., Bentley, J. P., Maack, D. J., & Young, J. N. (2022, November 17-20). *Meaning and purpose in life as predictors of mental health, physical health, and health anxiety* [Poster presentation submitted]. Association for Behavioral and Cognitive Therapies 56th Annual Convention, New York, NY, United States.
20. **Pavlacic, J. M.,** Schulenberg, S. E., Witcraft, S. M., & Buchanan, E. M. (2022, November 17-20). *Assessing the effectiveness and utility of a mindfulness-based ecological momentary intervention* [Poster presentation submitted]. Association for Behavioral and Cognitive Therapies 56th Annual Convention, New York, NY, United States.
19. Lucas, K. A., Hampton, H., **Pavlacic, J. M.,** & Schulenberg, S. E. (2021, April 3-5). *Role of experiential avoidance in the relationship between resilience and posttraumatic stress* [Poster presentation]. ResilienceCon Annual Convention, Nashville, TN, United States.
18. **Pavlacic, J. M.,** Weber, M. C., Torres, V. A., Buchanan, E. M., & Schulenberg, S. E. (2021, November 18-21). *Trajectories of psychological functioning in international students during the COVID-19 pandemic* [Poster presentation]. Association for Behavioral and Cognitive Therapies 55th Annual Convention, New Orleans, LA, United States.
17. Tinsley, D., **Pavlacic, J. M.,** Pruett, M., & Young, J. (2021, November 18-21). *Integrating*

telehealth services for opioid replacement patients at a local pain clinic [Poster presentation]. Association for Behavioral and Cognitive Therapies 55th Annual Convention, New Orleans, LA, United States.

16. **Pavlacic, J. M.,** Weber, M. C., Torres, V. A., Schulenberg, S. E., & Buchanan, E. M. (2021, July 15-17). *It's never too late to start being resilient: A time-series study of social support and meaning in life among international students in the U.S. during the COVID-19 pandemic* [Poster presentation]. The International Positive Psychology Association 7th World Congress on Positive Psychology.
15. **Pavlacic, J. M.,** Buchanan, E. M., McCaslin, S. E., & Schulenberg, S. E. (2020, November 17-22). *A systematic review of posttraumatic stress and resilience trajectories and covariates in Veterans and service members* [Poster presentation]. Association for Behavioral and Cognitive Therapies 54th Annual Convention, Philadelphia, PA, United States.
14. **Pavlacic, J. M.,** Dixon, L. J., & Schulenberg, S. E. (2019, November 21-24). *Examining the temporal associations between nightly alcohol use and following-day valued living: A daily diary study* [Poster presentation]. Association for Behavioral and Cognitive Therapies 53rd Annual Convention, Atlanta, GA, United States.
13. **Pavlacic, J. M.,** Buchanan, E. M., & Schulenberg, S. E. (2018, May 24-28). *A meta-analysis of expressive writing on posttraumatic stress* [Poster presentation]. Association for Behavior Analysis International 44th Annual Convention, San Diego, CA, United States.
12. *Gawlik, E. A., **Pavlacic, J. M.,** & Schulenberg, S. E. (2018, April 13). *Responding to Hurricane Harvey: A preliminary investigation into correlates of posttraumatic stress disorder symptoms* [Poster presentation]. University of Mississippi Psychology Research Day 5th Annual Convention, Oxford, MS, United States.
11. Weber, M. C., **Pavlacic, J. M.,** Schulenberg, S. E., & Buchanan, E. M. (2017, July 13-16). *Meaning, self-efficacy, and posttraumatic growth in university students: A study of tornado impact and survivor resilience* [Poster presentation]. The International Positive Psychology Association 5th World Congress on Positive Psychology, Montreal, Québec, Canada.
10. Weber, M. C., **Pavlacic, J. M.,** Schulenberg, S. E., & Buchanan, E. M. (2017, July 13-16). *Meaning, self-efficacy, and posttraumatic growth in university faculty and staff: A study of tornado impact and survivor resilience* [Poster presentation]. The International Positive Psychology Association 5th World Congress on Positive Psychology, Montreal, Québec, Canada.
9. **Pavlacic, J. M.,** Buchanan, E. M., & Rost, A. (2017, March 30-April 2). *A meta-analysis of expressive writing on quality of life and posttraumatic growth* [Poster presentation]. Southwestern Psychological Association 12th Annual Convention, San Antonio, TX, United States.
8. Harvey, S., **Pavlacic, J. M.,** & Sparks, J. (2017, March 30-April 2). *Impact of relationship priming on self-esteem and self-concept* [Poster presentation]. Southwestern Psychological Association 12th Annual Convention, San Antonio, TX, United States.
7. **Pavlacic, J. M.,** Fallone, M. D., & Rost, A. (2016, June 4). *Effects of expressive writing on psychological distress in a substance abuse population* [Poster presentation]. Missouri Psychological Association Annual Meeting, Columbia, MO, United States.
6. Chen, S., Battles, J. A., **Pavlacic, J. M.,** Stephens-Cantu, H. A., & Hudson, D. L. (2016, June 4). *The relationship between body dissatisfaction and intent to engage in dieting*

behaviors [Poster presentation]. Missouri Psychological Association Annual Meeting, Columbia, MO, United States.

5. **Pavlacic, J. M.,** Battles, J. A., Rost, A., & Fallone, M. D. (2016, April 8-10). *Effects of expressive writing on risky health behaviors, experiential avoidance, and valued living* [Poster presentation]. Southwestern Psychological Association 11th Annual Convention, Dallas, TX, United States.
4. Chen, S., Stephens-Cantu, H. A., **Pavlacic, J. M.,** Hudson, D. L., & Whisenhunt, B. L. (2016, April 8-10). *Investigation into the relationship among mood, body dissatisfaction, and weight concern* [Poster presentation]. Southwestern Psychological Association 11th Annual Convention, Dallas, TX, United States.
3. Bennett, B. L., Smith, J. M., Barnes, J. A., **Pavlacic, J. M.,** Whisenhunt, B. L., & Hudson, D. L. (2015, November 12-15). *Thin-ideal internalization as a mediator on the relationship between body-checking and body dissatisfaction* [Poster presentation]. Association for Behavioral and Cognitive Therapies 49th Annual Convention, Chicago, IL, United States.
2. Barnes, J. A., Chen, S., Logan, K., **Pavlacic, J. M.,** Hudson, D. L., & Whisenhunt, B. L. (2015, April 10-12). *Body shame predicting body image avoidance when controlling for body dissatisfaction* [Poster presentation]. Southwestern Psychological Association 10th Annual Convention, Wichita, KS, United States.
1. Bennett, B. L., Chen, S., Logan, K., **Pavlacic, J. M.,** Goldstein, C. M., Whisenhunt, B. L., & Hudson, D. L. (2015, April 10-12). *Examination of risky health behaviors as predictors of acceptance of cosmetic surgery* [Poster presentation]. Southwestern Psychological Association 10th Annual Convention, Wichita, KS, United States.

Research Positions

2017-present	**Graduate Research Assistant** Clinical-Disaster Research Center, University of Mississippi *Research Supervisor: Stefan Schulenberg, Ph.D.*
2016-present	**Graduate Research Assistant** Deciphering Outrageous Observations/Modeling Lab, Missouri State University *Research Supervisor: Erin Buchanan, Ph.D.*
2015-2017	**Undergraduate Research Assistant** ACT and Health Psychology Lab, Missouri State University *Research Supervisor: Ann Rost, Ph.D.*
2014-2017	**Undergraduate Research Assistant** Eating Disorder and Body Image Lab, Missouri State University *Research Supervisors: Danae Hudson, Ph.D., & Brooke Whisenhunt, Ph.D.*
2015-2016	**Undergraduate Research Assistant** Department of Psychology, Missouri State University *Research Supervisor: Christie Cathey, Ph.D.*

Clinical Positions

2021-present **Psychological Assessment Coordinator**
Psychological Assessment Clinic, University of Mississippi
Clinical Supervisor: Kristin Austin, Ph.D.
Overview: Conduct integrated assessments for adults. Train graduate students in assessment procedures and provide assessment didactics as needed. Serve as the initial contact for potential and scheduled assessments. Schedule, recruit, and promote clinic assessment services for integrated evaluations. Oversee administration, scoring, report writing, revisions, and feedback appointments. Peer review student-administered assessment technical protocols. Provide peer supervision as needed for graduate assessors. Coordinate with local community-based mental health service providers.

2020-present **Clinical Research Assistant**
Delta Autumn Clinical Consulting, LLC, Oxford, Mississippi
Clinical Supervisor: John Young, Ph.D.
Overview: Conduct bariatric pre-surgical evaluations and ADHD evaluations for adults. Interpret and write chronic pain assessment reports for spinal cord stimulators. Consolidate literature on clinical psychology topics (e.g., best-practice clinical supervision, Process-Based Cognitive Behavioral Therapy, binge eating disorder) for continuing education modules through the Delta Autumn Training Academy. Film role play therapy videos pertaining to cognitive-behavioral treatments for continuing education modules.

2020-present **Opioid Replacement Therapist**
Willow Pain and Wellness Clinic, Oxford, Mississippi
Clinical Supervisor: John Young, Ph.D.
Overview: Provide individual psychotherapy (i.e., Cognitive Behavioral Therapy [CBT], Acceptance and Commitment Therapy [ACT], Dialectical Behavior Therapy [DBT] skills) for adult patients undergoing opioid replacement therapy and who have co-occurring emotional problems, substance use, and chronic pain at an outpatient pain clinic. Track patient progress with evidence-based self-report measures assessing pain, substance use, sleep, and emotional difficulties.

2018-present **Graduate Therapist**
Psychological Services Center, University of Mississippi
Clinical Supervisors: Stefan Schulenberg, Ph.D., Scott Gustafson, Ph.D., ABPP, John Young, Ph.D., Danielle Maack, Ph.D., & Kristin Austin, Ph.D.
Overview: Provide individual psychotherapy (i.e., CBT, ACT, DBT skills, positive psychological interventions) primarily to adults with a wide range

of emotional difficulties. Conduct semi-structured clinical and diagnostic interviews and conceptualize cases prior to commencing therapy. Prepare patient progress notes and reports. Track patient progress with evidence-based self-report measures. Receive didactic training in various evidence-based interventions, such as CBT, ACT, DBT skills and methods, motivational interviewing, and positive psychological interventions. Supervise junior students using a tiered supervision model.

2020-2021 **Graduate Therapist**
University Counseling Center, University of Mississippi
Clinical Supervisor: Michael Hirschel, Ph.D.
Overview: Provided individual psychotherapy (CBT, ACT, DBT skills) to young adults with a wide range of emotional problems. Conducted initial intake assessments using semi-structured clinical interviews, conceptualized cases, and made diagnostic recommendations. Led mental health outreach activities.

2019-2020 **Clinical Assessment Practicum/Psychological Assessor**
Psychological Assessment Clinic, University of Mississippi
Clinical Supervisor: Scott Gustafson, Ph.D., ABPP
Overview: Conducted integrated psychological evaluations for child, adolescent, and adult community and university populations with diverse presenting problems (e.g., specific learning disorders, fitness-for-duty determinations, ADHD, emotional/behavioral difficulties). Participated in weekly supervision meetings focused on case conceptualization, report writing, and clinical assessment didactics. Provided assessment feedback to patients.

2019-2020 **Clinical Therapist/Assessment Intern**
Stonewater Adolescent Recovery Center, Oxford, Mississippi
Clinical Supervisor: Scott Gustafson, Ph.D., ABPP
Overview: Conducted integrated evaluations for adolescent and young adult males with substance use and co-occurring emotional problems at a residential facility. Provided diagnostic and evidence-based treatment recommendations to a clinical team comprised of direct care staff and a psychiatrist, clinical psychologist, social worker, and licensed therapist. Provided assessment feedback to patients and family members as needed. Led weekly DBT skills group. Designed behavioral modification plans and provided individual CBT and ACT for patients at the request of the medical director.

2018-2019 **Graduate Therapist**
The Baddour Center, Senatobia, Mississippi
Clinical Supervisor: Josh Fulwiler, Ph.D.
Overview: Provided individual psychotherapy (i.e., CBT, ACT, DBT skills) adapted for adults with intellectual disabilities and various forms of

cognitive impairment (e.g., traumatic brain injury) in a residential setting. Led social skills groups. Conducted dementia screener and tardive dyskinesia assessments. Designed and implemented behavior plans for patients.

2016 **Psychology Intern**
Cox Hospital Center for Addictions, Springfield, Missouri
Clinical Supervisor: Tressa Moyle, LCSW
Overview: Taught adult group psychoeducation sessions from an ACT model focused on values assessment and emotional barriers to valued living in a partial hospitalization and intensive outpatient program. Worked on a multidisciplinary team including substance use counselors, social workers, community support workers, case managers, nurses, psychologists, psychiatrists, and various support staff.

Teaching Positions

2020 **Lab Instructor of Record**
Research Methods in Psychology, University of Mississippi

2020 **Teaching Assistant**
Disasters and Mental Health, University of Mississippi
Instructor: Stefan Schulenberg, Ph.D.

2017 **Teaching Assistant**
Advanced Psychological Statistics, Missouri State University
Instructor: Erin Buchanan, Ph.D.

2015-2016 **Undergraduate Learning Assistant**
Introductory Psychology, Missouri State University
Instructors: Sarah McNew, Ph.D., & Ann Rost, Ph.D.

Mentoring Experience

2020-present **Peer Mentor**
Graduate Peer Mentorship Program, University of Mississippi

2017-2019 **Undergraduate Thesis Mentor**
Clinical-Disaster Research Center, University of Mississippi

Victoria Mulvey-*Active shooters on campus: Student perceptions and institutional recommendations at University of Mississippi*

Emily Gawlik-*Examining the impact of meaning and resilience on survivors' life satisfaction after Hurricane Harvey*

Relevant Workshops and Clinical Trainings

2021 **The Role of Deliberate Practice in Fine-tuning Clinical Skills**
Mississippi Psychological Association
Instructor: Danielle Maack, Ph.D.

2021 **Deliberate Practice for CBT**
American Psychological Association Division 12
Instructors: James Boswell, Ph.D., & Tony Rousmaniere, Ph.D.

2020 **Telepsychology Best Practice Series**
American Psychological Association
Instructor: Marlene Maheu, Ph.D.

2019 **Functional Analysis in Process-Based CBT**
Association for Behavioral and Cognitive Therapies
Instructors: Stefan Hofmann, Ph.D., & Steven Hayes, Ph.D.

2019 **The Summer Institute: Preparing for a Career in the Armed Forces**
Center for Deployment Psychology, Uniformed Services University
Instructors: Paula Domenici, Ph.D., & Libby Parins, Psy.D.

2019 **Making Your Job Easier-Using Applied Behavior Analysis**
The Baddour Center
Instructor: Molly Campbell Arana

2019 **Trauma-Informed Care-Understanding How the Past Can Affect Future Behavior**
The Baddour Center
Instructor: Stephen Bell, Ph.D.

2018 **Woodcock Johnson-IV Workshop**
Psychological Assessment Clinic, University of Mississippi
Instructor: Shannon Sharp, Ph.D.

Independent Ad Hoc Reviews

Clinical Case Studies
The Journal of Positive Psychology
Addictive Behaviors
Journal of Happiness Studies
Journal of Clinical Psychology
Mindfulness
Psychological Trauma: Theory, Research, Practice, and Policy
Behavior Research Methods
Military Psychology

Mentored Ad Hoc Reviews

Journal of Contemporary Psychotherapy
International Journal of Disaster Risk Reduction
PLOS One
Psychological Trauma: Theory, Research, Practice, and Policy
Psychological Reports
Professional Psychology: Research and Practice
Applied Research in Quality of Life
American Journal of Orthopsychiatry
Journal of Clinical Psychology
The Journal of Positive Psychology

Professional Student Memberships

2021-present	International Positive Psychology Association
2021-present	American Psychological Association
2020-present	Society for Military Psychology
2019-present	Association for Behavioral and Cognitive Therapies
2020-2021	Association for Contextual Behavioral Science
2017-2019	Association for Behavior Analysis International
2015-2017	Southwestern Psychological Association

Awards and Honors

2017-present	Graduate Student Travel Award
2017-present	Graduate Research Assistantship
2021	Clinical Graduate Student Research Achievement Award
2020	University of Mississippi Graduate Student Achievement Award
2016	Departmental Distinction of Honors in Psychology
2015 & 2016	Maxwell Research Award
2015	Missouri Undergraduate Psychology Conference Presentation Award

Statistical Proficiencies

Software: *R*, JASP, SPSS

Specialized Analyses: Structural Equation Modeling, Multilevel Modeling, Latent Growth Mixture Modeling

Leadership/Service Experience

2020-present	Speaker Series Committee Member (University of Mississippi)
2016-2017	Associate Editor: Journal of Undergraduate Research (Missouri State University)
2016	Student Orientation/Registration Leader (Missouri State University)
2015-2016	University Ambassador (Missouri State University)

2015	Event Coordinator (Missouri State University)
2015	Campus Visit Coordinator (Missouri State University)