ARE WE HERE YET? PILOT STUDY OF A SELF-DIRECTED WEB-BASED MINDFULNESS INTERVENTION AS AN ADJUNCT TO AN UNDERGRADUATE ACADEMIC COURSE

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Abstract

Mindfulness-based interventions have become increasingly popular in Western culture. A broad and expanding base of literature has supported the efficacy of mindfulness practice with numerous psychological and physical health conditions. Research has begun to focus on cost-effective and convenient ways to introduce these skills to undergraduate students, who often experience elevated rates of psychological difficulties.

The current research was a pilot study investigating the effect of a 12-week self-directed web-based mindfulness intervention on undergraduate students enrolled in a course on metacognition. Pre-intervention measures were completed to evaluate self-reported levels of mindfulness and psychological wellness. Students in the intervention group completed mindfulness activities (meditation, body scan, yoga, or unstructured mindfulness activities), while students in the control group engaged in the course material without additional mindfulness content. After each activity, intervention participants submitted a reflection online which detailed the activity, number of minutes spent practicing, and thoughts, feelings, or sensations which arose. Post-intervention, the same tests were re-administered in addition to questionnaires evaluating engagement.

Participants in the intervention condition reported decreased state and trait anxiety levels at post-test, while the control group reported no change in state and

anxiety and an increase in trait anxiety. When the intervention group was examined along with frequency of practice (total number of sessions), there was a significant decrease in trait anxiety, obsessive compulsive subscale scores (SCL-90) and an increase in total mindfulness (FFMQ). In contrast, total number of minutes of mindfulness practice contributed to decreased Depression and Hostility subscale scores (SCL-90).

Despite difficulties with enrollment, engagement, and attrition (reflecting general barriers in mindfulness research and practice), the current pilot contributes recommendations for ways to effectively tailor interventions to a specific population and methods to increase engagement. Doing so may allow more people to gain individually-relevant benefits from mindfulness practice while decreasing the perceived barriers.

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Introduction

Elevated rates of depression, anxiety, and general psychological distress have been consistently reported among undergraduate university students at higher levels than in the general population. For example, in October 2012, research conducted at McMaster University in Hamilton, Ontario reported that almost 90% of students were feeling "very overwhelmed": 50% with anxiety, 66% feeling very sad, and 34% reporting depression (Craggs, 2012). Despite elevated rates of distress, only 15% of undergraduate students with moderate to severe levels of depression or suicidal ideation were receiving formal treatment targeted to those symptoms (Garlow, et al., 2008). Downs and Eisenberg's (2012) investigation into psychological treatment seeking among highly distressed students identified several barriers to obtaining treatment, including: preference for dealing with stress alone, the perception of elevated stress as normal in the university population, not seeing their need as serious, and not having the time for psychological treatment. This research supports the development and implementation of interventions that are both easily accessible and time-sensitive, to address the needs of students experiencing high rates of stress and psychological distress.

Elevated rates of mental health concerns in undergraduate students typically occur during the periods of late adolescence and early adulthood. During this time, individuals ideally learn psychologically-adaptive coping strategies (such as assertiveness, effective communication, self-soothing, and goal-setting) to manage emotional regulation, tolerance of distress, and maximize interpersonal effectiveness. However,

heightened distress and psychological illness may negatively impact this skill development, particularly if individuals employ maladaptive skills such as avoidance, substance misuse, or self-harm behaviours. Mindfulness skills may assist with developing adaptive coping strategies and may serve as a protective strategy to help students address the heightened levels of stress they are likely to encounter during their undergraduate studies.

North Americans are suffering from high rates of chronic disease including mental illness, diabetes, hypertension, stroke, and asthma (Hoffman, Rice, & Sung, 1996; Mayer, Craske, & Naliboff, 2001; Johnston-Brooks, Lewis, Evans, & Whalen, 1998; Wolkowitz, Epel, & Reus, 2001). Many mental health and chronic disease states are aggravated by stress and often do not optimally respond to traditional primary, secondary, or tertiary health care interventions as mortal disease states (West, Otte, Geher, Johnson, & Mohr, 2004). Developing and evaluating early interventions designed to mitigate high stress levels may in turn help prevent the development of mental health disorders and/or chronic illness. Specifically, the above findings suggest a need to provide undergraduate students with cost-effective, accessible, and time-efficient strategies which have been shown to decrease stress, anxiety, and depression while increasing psychological wellness. Furthermore, there is a need to explore and address student-specific barriers to help-seeking. Addressing stress and coping at an early age may have long-standing benefits in mitigating the onset of chronic stress-related illness (e.g., both physical and psychological) as students enter adulthood.

The current research study examined a self-directed web-based mindfulness skills pilot program designed to enhance student wellness while decreasing perceived barriers to help-seeking, specifically by integrating the program into an existing course while offering the material in a convenient web-based and self-directed format. The program was offered as a complement to a 12-week undergraduate course on metacognition. The research employed a quasi-experimental repeated measures design (i.e., pre- and post-test), with a parallel control cohort (i.e., a concurrently offered course section which did not receive the mindfulness intervention). A battery of psychometric measures was administered to examine the effect of the mindfulness intervention on psychological wellness.

The following literature review will provide a brief history of mindfulness interventions within the context of Western culture as applied to undergraduate students, particularly in a web-based format. An overview of the foundation, practice, and definition of mindfulness will be presented along with the proliferation of research over time. Challenges in defining the construct of mindfulness and its mechanisms will be discussed, as well as research findings on the physical and psychological benefits of mindfulness. The mindfulness literature that examines web-based interventions with undergraduate participants will be described in greater detail. Short-comings of the current literature will be highlighted, especially those which the current study sought to address, including: gender bias, attrition, and measurement of practice quantity.

Contemporary Definitions of Mindfulness

In the current research literature, the most commonly cited definition of mindfulness comes from Jon Kabat-Zinn: “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally”, or “bringing one's complete attention to the present experience on a moment-to-moment basis” (Kabat-Zinn, 1994). Mindfulness is conceptualized as both a state and trait characteristic, both a “way of being” in the world (trait) and an in-the-moment practice (state).

Mindfulness practice involves developing an awareness and acceptance of constantly changing internal and external experiential phenomena (Baer, 2003): the nonjudgmental noticing of thoughts, emotions, and physical sensations in the body. Mindfulness attempts to cultivate this awareness “with the aim of helping people live each moment of their lives – even the painful ones – as fully as possible” (Kabat-Zinn, 1993, p. 260). The secular (non-religious) conceptualization of mindfulness (as defined and utilized by Kabat-Zinn) often appeals to North Americans who have typically had less familiarity or exposure to Eastern religious-philosophical traditions (Christopher, Christopher, Dunnagan, & Schure, 2005). A more in-depth examination of mindfulness, considering the theoretical basis and facets, will follow later in this discussion. The next sections will address how mindfulness has evolved from a historical spiritual tradition to a clinical intervention strategy, while considering the historical roots of mindfulness, the migration of mindfulness practice to the Western hemisphere, the adaptation of

mindfulness within clinical practices, and proliferation of mindfulness in empirical research.

History of the Practice of Mindfulness

The roots of mindfulness practice have been traced to traditional Zen Buddhist philosophy, encompassed by the term *sati*, defined as "to let what one knows slip away from one's mind. Its function is not to be distracted." (Rahula & Boin-Webb, 2001). More specifically, "the word *sati* derives from a root meaning 'to remember'; however, as a mental factor it signifies presence of the mind, attentiveness to the present, rather than the faculty of memory regarding the past. It has the characteristic of not wobbling, not floating away from the object. Its function is absence of confusion or non-forgetfulness. It is manifested as guardianship, or the state of confronting an objective field. Its proximate cause is the strong perception or the four foundations of mindfulness." (Bodhi, 2003). This early conceptualization of mindfulness is best summarized as "attention" or "awareness."

The Buddhist text *Satipatthana Sutta* prescribes that one practices mindfulness by going into the forest, sitting beneath a tree, and simply taking notice of the breath - "if the breath is long, to notice the breath is long, and if the breath is short, to notice the breath is short" (Nikaya, 118.2). Further description of mindfulness practice noted an increased sensitivity to the body and mental processes, training the mind to focus on inconstancy, dispassion, cessation, and relinquishment, and in steadying, satisfying, or releasing the mind. The text also introduced basic breath exercises (*anapanasati*), such

as counting the length of inhales and exhales and/or modifying the point of focus (e.g., attention to the spot beneath the nose or the rise and fall of the chest or stomach). Walking meditation and throat-singing have also been identified as mindfulness practices within contemporary Buddhism.

Mindfulness in Western Culture

While mindfulness meditation is rooted in ancient Zen Buddhist philosophy, it has only gained widespread popularity in the West over the past three decades. The increase in chronic disease and limited effectiveness of traditional health care models in addressing chronic stress-based physical and mental disorders has led to the growth of *complementary* or *alternative* medicine approaches (which often include yoga and meditation) to mitigate the demands of modern life in Western culture.

In North America, mindfulness was popularized by Jon Kabat-Zinn as a clinical intervention for the management of chronic pain and associated stress (Kabat-Zinn, 1982). In its Western incarnation, mindfulness strategies were adopted in the absence of religious affiliation. Kabat-Zinn has been practicing Mindfulness and developing Mindfulness Based Stress Reduction (MBSR) programs since the 1970s. He initially applied mindfulness as a clinical intervention at the Stress Reduction Clinic at the University of Massachusetts Medical Center. He named this highly-structured and manualized version of mindfulness "MBSR". Any programs which self-identify as "MBSR" should be adhering to Kabat-Zinn's protocol. When interventions identify as "MBSR-

inspired or -derived," they are no longer deemed to be adherent and subsequent claims of efficacy may be questionable unless subject to specific empirical examination.

The practice of MBSR became widely publicized throughout the early 1990s with the publication of the University of Massachusetts studies (in peer-reviewed academic journals), and the book *Full Catastrophe Living* (Kabat-Zinn, 1990). Bill Moyers' PBS special highlighting MBSR further served to heighten public and scholarly awareness of the manualized practice and growing evidence supporting its efficacy.

Empirical investigation throughout the early to mid-1990s highlighted the effectiveness of mindfulness-based interventions for individuals with chronic illness, fueling the popularity of mindfulness as a therapeutic adjunct to traditional Western interventions. Researchers in the areas of neurophysiology, endocrinology, and wellness psychology began applying mindfulness training to various populations, including: consumers of health care and mental health services with stress-mediated chronic illness such as psychological disorders (anxiety, depression, post traumatic stress disorder, and substance abuse) and physical illness (cancer, heart disease, and irritable bowel syndrome), as well as correctional populations, employees more likely to experience high stress or burnout (physicians, nurses, and social workers), and undergraduate university students.

Mindfulness-based interventions grew in mainstream popularity during the 1990s and were integrated as a major component of the so-called "third wave" of cognitive-behavioural therapies, which included MBSR (Kabat-Zinn, 1982, 1990)

alongside Acceptance and Commitment Therapy (ACT; Hayes S., 1984; Hayes, Strosahl, & Wilson, 1999), Dialectical Behaviour Therapy (DBT; Linehan, 1993), and mindfulness-based cognitive therapy (MBCT; Teasdale, Segal, & Williams, 1995). In these interventions, mindfulness is a central component to be practiced by both the therapist and client. The above interventions conceptualize mindfulness as a learned skill set which is practiced to reduce symptoms of psychopathology and increase mental and physical health and wellness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). In contrast, Kabat-Zinn and Eastern traditions (yoga, Zen Buddhism, etc.) would conceptualize mindfulness more holistically, considering it a way of being in the world as opposed to a skill set to be practiced in pursuit of a specific outcome (i.e., reduced distress).

The Practice of Mindfulness

While the application of mindfulness varies widely depending on the theoretical orientation of the practitioner, a standard MBSR program (as developed by Kabat-Zinn) typically lasts 2.5 hours weekly, over 8 weeks. It involves didactic, inductive, and experiential modes of learning which cater to diverse learning styles. Participants receive training in four basic mindfulness practices including body scan, seated and walking meditations, and hatha yoga.

The body scan requires participants to sequentially and non-judgmentally direct attention to parts of the body (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2013). A guided scan involves a gradual sweeping of attention through the body from feet to

head, focusing non-critically on sensations in body regions with periodic cues for breath awareness and noticing of emotions or thoughts. Sitting meditation involves mindful attention of the breath and other sensory perceptions and a heightened state of observational – but nonjudgmental – awareness of cognitions and stream-of-thought consciousness and distractions (Kabat-Zinn, 1990). Participants may focus on the breath, sounds in the environment, bodily sensations, or conscious stream of thoughts and emotions (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2013).

MBSR programs include walking meditation or standing meditation as another form of meditation practice; in contrast, some non-MBSR mindfulness programs have conceptualized walking meditation as a type of hatha yoga. Walking meditation typically involves a silent mantra repeated with each step (e.g., "walking left" as the left foot meets the ground and "walking right" with as the right foot makes contact). Walking meditation may involve attention to the physical sensations of walking or noticing sensory experiences in the environment (i.e., sounds, scents, textures).

Lastly, hatha yoga incorporates breathing exercises, simple stretches, and traditional postures designed to strengthen and relax the core musculoskeletal system (Kabat-Zinn, 1990). In this context "hatha" refers to physical posture (or *asana*, in the Sanskrit translation) and not a specific popularized style of physical yoga practice. "Yoga" refers to the yoking or unification of the body with the breath. Hatha yoga is considered an inherently mindful practice due to the integrated awareness of breath with physical movements – yoga does not need to be adapted from its traditional

practice to be considered “mindful”. Traditional yoga practices consider physical postures as necessary to prepare the body and mind for extended periods of seated meditation, while focusing on the breath with simple or specific breathing techniques (the Sanskrit term *pranayama*). In addition to the 2.5 hour weekly class, MBSR requires participants to practice two to four mindfulness exercises daily per week, with the aid of a CD or DVD provided by the teacher. The current study used the various types of mindfulness noted above.

The traditional MBSR program involves a “day of silence” retreat (*vipassana*) held during week six, which experimental applications are usually unable to incorporate due to practical considerations. Specifically, *vipassana* programs require a trained instructor to facilitate the silent retreat and ensure participants respect the parameters of conduct (i.e., no speaking, no access to technology, no writing, no reading). The teacher meets with participants individually during the retreat to debrief about emotional and cognitive aspects of the experience. Further, *vipassana* requires a quiet location with space for meditation. These resources may be limited in adapted versions of MBSR programming. For the reasons listed above, the day of silence was not used in the current study.

Preliminary research findings suggest that the above mindfulness activities may yield differential effects for the practitioner. Carmody and Baer (2008) reported that the amount of time spent practicing yoga, but not seated meditation within the yoga practice, was associated with increased non-judgment of internal experience. To disentangle overlap in practices, Sauer-Zalava and colleagues (2013) examined the three

practices presented separately for three weeks to undergraduate students. Participants attended three weekly one hour sessions (105 min of guided meditation and 75 min of discussion in total) for all three conditions. Each study condition was posted for a different time slot (at a similar time of day) under the same heading ("Mindfulness Study"), and participants were assigned to a condition based on the time slot they chose. Participants reported a greater increase in psychological wellness for mindful yoga than for either meditation or body scan, greater decrease in emotional regulation following yoga or meditation (but not body scan), and increased tendency toward non-evaluation after seated meditation (versus body scan). These results suggest that a mindfulness program which aims to increase mindfulness, physical well-being, and psychological well-being should incorporate both yoga and meditation (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2013). Further examination into the differential effect of component strategies within mindfulness may help clarify mechanisms by which it works, as well as contributing to a more complete understanding of the construct itself (see below for commentary).

Adaptions of MBSR

Adaptations of the traditional MBSR program typically occur for a number of reasons: programs may want a longer or shorter time period (for example, five or twelve weeks versus the traditional eight), may be delivered in different "doses" (several shorter sessions over the week, versus the traditional 2.5 hours once per week), may utilize different media (web-based versus in-person), may be adapted for specific

populations (i.e., incarcerated inmates, psychiatric inpatients), or may be delivered by clinicians or researchers with different kinds of training (i.e., they may not be certified to deliver MBSR as it is taught at UMASS medical). Early research focused primarily on traditional MBSR programs, but more recently there has been a growing body of research examining both adapted programs (MBSR that has been modified) and interventions which add mindfulness strategies to existing protocols.

Modifications often occur to allow mindfulness interventions to fit within clinical setting resources and time constraints. In particular, the standard 2.5-hour weekly session length might be decreased. A 2009 review by Carmody and Baer examined length of in-class sessions related to effect sizes for reducing psychological distress, and reported a non-significant correlation between effect size and number of in-class hours for both clinical and non-clinical populations. The authors speculated that decreasing class time may be advantageous for targeting clinical distress, or in populations where extended class participation is a barrier to practice (i.e., participants with psychotic symptoms). However, the traditional MBSR program has accrued far more empirical support, in part based on being a long-established standardized protocol amenable to research. Further investigation is needed to examine the effects of decreasing class time with varying populations (Carmody & Baer, 2009). The current study sought to contribute to the issue of practice time and effect size by measuring the frequency of practice, type of mindfulness activity, and total minutes of mindfulness practiced by each participant.

Differentiating Mindfulness from Relaxation

Relaxation techniques are commonly used as part of cognitive behaviour-based interventions and are often mistaken for mindfulness strategies. Specifically, individuals new to the practice of mindfulness may believe that relaxation is a primary goal of mindfulness. This misconception is typically addressed in an orientation to mindfulness practice.

Relaxation seeks to *replace* unpleasant or stressful physical states with the experience of calm, peace, or relaxation; in contrast, the goal of mindfulness is presence in the experience of the moment without judging that experience as inherently positive or negative. Kabat-Zinn states that, "acknowledging present-moment reality as it actually is, whether it is pleasant or unpleasant, is the first step towards transforming that reality and your relationship to it" (Kabat-Zinn, 1993, p. 261). This view aims to acknowledge and accept unpleasant experiences or emotions, which can contribute to the experience of physical and psychological distress. In mindfulness philosophy, nonjudgmental acceptance of unpleasantness helps to develop psychological flexibility, which in turn assists the individual in coping with a myriad of life experiences (physical, emotional, and social). The current research highlighted and emphasized the distinction between mindfulness and relaxation in an orientation handout to participants, weekly mindfulness newsletters, and individual feedback where relevant.

Mindfulness Research

A search of journal articles published in peer-reviewed journals on the PsycINFO portal featuring the keyword “Mindfulness” illustrates the explosive growth of research in the area: 33 studies were published between 1981-1990, 47 (1991-2000), 171 (2001-2005), 804 (2006-2010), 4,912 (2011 to 2015, and 1,570 (2016 to March 5, 2017). A search on PubMed for article titles and abstracts with the keyword “Mindfulness” revealed a similar trend over the same time periods for published articles in scholarly journals: 11 (from 1981-1990), 33 (1991-2000), 116 (2001-2005), 613 (2006-2010), 1734 (2011-2015), and 1002 (2016- March 5, 2017). These findings indicate that mindfulness – as a state of being, personality trait, practice, and therapeutic intervention - has become exceptionally popular in the social and clinical psychology and medical literature since the turn of the century, particularly within the last five years.

As the following section will illustrate, it is challenging to synthesize results across studies and difficult to replicate previous studies. This is mainly due to the difficulties inherent in attempting to operationalize the experiential concept of mindfulness. This has resulted in inconsistent definitions of mindfulness and different ways of measuring this construct across studies.

Measuring Mindfulness: Mechanisms and Facets

Mindfulness, as practiced by Buddhists and Eastern religious, philosophical, and spiritual traditions (i.e., Hinduism, Taoism, yoga, etc.), is a highly experiential phenomenon. Traditionally, little importance has been given to considering mechanisms of action, component facets, or measurement. Mindfulness is considered a way of being

that is experienced through repeated practice, as opposed to a skill set to be analyzed and measured (Kabat-Zinn, 1982). This presents a challenge for researchers wishing to study mindfulness interventions. The adoption of mindfulness by the Western world, particularly in the medical and psychological disciplines, introduced the notions of operational definition and quantitative analysis to an abstract, experiential, existential practice.

Based on Kabat-Zinn's early definition derived from Buddhist writings, mindfulness practice was thought to be synonymous with attention or awareness. As such, the first widely-used measure of mindfulness, the Mindful Attention and Awareness Scale (or MAAS, Brown & Ryan, 2003) focused on this single dimension. As the research literature on mindfulness interventions grew, researchers began to conceptualize mindfulness as being composed of distinct facets or components (see Bergomi, 2012 for a more in-depth examination of the underpinnings of mindfulness theories). Measurement scales such as the Five Facet Mindfulness Questionnaire (FFMQ, Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) were developed based on factor analysis of a collection of existing scales. The FFMQ identified five distinct facets: observing, describing, acting with awareness, non-judging of inner experiencing, and non-reactivity to inner experience.

Alternately, other researchers have conceptualized mindfulness as a holistic concept, with tightly interconnected facets which are not easily disentangled (Bergomi, 2012). The Southampton Mindfulness Questionnaire (SMQ; Chadwick, Hember, Mead,

Lilley, & Dagnan, 2008) derives from this latter theoretical framework. As discussed in the methods chapter of this dissertation, the MAAS, FFMQ, and SMQ were used in the current study to provide a balanced representation of theoretical constructs (i.e., holistic versus factor-based, unitary versus multi-faceted construct).

Across research studies, different theoretical lenses have resulted in various definitions and measures of mindfulness. The current study does not seek to re-define mindfulness, and acknowledges the difficulties inherent in measuring an experiential and abstract phenomenon which does not appear to have a consistent definition. Despite these long-standing definitional challenges, a review of studies that have evaluated the effects of mindfulness approaches show therapeutic effects across thousands of studies – that is, something about mindfulness is effective, and the current study seeks to clarify a small piece of this puzzle. The following sections will present a review of literature relevant to the current research, including the benefits of mindfulness (both physiological/neuroendocrine and psychological), with focus on undergraduate populations and web-based interventions.

Benefits of Mindfulness

Physiological and neuroendocrine benefits of mindfulness. A significant body of research has examined the benefits of physical exercise on stress (Scully, Kremer, Meade, Graham, & Dudgeon, 1998); in contrast, research on the benefits of mental exercise on stress was slower to emerge. Based on Kabat-Zinn's early experience with mindfulness and chronic illness, the foundational literature focused on the physical benefits of

mindfulness practice. Mindfulness meditation was initially introduced as a method of managing subjective distress associated with chronic disease, and benefits effecting physiological and neuroendocrine function were first noticed as side-effects.

McComb and colleagues (2004) conducted a meta-analysis of randomized controlled trials examining the effects of traditional MBSR classes on females with vascular disease (i.e., hypertension, heart disease, type I and II diabetes, and stroke) and reported overall decreased anxiety, lower resting cortisol levels, and increased ventilator efficiency (an indication of heart functioning related to decreased heart disease). Therefore, MBSR was reported to have a significant effect on reducing objective indicators of physiological stress levels (as opposed to a subjective self-report measure of perceived stress).

Similarly, Vadiraja and colleagues (2009) examined the effects of an integrative mindful yoga program on chronic illness by evaluating females with cancer undergoing radiotherapy. After a 6-week program with three weekly 1-hour group sessions, experimental participants reported a significant decrease in perceived stress, anxiety, and depression compared to participants randomly assigned to brief supportive therapy (treatment as usual – a 15-minute individual meeting every 10 days with a trained counselor). These subjective results were supported by statistically significant decreases in both morning and mean cortisol levels. Of note, previous research had reported that early cortisol regulation leads to better prognoses and increased chances of survival in cancer patients (Sephton, Sapolsky, Kraemer, & Spiegel, 2000). The above findings

support the critical role of mindfulness interventions for cancer patients, where its use can be life-prolonging.

Physical benefits have been demonstrated in emotionally-distressed medical patients following participation in MBSR programs. In a three-armed randomized control trial, participants were assigned to one of three different 12-week interventions: a moderate yoga program (90 minutes/week), an intense yoga program (2 sessions of 90 minutes/week) or a wait-list control. After 12 weeks, self-referred emotionally-distressed women reported lower perceived stress and fatigue, had lower salivary cortisol levels, and endorsed increased levels of overall well-being, energy, and pain relief compared to wait-list controls (Michalsen, et al., 2008). Researchers reported significant findings from both yoga conditions, but noted decreased adherence among participants in the intense program. This finding suggests that a higher level of intervention intensity does not necessarily translate to more robust outcome.

West and colleagues (2004) reported that undergraduate students experienced decreased stress and negative affect after participating in either an African dance or hatha yoga class compared to participants in a biology class control condition (based on a convenience sample of participants self-selected into the courses). Only the yoga students had lower cortisol levels after their class, whereas biology students showed no change, and African dance students had increased cortisol levels. Finally, only African dance students reported increased levels of positive affect, while yoga students showed no change, and biology students reported decreased positive affect levels. These results

are in line with the goals of mindfulness, which aims to increase awareness and nonjudgmental attention to experience. Thus, increased positive affect is less important than finding a stable affect or decreasing negative affect (the latter of which was not explicitly measured by researchers).

While physical exercise may lower the subjective perception of stress, yoga offers an additional mindfulness component which may increase the positive effect on the physiological stress systems in the body, while decreasing negative affect. Studies have also found that hatha yoga practice increases flexibility, strength, balance, increased immune function, and resistance to acute physical illness compared to randomly-assigned wait-list controls (Davidson et al., 2003). These results suggest that mindfulness practices in general may increase immune functioning (Davidson et al., 2003), which may also enhance psychological well-being.

Psychological benefits of mindfulness. In addition to the physical benefits outlined above, mindfulness interventions have been associated with improved psychological and emotional health in a variety of populations. A preliminary study of mindfulness meditation practice in undergraduate students reported significantly improved psychological symptoms (i.e., including levels of anxiety and depression), increased adaptivity (i.e., measured by higher domain-specific sense of control, increased acceptance, and more yielding mode of control in their lives), and higher scores on measures of spiritual experiences when compared to non-intervention controls (Astin, 1997).

Following an 8-week MBSR course, nurses were reported to have increased levels of patience, calm, and relaxation, and increased levels of self-awareness, connection to others, and better communication and relationship skills when compared to randomly-assigned wait-list controls (Cohen-Katz, Wiley, Capuano, Baker, Deitrick, & Shapiro, 2005).

In an MBSR program adapted for offenders, Samuelson and colleagues (2007) reported decreased levels of hostility and problematic behaviour, and increased self-esteem and affect compared to quasi wait-list controls (i.e., offenders who were initially delayed in starting a mindfulness program after completing pre-test questionnaires, due to administrative or practical barriers). Furthermore, the effects of the adapted program were maintained at follow-up 6 to 8 weeks later. Based on these results, the authors advocated for providing ongoing mindfulness initiatives to decrease stress levels while inmates are incarcerated and to increase coping skills immediately following release.

More robust findings were reported across measures for female offenders compared to males in the Samuelson study (2007). Research in non-forensic populations has typically reported more robust findings among female participants; however, researchers often report vastly disproportionate numbers of males and females in participant demographics. A lower proportion of male participants is often hypothesized to account for the weaker findings among males. However, the above replication among a population comprised of 71% males (n=1,050) suggested that females may generally experience more robust benefits from mindfulness meditation than males. Future

investigations may lend insight into how sex and/or gender play a role in mindfulness practice, especially as research investigates the mechanisms by which mindfulness exerts its influence.

Benefits of mindfulness have also been examined and reported among adolescent populations. A group of clinical outpatient psychiatric adolescents participated in an MBSR program for 2 hours weekly over 8 weeks (including informal and formal practices of body scan, seated meditation, walking meditation, and hatha yoga practice). Participants self-reported decreased levels of anxiety, depression, and somatization symptoms (as measured by the SCL-90-R) versus treatment-as-usual controls (Biegel, Brown, Shapiro, and Shubert, 2009). Participants also reported increased self-esteem and sleep quality. Results were so robust as to impact DSM-IV Global Assessment of Function (GAF) scores, with a significant enough increase to warrant diagnostic changes in over half of patients with pre-existing mood disorders. Such findings suggest that early mindfulness interventions may be particularly useful among adolescent populations and warrants further investigation.

In summary, Mindfulness and MBSR programs have reported positive emotional and psychological benefits across several populations of both sexes, including undergraduate students, health care workers, incarcerated offenders, and psychiatric adolescents. The following section will focus on mindfulness interventions studied among undergraduate populations.

Mindfulness with Undergraduate Populations

Given the elevated rates of stress and psychological distress found among undergraduate students, there has been a growing interest in the impact of mindfulness interventions on this population. In a recent meta-analysis, Regehr, Glancy, and Pitts (2012) analyzed 29 studies aimed at reducing stress among university students. The researchers applied rigorous inclusion criteria (i.e., requiring randomized control trial or parallel-cohort design and adequate power) and compared arts-based interventions, psycho-educational interventions, and cognitive-behavioural/mindfulness-based interventions. Results indicated that both cognitive-behavioural and mindfulness interventions had significantly more impact on symptoms of anxiety, depression, and levels of cortisol when compared to control conditions. Findings were consistent across a variety of geographical locations. The meta-analysis originally identified 63 potentially relevant studies among undergraduates; however, this number was whittled to 29 in after excluding studies without stress/anxiety as an outcome measure, those which included a pharmacological intervention, and those with insufficient data for analysis. While mindfulness has gained popularity in empirical research, mindfulness among undergraduates remains understudied (i.e., compared to other populations) and the literature often suffers from methodological limitations.

Regehr and colleagues (2012) identified the STAI (State Trait Anxiety Inventory; Spielburger, 1983) and the PSS (Perceived Stress Scale; Cohen et al., 1981) as the most frequently used and psychometrically-sound outcome measures of stress and anxiety

across existing research with undergraduate students. Both were used in the present study to facilitate comparison with results of previous studies.

More recently, Bergen-Cico, Possemato, and Cheon (2013) examined the effect of a 5-week MBSR program integrated into an undergraduate academic course. Despite reporting encouraging results (i.e., at a trend level), researchers concluded that 5 weeks was insufficient time to produce robust results. The authors hypothesized that short-term interventions may result in a trend towards expected results; however, the duration may not be long enough to foster habitual practice or produce meaningful results. It remains unclear if the 5-week time-frame would have been sufficient if the frequency and/or duration of the intervention was adjusted. Furthermore, the general literature has rarely focused on follow-up and maintenance of results. It remains unclear what magnitude of response is required to maintain gains over a longer period. The current study measured total minutes and number of sessions of mindfulness practice in attempt to shed light on this issue.

In a subsequent study addressing issues of intervention length and maintenance of change, Cavanagh and colleagues (2013) recruited undergrads via self-selection and randomly assigned them a self-directed intervention course ("Learning Mindfulness Online") or wait-list control condition. After 2 weeks of practice, the intervention group reported lower levels of stress, anxiety, and depression, and higher levels of mindfulness (as measured by the FFMQ or Five Facet Mindfulness Questionnaire). Participants in the intervention condition were invited to practice mindfulness daily; and at the end of the

study, 61% of participants (n=15) reported practicing more than once weekly while 26% practiced daily (n=5). These results stand in sharp contrast to the intervention by Bergen-Cico, Possemato, and Cheon (2013), who failed to detect robust responses after 5 weeks. It is possible that participants experienced early positive results from practicing mindfulness, before levels either plateau or decrease, oscillating over the course of practice. Indeed, many practitioners report an initial positive response followed by frustration or confusion, as they struggle to integrate and make meaning of their advancing mindfulness practice. Initial robust findings may have reflected a preliminary positive experience in the early practice of mindfulness among novice practitioners.

A 2015 study by Hindman, Glass, Arnkoff, and Maron examined the effects of a 6 week intervention, where undergraduates responded to an advertisement and were assigned to either a formal meditation group (i.e., 45 minute formal meditations modelled from MBSR programs), a brief meditation group, which used short meditation activities typical of Acceptance and Commitment Therapy (Hayes, Strosahl, and Wilson, 1999) or Dialectical Behaviour Therapy (Linehan, 1993) programs, or a waitlist control group. Intervention participants participated in 6 weekly hour-long workshop sessions and were encouraged to practice and log their meditation and informal practices (i.e., walking meditation, mindful dishwashing, mindful music listening) between classes. Both intervention groups demonstrated superior change from pre- to post-study measurements of psychological wellness and mindfulness (e.g., increased FFMQ total, some FFMQ facets and MAAS scores, and decreased stress, depression, and anxiety

scores); however, the formal meditation participants reported more robust change over a larger number of indicators than those who completed the brief practices. Furthermore, participants in the formal meditation group reported a greater intention to continue their mindfulness practice, in addition to rating their workshop experience as being more logical and helpful than participants in the brief mindfulness group.

Web-based Mindfulness with Undergraduate Populations

Investigating the challenges and benefits of online interventions, Lauricella (2013) compared face-to-face with online mindfulness interventions among 40 undergraduate students. They reported that 26% preferred the online version due to convenience and privacy, 58% preferred the face-to-face session for aspects of socialization, creation of community, and benefiting from leadership, while 10% reported no format preference. Researchers suggested that the undergraduate population may respond more favourably to mindfulness when there is accountability and support from an instructor and sense of community which maximizes engagement. The current study sought to incorporate these recommendations into the research design.

The authors of an internet-based stress management program for adults in the community reported significant improvement in stress, mindfulness, psychological well-being, and quality of life after a 12-week period (Morledge, et al., 2013). Significant results were found at both the 8-week mark and the program's conclusion at 12 weeks. These findings support the ability of an 8-week program to produce significant results (Regehr, Glancy, & Pitts, 2012). The program utilized an interactive message board

condition which was hypothesized by researchers to improve the therapeutic experience of some participants. In contrast, 85% of participants in the message board condition reported it to be of little or no help, citing lack of time or interest, problems accessing the website, and low overall activity on the message board. These findings suggest that dynamic social media may be an important feature of an online mindfulness program, but only when offered in an engaging and user-friendly manner. Ongoing research is needed to determine optimal strategies for integrating social media, with the overarching aim of fostering a sense of community and accountability among participants.

In summary, research into mindfulness interventions for undergraduates has reported mixed results. It is unclear what program duration, frequency, and length of practice is required to produce clinically significant results. Furthermore, it is unclear if the results are maintained over time or how the participants should integrate a formal mindfulness practice into their lives to maintain these gains. Finally, there is the question of how web-based interventions may need to differ from in-person practice to foster similar participation and benefits. The current study attempted to utilize the findings to date to create a mindfulness intervention based on the most salient factors identified by the existing research.

Limitations of Previous Research

When designing the present study, several relevant limitations were identified from the existing literature.

Gender-based bias: more female participants with better results. Numerous studies have reported more robust findings among female participants (e.g., Samuelson, Carmody, Kabat-Zinn, & Bratt, 2007; Regehr, Glancy, & Pitts, 2012). These results may be attributed to significantly higher proportions of females in populations from which the samples were recruited (i.e. undergraduate psychology courses, yoga classes, wellness programs). To address these issues, the current study recruited participants from an undergraduate class with open registration (i.e., available to students from any program or faculty), which was neither mindfulness-based in nature nor bound to a specific academic program. Thus, the course may have been less subject to sex-biased enrollment than if the course were exclusively based in psychology, mindfulness, or yogic practice. In addition, sex differences in attrition and outcome were assessed.

Attrition: "It's hard and I don't have time." Some participants have reported increased restlessness and pain during the early weeks of mindfulness practice, which may be sufficient to increase attrition rates before participants began to experience any benefit (Cohen-Katz, Wiley, Capuano, Baker, Deitrick, & Shapiro, 2005). In addition to high intensity programs not necessarily reporting better results, programs with low to moderate levels of mindfulness-based yoga were more effective than programs with longer sessions at enhancing mood and improving psychological function (Scully, Kremer, Meade, Graham, & Dudgeon, 1998) (Michalsen et al., 2008). High frequency programs (i.e., two 90-minute weekly yoga sessions) reported increased rates of attrition when compared to moderate (90 minutes once weekly) (Vadiraja, Raghavendra, Nagebdra, &

al, 2009). The above studies suggest that more *isn't* always better. There may be an optimal level of mindfulness practice (measured in either minutes or number of sessions) that may depend on individual variables.

In response to these concerns, the current study allowed participants to select the duration and type of mindfulness practice that best suited their schedule and interest (meditations, yoga, and body scans ranging 3- to 45-minutes in length). It was hypothesized that choice of time would minimize participant attrition due to other school obligations and minimize over-compensatory self-reporting (as increased value is not assigned based on practice duration), while choice of activity would help maintain interest.

Biased recruitment of those with mindfulness interest. Most studies that have investigated undergraduates and online mindfulness interventions have recruited participants based on self-identified interest in a mindfulness program before random assignment to either an intervention or wait-list control. This may have resulted in a biased sample. The current study has aimed to circumvent recruitment bias by randomly assigning course sections (i.e., rather than individuals) to either an intervention or parallel cohort control before recruiting individual students as participants. Doing so allowed for comparison of those who elected to complete mindfulness activities versus those who had the opportunity and materials but did not choose to participate.

Ecological validity and practical implementation. The current mindfulness program was designed with real-world limitations of time and resources in mind. For

inclusion in an undergraduate course, a mindfulness component would ideally not cause additional strain on an instructor's or student's resources. Unlike a traditional MBSR-program requiring additional instructor-facilitated weekly practice (either in person or online via modules), the current program was designed to require little to no extra involvement by the instructor. Furthermore, instead of requiring a student to engage with an instructional module or group each week, the mindfulness practice in the current study was intended to be brief, consistent, and ongoing to maximize the likelihood of regular practice. Previous literature has reported participants' perceived lack of time as a major influence on attrition or non-adherence, with 22% reporting being "too busy" as a reason for dropping out or not completing follow-up measures (Morledge, et al., 2013).

Previous research attempted to increase adherence by investigating the use of messaging boards (Morledge, et al., 2013). Authors intended the board to increase accountability and motivation; however, 85% of participants reported the message board to be of little or no use due to lack of time, technical difficulties, lack of interest, and lack of activity on the board. Researchers also noted that more than one reminder email during the week following a due date may have increased adherence. To balance the above results with positive effects of in-person group practice (namely, accountability and sense of community, based on findings by Lauricella, 2013), the current study utilized weekly newsletters intended to motivate participants, provide a sense of shared experience and serve as a reminder to practice. In addition, participants received brief

semi-structured feedback based on their first 5 written reflections (described in the methods section below), to create a sense of safety with and accountability to the research facilitator, while ensuring fidelity to the activities.

Attrition and intent-to-treat analyses. Internet-based mindfulness programs have reported similar attrition rates as other online intervention programs. In their triple-pronged study, Morledge and colleagues (2013) reported attrition rates of 74% (among waitlist controls), 45% and 51% (among mindfulness with and without message board experimental conditions). In Reid's (2013) pilot of Master's level occupational therapy students, over 25% did not access the online material on a regular basis. Lauricella (2013) reported that undergrads who did not complete both the face-to-face and online single-time activities and the subsequent survey were not included in the results; however, researchers did not report original recruitment numbers, only the final total of completers. It is reasonable to assume that participants who drop-out before study completion may vary in terms of demographic variables, distress, and/or wellness scores; therefore, the current study included all randomized participants in the final analysis after examining differences in demographic variables. Given that data was measured at only two points in the study (pre- and post-intervention), an intent-to-treat carry-forward analysis was not viable due to the high proportion of missing responses.

Current Study: Hypotheses and Research Questions

The overall aim of the current study was to examine the effect of mindfulness practice on psychological health and wellness of undergraduate students registered in a

course on metacognition. Mindfulness was operationally defined based on the five-facet operationalization developed by Baer and colleagues (2006) and measured by the Five Facet Mindfulness Questionnaire (FFMQ): the ability to observe, describe, act with awareness of present moment experience, with non-judgment and non-reactivity. Given the commentary by Bergomi and colleagues (2013), the Southampton Mindfulness Questionnaire (SMQ) and Mindfulness Attention and Awareness Scale (MAAS) were both administered to provide further descriptive data based on an undergraduate population and to investigate the specific effective core mindfulness facets.

The specific objectives of the current study were fourfold: (1) to evaluate if there is an increase in mindfulness over the course of one academic term, (2) to assess the impact of a regular mindfulness practice on student psychological wellness and distress over the 12-week academic term, and (3) to examine whether the number of minutes of daily mindfulness, or (4) number of mindfulness sessions predicts any change in student mental and physical wellness (based on self-report of number of minutes practiced, and self-report on measurements of wellness and distress before and after the course).

The current study hypothesized that (1) mindfulness practice will be associated with increased mindfulness (as measured by the FFMQ, MAAS, SMQ), and (2) mindfulness practice will be associated with decreased distress (as measured by the SCL-90, PSS, STAI). The research questions were: (3) what is the effect of reported consistency (measured by number practice sessions) of mindfulness practice on measures of mindfulness and distress, and (4) what is the effect of duration (measured

by overall minutes of practice) of mindfulness practice on measures of mindfulness and distress?

Methods

The current study employed a quasi-experimental research design. Four sections of a twelve-week undergraduate course served as the intervention condition and two sections of the course served as the control condition. The experimental condition received an added mindfulness intervention, while the control condition was taught based on the existing syllabus (i.e., treatment as usual). Assessments took place at the beginning of term (i.e., week one, pre-treatment) and at the end of term (i.e., week twelve, post-treatment) for both conditions.

Participants

Participants were recruited from students registered in a 12-week undergraduate course (UCC2020: Applied Cognitive and Affective Learning Strategies) at Memorial University of Newfoundland (MUN). The course syllabus describes UCC2020 as "an introduction to cognitive and affective strategies and techniques, and information literacy skills. The application of these techniques in your own learning repertoire will be emphasized."

The course offered three sections taught by two different instructors during the Winter and Fall 2014 academic semesters (12 weeks in duration), all of which were utilized in the current study. The variety of sections allowed for examination of potential instructor, time-of-day, and time-of-year effects on the results. The table below (Table

1) summarizes condition assignment per course section. Courses were assigned to conditions (i.e., intervention or control) in attempt to balance time of day, instructor, and time of year effects while maintaining sufficient potential participant numbers for statistical power.

Table 1.
Participant assignment to course condition by course section.

Winter 2014	Condition	Fall 2014	Condition
UCC2020 – 001 Instructor: 01 (M/W/F 1000-1050h) 30 Students	INTERVENTION	UCC2020 – 001 Instructor: 01 (M/W/F 1000-1050h) 30 Students	INTERVENTION
UCC2020 – 002 Instructor: 02 (M/W/F 0900-0950h) 60 Students	INTERVENTION	UCC2020 – 002 Instructor: 02 (M/W/F 0900-0950h) 60 Students	CONTROL
UCC2020 – 003 Instructor: 01 (Tu/Th 1200-1250h F 1300-1350h) 30 Students	CONTROL	UCC2020 – 003 Instructor: 01 (Tu/Th 1200-1250h F 1300-1350h) 30 Students	INTERVENTION

One section from Winter 2014 (30 students enrolled) and one from Fall 2014 (60 students enrolled) were assigned as control conditions. The control sections were taught based on previous years' syllabi and did not include a mindfulness component. Two Winter 2014 sections (with a total of 90 students enrolled) and two Fall 2014 sections (with 60 students enrolled) followed the same syllabi (as previous years and the control condition) but included the mindfulness intervention component which was presented as a "pilot project" to the students. The study was approved by the Health Research Ethics Authority (HREA) of Newfoundland and Labrador.

Recruitment. All students registered in UCC2020 during the Winter and Fall Semesters of 2014 were invited to participate in the study. The course required students to access the university's online platform (D2L Desire to Learn platform, running ePortfolio software). Course-specific material was accessible to students on the first day of the term, approximately one week before classes began. The D2L platform facilitates web-based communication between the instructor and students, and includes an individual inbox, group messaging, and ability to post documents, blogs, and course grades. The Principal Investigator (PI) was added as a research assistant to allow for communication with registered students. On the first day of term, each registered student emailed about the study and recruitment process. The consent form (see Appendix A), was also provided.

During the first week of classes, researchers attended each course section to present the study and its objectives. Interested students were invited to stay after class to hear more about the study. The PI was available to provide additional information, explain and distribute the consent forms, and administer the battery of baseline self-report measures.

Registered students who did not fill out the surveys in class were emailed a URL link to complete the consent form and measures on-line (via the kwiksurveys.com website). This process was intended to accommodate students with commitments following class time or those who preferred to complete the measures online. The link was emailed four times (i.e., days one, three, five, and seven) during the first week of

class through ePortfolio to those who had not yet signed up. The final three emails were personalized with the recipient's name to encourage response. All emails contained a link to the online survey and reminder of the gift card incentive draw (see below).

Survey results were emailed to the researcher at a project-specific email account. They were printed with the name removed (to preserve confidentiality), and maintained with the other data records.

Incentives for Participation. During the recruitment visit to all class sections, participants were provided with coffee and donuts while they were completing the initial battery of measures.

To provide incentive for students across conditions to complete both pre- and post- measures, there was an advertised random draw for a $100 VISA Gift Card. Participants who completed both sets of questionnaires were given the option to provide their name and contact information for the random draw.

To compensate students for daily mindfulness activities (in the intervention condition only), course instructors offered up to a maximum of five extra marks (i.e., per centage points) to a student's final mark in the course for intervention participation. This incentive was detailed on the course syllabus. To avoid perceived coercion, students were not required to participate in the research (i.e., completing the survey battery) to receive credit for completed mindfulness reflections (described in detail below). With approximately 75 days in the semester, a 1% bonus was awarded for every 15 completed reflections. Reflections were tracked by the PI. Tallied bonus marks were

provided to the course instructor after the final exam (to ensure instructor blindness to student participation and reflection content).

Informed Consent (Appendix A)

Risks. Participants were advised that they may experience discomfort when completing mindfulness activities and reflections.

Participants were monitored for signs of low mood and negative affect on the pre- and post-test survey batteries. Participants scoring above clinical levels on the SCL-90 were sent a standardized email from the PI (see Appendix H) informing them of the elevated scores. Contact information for several resources were provided, including contact information for the University Counseling Centre, St. John's mental health crisis line, and the supervising clinical psychologist of the project.

Students were not penalized for declining to participate in the research. The course instructor was blind towards individual student participation. Students were informed of this safeguard during recruitment as to avoid perceived duress.

Inconveniences. Participants in the intervention condition were advised that participation would involve committing at least several minutes daily during the semester, which would involve a mindfulness practice (i.e., of self-selected length and type) and a brief written reflection to be submitted online.

Confidentiality. During data entry, all data referencing personal information was stored in the PI's locked office at the Memorial University campus in a locked filing cabinet. Any

records with personalized data were password-protected and stored on a secure USB drive while they were being maintained, before being stripped of identifying information. Data were securely stored in the supervisor's locked office for the duration of the time specified by the HREA. Following feedback to individual students and assignment of bonus marks, remaining data was anonymized by the PI (i.e., cases were assigned a participant identification number and any personally-identifying information was removed from surveys and reflections). The project-specific email account was de-activated following data collection.

Procedure

Pre-intervention assessment. For both conditions, participants completed a battery of measures (described below, see specified Appendices) during the first and last week of the course. The pre- and post-batteries were identical except for a pre-test demographics form (see Appendix I) and a post-test engagement form (which enquired about reasons for course registration, study participation, mindfulness practice, and barriers to practice, see Appendix J). The batteries required approximately 30 minutes to complete.

Mindfulness activities and reflections. The control condition of UCC2020 was taught in a manner consistent with previous years (and taught by the same instructors). In contrast, the intervention sections of the course had an added mindfulness component which was introduced and managed by the PI.

Orientation to mindfulness activities. The intervention group received a written orientation to mindfulness (Appendix B) and were instructed to choose one of three different types of mindfulness activities (Appendix C) including: meditation, body scan, or hatha yoga, in a range of time lengths (from three to forty-five minutes). Various formats of delivery included audio files (for download onto electronic devices), YouTube videos available for public viewing, online webpages with written scripts, or "Apps" (i.e., web-based software applications), which could be downloaded for free or at minimal cost to the participant. It was hoped that multiple formats would both cater to multiple learning styles while providing convenience and flexibility, with the aim of increasing the likelihood of regular practice.

Activities were distributed in several ways: on handouts distributed the first day of class, posted to the online platform, and through emails sent by the PI. As part of the study, participants were encouraged (by the PI) to complete one activity per day.

Tracking mindfulness practice with written reflections. After completing a mindfulness activity, participants were required to submit a brief written reflection (outlined in Appendix D) to receive additional course credit and allow for mindfulness practice to be tracked by the PI. Participants were instructed to include: (1) the type of activity, (2) the number of minutes which they engaged in the activity, and (3) any thoughts, emotions, or physical sensations they noticed before, during, and/or after the activity. Reflections were coded based type of activity (meditation, body scan, yoga, or

"other" – such as mindful dish-washing or sensory focus), number of minutes, as well as total number of sessions and minutes.

Feedback to enhance adherence to instructions. To ensure that participants were completing the mindfulness practices and reflections based on the instructions, the PI provided email feedback for the first five submitted reflections. Feedback followed a semi-structured, standardized format. The PI included a statement reflecting the students' experience, a statement to clarify misconceptions or procedural errors, and a question to increase the depth of future reflections (Appendix E). After submitting five responses, the participant was provided with a standardized response indicating that no further feedback would be given and to continue with the practice over the remaining weeks of class (Appendix F).

To prevent instructor bias and ensure confidentiality, reflections were not seen by the course instructor. Reflections were tracked and totaled by the PI. Bonus marks were communicated with the course instructor after the final exam.

When designing the current study, there was an awareness that participants could possibly submit reflections based on fabricated data. To address this concern, there was a focus on minimizing barriers to practice (i.e., offering brief, accessible resources). Bonus credit was given for completion of a reflection regardless of content, time spent, or activity type, which was intended to reduce artificially-inflated or erroneous self-reports.

Reminders. To prompt consistent practice, weekly newsletters (Appendix G) were both sent via email and uploaded to online platform. Additionally, the PI posted daily mindfulness reflections to create a sense of accountability and community connection among participants.

Post-intervention assessment. Participants were contacted during the final week of class (during scheduled class time) and via email (a total of four times at the end of term) to encourage completion of the post-test battery. Individuals who withdrew from the course during the term were also contacted with four follow-up emails using the time schedule outlined for the pre-test assessment period.

One week following the post-intervention assessment, participants who requested a follow-up debriefing (i.e., via the post-survey), were contacted to schedule an appointment with the PI. The follow up meetings lasted approximately 15 minutes and communicated pre- and post- results to the participant. For example, the PI described how their levels of mindfulness, stress, frustration, irritability, or interpersonal connection increased or decreased between the start and end of term. Subscale names on the SCL-90 were re-named to convey a more representative meaning without clinical connotations (i.e., “hostility” was changed to irritability”). Participants were given an opportunity to provide informal (non-recorded) feedback about their experience. Again, a list of resources (University Counselling Centre, supervisor contact information, and city crisis hotline) was provided to participants and described as further options if they

sought to learn more about ways to manage their thoughts and feelings. Two participants scheduled and attended a follow-up meeting.

Measures

The pre- and post-test measures were chosen based on psychometric strength and widespread use in the existing research on mindfulness in undergraduate populations. By utilizing common measures, it was hoped that relevant comparisons could be made between the current results and existing findings. The selected battery of measures included a pre-test demographic form (Appendix I), the post-test engagement form (Appendix J), the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988; Appendix K), the Symptom Checklist Inventory 90 (Derogatis, 1992; a psychometric test with restricted access and therefore not included in the appendix), the State Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vaag, & Jacobs, 1983; Appendix L), the Mindfulness Attention and Awareness Scale (Brown & Ryan, 2003; Appendix M), the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Appendix N), and the Southampton Mindfulness Questionnaire (Chadwick, Hember, Mead, Lilley, & Dagnan, 2008; Appendix O). The complete battery required approximately 30 minutes to complete.

Perceived Stress Scale (PSS). The PSS-10 (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988; see Appendix K) is a widely-used brief self-report tool designed to measure the subjective perception of stress over the last 30-day period. It measures the degree to which situations in one's life are appraised as being stressful, by asking both

specific and general questions. Respondents rate items on a ten-point Likert-style scale from zero (*never*) to four (*very often*). Test items were designed to assess personal evaluation of how unpredictable, uncontrollable, and overloaded respondents perceive their lives to be (e.g., PSS#1: "*In the last month, how often have you felt that you were unable to control the important things in your life?*"; PSS#8: "*In the last month, how often have you felt that you were on top of things?*").

Studies have reported acceptable reliability with good internal consistency (Cronbach's alpha of .89), and item-total correlations (Cronbach's alpha ranging from .58-.72) (Roberti, Harrington, & Storch, 2006). Several items are reverse-scored to control for response bias. Construct validity has been demonstrated to be acceptable, with the PSS-10 reported to correlate highly with the State-Trait Anxiety Inventory (STAI total score) (Roberti, Harrington, & Storch, 2006). Furthermore, the PSS-10 has demonstrated predictive validity for a period of four to eight weeks following administration, due to the temporally-sensitive and transient nature of many perceived stressors (Cohen & Williamson, 1988). These latter findings demonstrate that the measure is responsive to changes in the individual's perceived stress level over time, across changing circumstances; however, the scores would not be expected to considerably vary in a day to day administration. Therefore, the PSS can be conceptualized as something of a hybrid state/trait measure.

Spielberger State/Trait Inventory (STAI). The STAI (Spielberger, Gorsuch, Lushene, Vaag, & Jacobs, 1983; see Appendix L) is a commonly used measure of state and trait anxiety

(20 items each). State items include: "*I feel calm*", "*I feel worried*"; while more general trait items include: "*I worry too much over something that really doesn't matter.*" Items are rated on a four-point Likert Scale. Internal consistency coefficients for the scale have ranged from .86 to .95 and test-retest reliability coefficients have ranged from .65 to .75 over a two-month interval (Spielberger, Gorush, Lushene, Vagg, & Jacobs, 1983). Considerable evidence attests to the construct and concurrent validity of the scale (Spielberger, 1989). Studieshave established the STAI as a sensitive predictor of distress over time, with scores that vary in response to changes in support systems, health, and other individual characteristics (Shewchuk, Richards, & Elliott, 1998) (Elliott, Shewchuk, & Richards, 2001).

The current study used the STAI to examine the participant's self-reported level of anxiety both in-the-moment (i.e., state or short-term level) and more generally (i.e., trait, or hypothetically, more stable over time).

Symptom Checklist 90 revised (SCL-90-R). The SCL-90-R (Derogatis, 1992; unavailable for reproduction in the appendices due to publication and access restrictions by the test authors and distributor) is a 90-item self-report screening tool used to evaluate a broad variety of symptoms of psychopathology. The SCL-90-R is widely used in measuring current symptoms to assess current functioning, progress over time, and/or treatment outcomes. The SCL-90-R asks participants to rate their degree of distress arising from specific symptoms (e.g., *headaches, poor appetite, crying easily, trouble remembering things, or other people being aware of your private thoughts*).

Distress due to symptoms is rated for the past seven-day period on a five point Likert-style scale ranging from zero (*not at all*) to four (*extremely*).

The SCL-90R provides sub scores across ten clinical scales (including somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism). The measure also provides three global index scores: global distress (i.e., depth of distress, typically used as an overall clinical indictor for help-seeking), positive symptom distress (i.e., level of distress), and positive symptom total (i.e., symptom breadth). Normative scores by gender, age (adolescent versus adult), and setting (inpatient, outpatient, or non-clinical) are available and were used for the current research.

Participants who reported a clinically-elevated score on the SCL-90-R (defined by measure developer as a Global Severity Index (GSI) total T-Score exceeding 64, or any two subscales exceeding a T-Score of 63), were emailed a standard script outlining available psychological services for participants experiencing distress (Appendix B).

In the current study, the SCL-90-R was utilized to evaluate symptoms of psychological distress (i.e., anxiety, depressed mood, psychosis).

Mindfulness Attention and Awareness Scale (MAAS). The MAAS (Brown & Ryan, 2003; see Appendix M) is a 15-item self-report measure scored on a six-point Likert Scale (rated from *almost always* to *almost never*) validated for use with multiple populations, including undergraduates. It yields a single factor score: higher scores are proportional to greater levels of open and receptive attention, and awareness to what is

happening in the present moment. It is considered a relatively narrow measure of mindfulness, focusing on the single facet of attention/awareness.

Brown and Ryan reported internal consistency (Cronbach's alpha of .82) and found expected discriminant and convergent validity correlations. The MAAS is reported to correlate significantly and positively with other measures of wellness and positive outcome (including optimism, self-worth, and openness to experience), negatively correlate with rumination, depression, and neuroticism, and was unrelated to hypothesized neutral variables like self-monitoring. MAAS scores were found to be significantly higher in populations with a regular mindfulness practice compared to matched community controls (Brown & Ryan, 2003).

The MAAS has a reported inter-correlation of .38 ($p<.01$) with the Southampton Mindfulness Questionnaire among a large undergraduate sample (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). This result is not surprising, given the holistic theory of mindfulness upon which the SMQ was founded (see below).

A commonly cited limitation of the MAAS is the negative item phrasing (for example, MAAS 2: "*I break or spill things because of carelessness, not paying attention, or thinking of something else*" and MAAS 3: *"I find it difficult to stay focused on what is happening in the present*"). No items are phrased in a mindfulness-positive manner ("*I rarely break or spill things*" or "*I tend to focus on what is happening in the present*") which has led some researchers to criticize the MAAS as measuring mind*LESS*ness. Critics have described it as measuring "being seriously spaced out" (Rosch, 2007, pp.

262-263), “an agitated lack of attentiveness” (Grossman, 2008), or the effects of “being on autopilot” (Willliams, 2010). As a result of negative item phrasing, researchers have posited that the MAAS may also implicitly measure a judgmental or self-critical stance (Bergomi, Tschacher, & Kupper, 2013). It is unclear if this negative item phrasing exerts an impact on respondent self-evaluation.

Despite this criticism, the MAAS remains a brief, straightforward measure identified as reliable and valid for first-time (or novice) meditators. In contrast, other measures may fluctuate in scoring depending on varying meditation or mindfulness experience among participants (Bergomi, Tschacher, & Kupper, 2013).

Per a 2013 review (Bergomi, Tschacher, & Kupper), the MAAS remained the only self-report mindfulness measure with documented predictive validity. Post-treatment scores on the MAAS were reported to predict relapse or recurrence of Major Depressive Disorder for a period of 12 months following a Mindfulness-Based Cognitive Therapy intervention (Michalak, Heidenreich, Meibert, & Schulte, 2008).

Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; see Appendix N) is a 39-item self-report measure scored on a five-point Likert scale ranging from one (*never or very rarely true)* to five (*very often or always true)*. The tool was developed following a factor analytic study of five independently-developed mindfulness questionnaires which were available at the time. Analysis utilized the 112 total items from the Mindful Attention Awareness Scale, the Freiberg Mindfulness Inventory (FMI; Buchheld et al. 2004; Walach et al. 2006), the

Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), the Cognitive and Affective Mindfulness Scale (CAMS-R; Feldman et al. 2007; Haynes & Feldman, 2004), and the Southampton Mindfulness Questionnaire (SMQ; Chadwick et al. 2008), and the results were replicated with a confirmatory factor analysis (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The FFMQ is comprised of five facets common to the current conceptualization of Mindfulness: observing/noticing/attending to thoughts/feelings/sensations (FFMQ 1: *"When I'm walking I deliberately notice the sensations of my body moving")*, describing or labelling (FFMQ 2: "*I'm good at findings words to describe my feelings"*), acting with awareness (FFMQ 5R: "*When I do things, my mind wanders off and I'm easily distracted"*) , non-judgement of inner experiencing (FFMQ 3R: "*I criticize myself for having irrational and inappropriate emotions"*), and non-reactivity to inner experience (FFMQ 9: "*I watch my feelings without getting lost in them"*). Half of the items are reverse-scored to control for response bias. The FFMQ yields a sub score for each factor as well as measure of overall mindfulness.

The measure serves as a comprehensive scale that has been widely used in the empirical investigation of mindfulness since the tool's development. The original study reported adequate to excellent internal consistency (Cronbach's alphas ranging from .75 to .91), with relationships between facet scales as predicted (for the most part) by researchers (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). A follow-up study investigating the FFMQ's construct validity reported significantly higher scores on all facets (except act with awareness) for experienced meditators than among

nonmeditators (Baer et al., 2007). Carmody and Baer (2008) also reported higher FFMQ scores following participation in an eight-week MBSR program for individuals with stress, anxiety, or illness-related complaints, with scores across facets increasing significantly from pre-intervention scores. These findings support the utility of the FFMQ in assessment of mindfulness as a multi-faceted construct, in both experienced and novice meditation practitioners (Baer, Walsh, & Lykins, 2009).

There are several limitations noted by Bergomi and colleagues (2013) based on the empirically-based scale construction method. Specifically, the FFMQ was derived from an empirical factor analysis, which may have led to over-representation of factors in the total item pool or over-representation of factors with a more clear, unitary structure. Furthermore, reliance on empirical foundation overlooks the contribution of mindfulness theory, which may further lead to over- or under-representation of facets that are theoretically relevant to the exploration of mindfulness as a construct (Bergomi, Tschacher, & Kupper, 2013). Bergomi and collegues (2013) posit that the FFMQ remains a strong tool for use with general population samples, providing a comprehensive overview of mindfulness; however, measurement of more clinically-relevant nuances (such as reactions to distressing inner experiences or patterns of withdrawal versus willingness to engage) may require the use of additional measures – until another measure is developed which encompasses all aspects of the current conceptualization of mindfulness.

Southampton Mindfulness Questionnaire (SMQ). The SMQ (Chadwick, Hember, Mead, Lilley, & Dagnan, 2008; see Appendix O) is a brief, 16-item self-report inventory which assesses the degree to which individuals respond to distressing thoughts or images. Items begin with "*usually, when I have distressing thoughts or images*" and continue with a mindfulness-related response, such as "*in my mind I try to push them away*" (SMQ 12). Items are scored on a seven-point Likert scale from zero (strongly *disagree*) to six (*strongly agree*). The measure is designed to measure four bipolar facets of mindfulness, including: mindful observation (de-centered awareness vs. being lost and reacting), non-aversion (attention to stay with difficult experiences vs. avoidance), non-judgment (acceptance of aversive thoughts or images and oneself vs. self-judgment), and letting go (non-reactivity vs. rumination and worry). Despite these facets, authors recommend using only the total score based on a theoretical view of mindfulness as holistic and tightly interconnected (Leary & Tate, 2007).

The SMQ was included in the second semester of the study (i.e., only completed by a subset of participants). It was selected to balance the empirically-derived basis of the FFMQ with a theoretically-based measure, and further investigate the inner experience of mindfulness as it relates to mental health and wellness, especially in populations prone to elevated levels of stress or low mood (Bergomi, Tschacher, & Kupper, 2013). Furthermore, the SMQ explores three facets of mindfulness which are not represented on the FFMQ (perhaps for reasons described in the above critiques of the FFMQ).

The SMQ is reported to have good internal consistency (Cronbach's alpha of .89), with a significant correlation as hypothesized with the MAAS (*r=0.57)* while being able to differentiate between experienced and novice meditators. Scores were also correlated with psychological wellbeing and increased from pre-to-post participation in an MBSR course (Chadwick, Hember, Mead, Lilley, & Dagnan, 2008).

Statistical Analyses

All data were analyzed using the statistical package SPSS Version 23.0.

An a priori power analysis was conducted using the GPower software package (Faul & Erdfleder, 1992) to calculate minimum sample size based on previous similar research. Analyses suggested that a sample of 25 to 40 participants per group was required to detect a moderate effect size in the current study.

Frequency measures were used to examine descriptive data collected from the participants (i.e., demographic variables, which included pre-existing mindfulness practice, mean scores on the mindfulness and psychological wellness outcome variables, and post-test questions exploring reasons for participating and barriers to practice).

The current study used independent samples t-tests to examine demographic variable mean scores in relation to both pre- and post-test measures of mindfulness and psychological wellness. These differences were examined to rule out findings based on gender, age, primary residence, and existing practice of mindfulness, meditation, yoga,

or other wellness-based activity. Demographic and outcome variables were also examined in relation to study attrition and engagement, to rule out potential confounds.

The first and second hypotheses were analyzed using repeated measures 2x2 ANOVA (comparing mean scores on the week 1 pre-test and week 12 post-test measures), to evaluate change across 21 mindfulness (measured with the MAAS, SMQ, FFMQ) and psychological wellness outcome measures (measured with the STAI, PSS, and SCL-90) for the Mindfulness and the No-mindfulness groups. All specific hypotheses and analyses were planned in the research design phase, prior to data collection and analysis, and were based on theoretically-driven hypotheses. Despite this a priori planning, Bonferroni corrections were applied where relevant to reduce the possibility of Type I error, and are noted in the results that follow.

The research questions (regarding the effect of number of sessions and number of minutes of mindfulness practice on the outcome variables) was examined with hierarchical regression analyses, using the post-intervention test score as the dependent variable, and pre-intervention test scores and number of minutes of mindfulness as the first and second predictors.

RESULTS

Recruitment

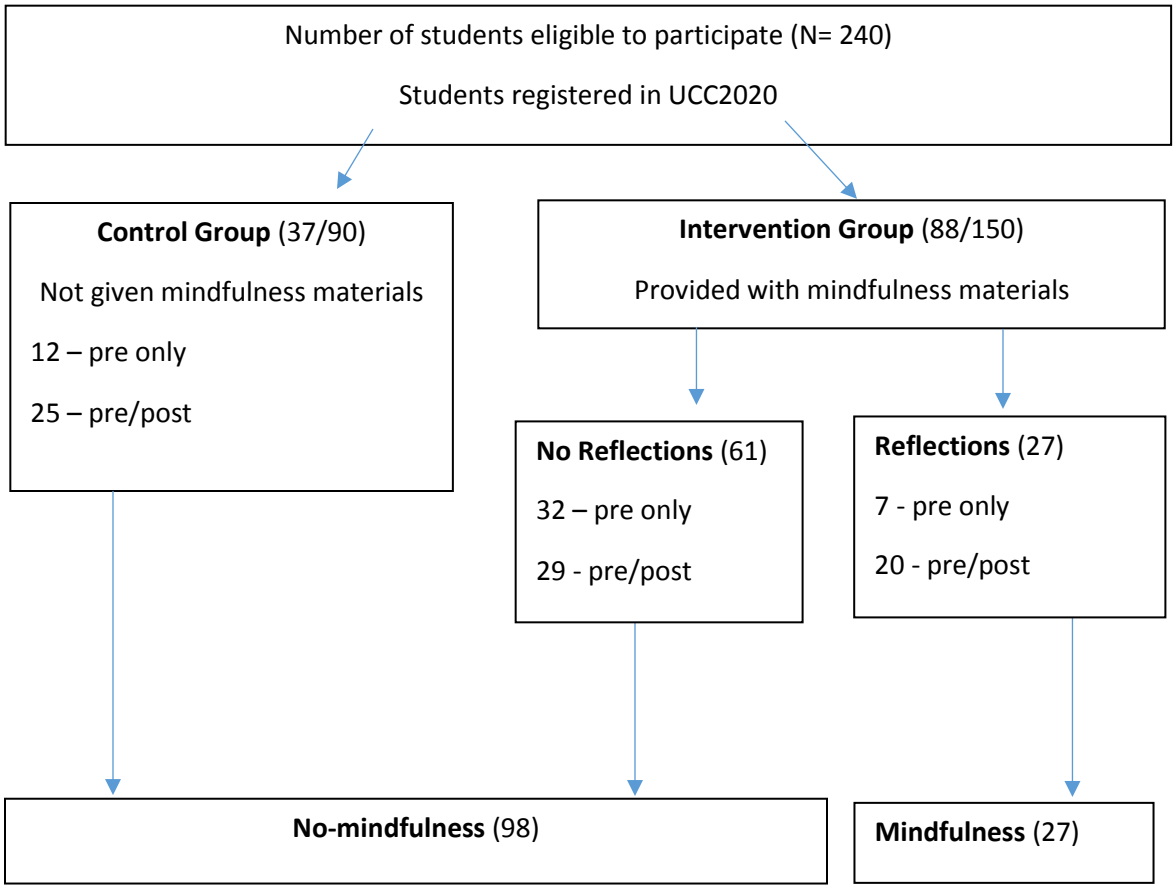
A total of 240 students were enrolled in the UCC2020 course sections used in the present study. Of these, 125 students signed consent forms and completed pre-test

questionnaires (52% of potential participants) and 75 completed post-test questionnaires (57.6% of the pre-test sample). Figure 1 depicts the study flow of recruitment and participation described below (i.e., number of consenting versus available participants and number of participants in the intervention group who completed mindfulness reflections).

Control Group. Of the 90 eligible students in the control group, 37 consented to participate in the current study and completed the pre-test questionnaires (41.1%). Of these 37, 25 completed the post-test questionnaires (67.6%). These students were not provided with the mindfulness materials until after the study period was complete.

Intervention Group. Of the 150 eligible students in the Intervention group, 90 consented to participate and completed the pre-intervention measures (60.0%). Two students responded to numerous measures with a response set bias (e.g., all true, all false, etc.); their answers were determined to be invalid and data were subsequently excluded, yielding 88 total Intervention participants. All participants in the Intervention group were prompted to complete a daily mindfulness practice and submit a reflection afterwards (see Appendix E). They were reminded with weekly newsletters sent to their university email accounts. Despite these reminders and academic incentive for submitting reflections, only 27 of 88 total participants (30.7%) submitted at least one reflection via email or the online course platform. In contrast, 61 participants did not submit any reflections.

Figure 1.
Study flow: recruitment and intervention participation



Data Screening, Attrition, and Missing Data. All statistical analyses were conducted with SPSS version 23.0. Data were first screened for outliers, missing values, and normality. The Shapiro-Wilk test was conducted to assess for normal distribution of data.

Of the total number of participants who signed up to participate in the study (N=125), 74 completed both the pre- and post-intervention measures (59.2%), while 51 completed the pre-test only (40.8%). One student completed the post-test only and the case was excluded from analysis. Three participants skipped occasional items or

responded to one of the scales with a response set bias. These specific measures were excluded from analysis, while the participants' other data were still used (i.e., if responses did not appear to be invalid due to random or biased response style). As mentioned above, two participants responded with response set bias on more than two measures, and all data were excluded for these two cases.

Repeated measures analyses were limited to participant cases where both the pre- and post-intervention measures were completed. Data for pre-test only participants were included to inform initial sample demographic characteristics. Because such a large portion of the sample (51 participants, or approximately 40%) was lost to attrition, imputation strategies (i.e., intent to treat analyses) were deemed inappropriate for the current study. Potential impact on the findings will be discussed as a limitation of the current research.

Assessment for Group Confounds

A repeated measures 2x2 ANOVA (see Tables 2.1 and 2.2) revealed no statistically significant differences between pre-test only and pre-post test groups on most variables including demographic, pre-existing practice variables, or measures of mindfulness and psychological wellness. Ethnic minority groups (i.e., landed immigrants or international students) were significantly more likely to complete both sets of measures than Canadian citizens; however, ethnic minorities accounted for only seven of the total participants. The effect size for this analysis was small (d = 0.45).

Table 2.1

Mean scores for participants completing pre-test measures only and those completing both pre- and post-test measures.

		M	
		pre-test	pre- and post-
Demographics	Age	20.14	20.26
	Sex	1.28	1.40
	Residence	2.25	2.14
	Ethnicity	**1.00**	**1.17***
	PostSec	1.51	1.54
	Faculty	7.46	7.18
Pre-Existing Practice	**Mindfulness**	**.226**	**0.94***
	Meditation	0.11	0.24
	Yoga	0.19	0.42
	Physical Activity	0.19	2.97
	Wellness	0.13	0.54
STAI	State	38.72	37.49
	Trait	42.30	42.71
FFMQ	Observe	24.62	24.38
	Describe	26.36	25.83
	Act	24.43	25.23
	Nonjudge	28.42	28.99
	Nonreact	21.15	19.85
	Total	124.98	122.92
MAAS		3.65	3.61
PSS		18.26	17.25
SMQ		49.79	47.65
SCL-90	SOMpre	56.60	57.61
	OCpre	61.94	61.19
	ISpre	58.60	59.00
	DEPpre	59.72	59.18
	ANXpre	55.26	54.40
	HOSpre	56.02	54.93
	PHOpre	54.02	55.35
	PARpre	53.84	54.89
	PSYpre	57.22	56.01
	GSIPre	59.28	59.72

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS=Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.

* = significance <.05

Table 2.2

Mean differences between participants completing pre-test only (n=51) and both pre-post tests (n=74).

		SS	df	MS	F	Sig
Demographics	Age	.328	1	.328	.057	.811
	Sex	.428	1	.428	1.590	.210
	Residence	.358	1	.358	.615	.434
	Ethnicity	.867	1	.867	5.295	**.02***
	PostSec	.020	1	.020	.013	.910
	Faculty	2.384	1	2.384	.085	.772
Pre-Existing Practice	Mindfulness	14.012	1	14.012	6.148	**.015***
	Meditation	.484	1	.484	1.129	.290
	Physical Activity	5.602	1	5.602	.954	.331
	Wellness	4.932	1	4.932	2.925	.090
STAI	State	46.251	1	46.251	.480	.490
	Trait	5.043	1	5.043	.048	.827
FFMQ	Observe	1.872	1	1.872	.052	.819
	Describe	8.419	1	8.419	.213	.645
	Act	19.045	1	19.045	.511	.476
	Nonjudge	9.888	1	9.888	.191	.663
	Nonreact	51.888	1	51.888	2.352	.128
	Total	130.111	1	130.111	.420	.518
MAAS		.039	1	.039	.045	.832
PSS		30.101	1	30.101	.619	.433
SMQ		67.409	1	67.409	.247	.621
SCL-90	SOMpre	30.168	1	30.168	.236	.628
	OCpre	16.402	1	16.402	.130	.719
	ISpre	4.721	1	4.721	.028	.867
	DEPpre	8.587	1	8.587	.068	.795
	ANXpre	21.684	1	21.684	.145	.704
	HOSpre	35.023	1	35.023	.342	.560
	PHOpre	51.979	1	51.979	.386	.535
	PARpre	32.464	1	32.464	.220	.640
	PSYpre	42.926	1	42.926	.254	.615
	GSIPre	5.771	1	5.771	.042	.838

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS= Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.

* = significance <.05

Participants who completed both sets of measures reported significantly more participation in an existing mindfulness practice prior to the study (compared to those who completed the pre-test measure only). The effect size of this finding was small (d = 0.47). This finding may indicate a self-selection bias among the participants who submitted both sets of surveys.

The current study initially yielded three groups: Control (participants without the option to complete mindfulness reflections), Mindfulness (participants who submitted at least one mindfulness reflection), and No Reflection (participants who were eligible to submit mindfulness reflections but did not). One-way repeated measures ANOVA (for week 1 pre-intervention and week 12 post-intervention measures) examined differences between these three groups at baseline. There were no significant differences at pre-test on any demographic or outcome variables.

In principle, neither the Control nor the No Reflection groups engaged in the mindfulness intervention (i.e., the Control group lacked access and the No Reflection group did not submit reflections). Analyses (independent sample t-tests) revealed no statistically significant differences between the Control and No Reflection groups on any of the pre-test measures including demographic or practice frequency variables (e.g., weekly mindfulness, meditation, physical fitness practice prior to the study) (see Tables 3.1, 3.2, 4.1, and 4.2). Additionally, a question on the post-test questionnaire directly asked participants if they completed mindfulness activities but did not submit reflections for same. One participant reported that they practiced mindfulness at all times in their

life (and whose data were later excluded based on invalid or missing responses on pre- and post-test measures). No other participants reported completing mindfulness activities, as outlined in the current study, without submitting a reflection. However, it is possible that there were participants who completed activities, did not submit reflections, and also did not complete a post-test (therefore, not having an opportunity to report their experience).

Table 3.1
Mean scores for Control and No Reflection groups for demographic variables.

	Mean	
	Control	No Reflection
Age	20.63	19.89
Sex	1.24	1.38
Residence	2.08	2.18
Ethnicity	1.14	1.07
Post Secondary	1.62	1.46
Faculty	8.16	6.83

Table 3.2
Mean differences between Control and No Reflection groups for demographic variables.

						95% CI	
	t	df	sig (2-tailed)	mean diff	SE	Lower	Upper
Age	-1.301	77	.197	-.742	.571	-1.878	.394
Sex	1.208	96	.230	.134	.111	-.086	.354
Residence	.592	95	.555	.097	.164	-.228	.422
Ethnicity	-.816	96	.416	-.070	.085	-.239	.100
Post Secondary	-.633	96	.528	-.163	.257	-.672	.347
Faculty	-1.189	95	.237	-1.329	1.118	-3.547	.890

Two pre-test measures suggested a significant between-groups difference: the Control group reported a significantly lower mean score (t(96)=-2.358, p=.020) on the non-judgement subscale of the Five-Factor Mindfulness Questionnaire (FFMQ) (M=26.51, SD=7.77) than the No Reflection group (M=29.93, SD=6.43), with a small effect size (d = 0.48). There was also a difference in pre-test SMQ where the Control group reported a lower mean score (M=41.35) than the No Reflection Group (M=54.68) (t(48)=2.898, p=.006). Only one post-test measure differed significantly between groups: the Control group reported a significantly higher mean score on the paranoia subscale of the Symptom Checklist (SCL-90) (M=56.50, SD=10.30) than the No Reflection group (M=50.03, SD=11.56), (t(51)=2.129, p=.038. This finding had a medium effect size (d = 0.59) based on Cohen's threshold.

A repeated measures ANOVA compared demographic and pre-post variables for the Control and No Reflection groups (see Tables 3, 4, and 5). As no significant differences were detected between groups, they were combined to form the "No Mindfulness" group (n=96) with the intent of maximizing statistical power for outcome tests. This decision was based on the rationale that neither group completed the mindfulness intervention. The only difference in treatment of these groups was that the No Mindfulness group received weekly newsletters prompting practice.

For outcome analyses, the pre-post results of the No Mindfulness group (n=54) were compared with those of the Intervention group (n=27). Repeated measures 2X2 ANOVA for Mindfulness and No-Mindfulness groups at pre- and post-test (weeks 1 and

12 of the semester) was used to evaluate the study hypotheses for each of the dependant variables.

Table 4.1

Mean scores for Control and No Reflection groups for pre-test measures.

		Mean	
		Control	No Reflection
Pre-Test Practice (weekly)	Mindfulness	0.62	0.56
	Meditation	0.27	0.16
	Yoga	0.38	0.31
	Phys Activity	2.89	3.32
	Wellness	0.41	0.31
STAI	State	38.46	37.34
	Trait	44.46	41.77
FFMQ	Observe	24.43	24.05
	Describe	25.78	25.84
	Act	24.14	24.93
	Nonjudge	**26.51**	**29.93***
	Nonreact	21.30	20.00
	Total	122.16	124.39
MAAS		3.50	3.60
PSS		18.69	17.63
SMQ		**41.35**	**54.68***
SCL-90	SOM	58.08	57.10
	OC	62.00	60.75
	IS	58.94	58.54
	DEP	59.47	58.86
	ANX	54.94	54.76
	HOS	54.83	55.68
	PHO	55.61	54.24
	PAR	55.00	53.69
	PSY	57.75	56.22
	GSI	59.67	59.29

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS=Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.
* = significance < .05, ** = significance < .01

Table 4.2

Mean differences between Control and No Reflection groups for pre-test measures.

		t	df	sig (2-tailed)	mean diff	SE	95% CI Lower	95% CI Upper
Pre-Test Practice (weekly)	Mindfulness	-.227	96	.821	-.064	.284	-.627	.499
	Meditation	-.724	96	.471	-.106	.147	-.398	.185
	Yoga	-.377	96	.707	-.067	.178	-.420	.286
	Phys Activity	.826	95	.411	.425	.514	-.596	1.445
	Wellness	-.351	96	.726	-.094	.267	-.625	.437
STAI	State							
	Trait							
FFMQ	Observe	-.303	96	.763	-.383	1.266	-2.896	2.130
	Describe	.039	96	.969	.052	1.338	-2.603	2.708
	Act	.598	95	.551	.798	1.336	-1.853	3.450
	Nonjudge	2.358	96	**.020***	3.421	1.451	.541	6.301
	Nonreact	-1.366	96	.175	-1.297	.950	-3.182	.588
	Total	.614	96	.541	2.231	3.633	-4.981	9.443
MAAS		-.002	94	.999	-.0003	.2079	-.4132	.4125
PSS		-.699	93	.486	-1.067	1.527	-4.099	1.964
SMQ		2.898	46	**.006****	13.332	4.601	4.072	22.593
SCL-90	SOM	-.405	93	.686	-.982	2.421	-5.790	3.827
	OC	-.504	93	.615	-1.254	2.487	-6.193	3.684
	IS	-.138	93	.891	-.402	2.921	-6.202	5.398
	DEP	-.243	93	.809	-.608	2.505	-5.582	4.366
	ANX	-.068	93	.946	-.182	2.659	-5.463	5.099
	HOS	.386	93	.700	.845	2.186	-3.496	5.186
	PHO	-.544	93	.588	-1.374	2.524	-6.387	3.639
	PAR	-.492	93	.624	-1.305	2.654	-6.576	3.966
	PSY	-.547	93	.586	-1.530	2.798	-7.085	4.026
	GSI	-.148	93	.882	-.379	2.552	-5.447	4.690

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS=Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.

* = significance < .05, ** = significance < .01

Table 5.1

Mean scores for Control and No Reflection groups for post-test measures.

		M	
		Control	No Reflection
Post-Test Practice (weekly)	Mindfulness	2.71	1.87
	Meditation	0.79	1.26
	Yoga	0.50	0.90
	Phys Activity	2.79	3.45
	Wellness	1.00	0.68
STAI	State	39.67	42.35
	Trait	43.54	42.06
FFMQ	Observe	25.04	24.71
	Describe	26.38	26.35
	Act	24.79	25.39
	Nonjudge	**26.29**	**30.39***
	Nonreact	21.21	19.94
	Total	123.67	126.77
MAAS		3.87	3.64
PSS		19.50	18.33
SMQ		45.92	56.00
SCL-90	SOM	54.43	58.97
	OC	59.75	58.97
	IS	58.29	55.21
	DEP	57.75	56.28
	ANX	54.21	54.79
	HOS	54.96	54.34
	PHO	52.83	54.31
	PAR	**56.50**	**50.03***
	PSY	56.21	55.86
	GSI	54.21	56.48

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS=Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.
* = significance <.05

Table 5.2

Mean differences between Control and No Reflection groups for post-test measures.

		t	df	sig (2-tailed)	mean diff	SE	95% CI Lower	95% CI Upper
Post-Test Practice (weekly)	Mindfulness	-1.503	53	.139	-.837	.557	-1.955	.280
	Meditation	.862	53	.393	.466	.541	-.619	1.552
	Yoga	1.008	53	.318	.403	.400	-.399	1.206
	Phys Activity	1.176	53	.245	.660	.561	-.465	1.785
	Wellness	-.669	53	.507	-.323	.482	-1.290	.645
STAI	State	.811	53	.421	2.688	3.313	-3.957	9.334
	Trait	-.496	53	.622	-1.509	3.043	-7.614	4.595
FFMQ	Observe	-.214	53	.831	-.332	1.552	-3.445	2.781
	Describe	-.014	53	.989	-.020	1.476	-2.981	2.941
	Act	.330	53	.742	.595	1.802	-3.018	4.209
	Nonjudge	2.080	53	**.042***	4.137	1.989	.148	8.126
	Nonreact	-1.019	53	.313	-1.273	1.249	-3.777	1.232
	Total	.647	53	.521	3.108	4.806	-6.532	12.747
MAAS		-.724	53	.472	-.1812	.2502	-.6832	.3206
PSS		-.636	52	.528	-1.167	1.834	-4.847	2.514
SMQ		1.996	22	.058	10.077	5.048	-.393	20.547
SCL-90	SOM	1.464	50	.149	4.531	3.095	-1.685	10.747
	OC	-.221	51	.826	-.784	3.554	-7.920	6.351
	IS	-.864	51	.392	-3.085	3.570	-10.25	4.082
	DEP	-.464	51	.645	-1.474	3.179	-7.856	4.908
	ANX	.169	51	.866	.585	3.456	-6.354	7.524
	HOS	-.229	51	.820	-.614	2.678	-5.990	4.763
	PHO	.512	51	.611	1.477	2.887	-4.320	7.274
	PAR	-2.129	51	**.038***	-6.466	3.037	-12.56	-.369
	PSY	-.098	51	.923	-.346	3.544	-7.462	6.769
	GSI	-.203	51	.840	-.726	3.579	-7.910	6.459

Note: STAI=State Trait Anxiety Inventory, FFMQ=Five Facet Mindfulness Questionnaire, MAAS=Mindfulness Attention and Awareness Scale, PSS=Perceived Stress Sale, SMQ=Southampton Mindfulness Questionnaire, SCL-90=Symptom Checklist.

* = significance <.05

Descriptive Statistics

Demographic data were collected during the pre-test (week 1 in class and online) and presented in Table 6. Males comprised 30% of the current sample. Participants ranged in age from 17 to 32 years (with a mean age of 20.0 (SD =2.38 years). The sample was divided evenly across years of undergraduate education: 24.2% were in first year, 25.6% in second, 29.6% in third, and 17.8% in fourth year, with 2.4% having completed more than four years of undergraduate study. Participants were asked about their primary place of residence: 39.8% reported living in off-campus housing, 39% were living with parent(s) or legal guardian(s), and 21.1% reported living in residence on campus. The ethnic background of the sample was reflective of the generally homogenous (i.e., Canadian-born) demographic of St. John's, Newfoundland.

Participants represented a diverse array of academic faculties: Arts (20.2%), Science (non-psychology, 15.3%), Undecided (21.0%), Business (16.1%), Education (6.5%), Human Kinetics/Recreation (4.8%), Unknown (7.3%), Psychology (4.0%), Nursing (1.6%), Engineering (0.8%), Marine Institute (0.8%), Pharmacy (0.8%), or no answer provided (0.8%).

Table 6.
Demographic variable descriptive statistics by group and overall.

	Intervention		No Reflection		Control		Total	
	N	%	N	%	N	%	N	%
	27	100.0%	61	100.0%	37	100.0%	125	100.0%
Sex (n=125)								
Female	18	66.7%	40	65.5%	28	75.5%	86	68.8%
Male	9	33.3%	20	32.8%	9	24.3%	38	30.4%
Other	0	0.0%	1	1.6%	0	0.0%	1	0.8%
Residence (n=123)								
Campus	3	11.1%	14	23.0%	9	24.3%	26	20.8%
Off-campus	12	44.4%	25	41.0%	12	32.4%	49	39.2%
Parents	11	40.7%	22	36.1%	15	40.5%	48	38.4%
Ethnicity (n=124)								
Canadian	24	88.9%	59	96.7%	34	91.9%	117	93.6%
Landed Immigrant	1	3.7%	0	0.0%	1	2.7%	2	1.6%
International	1	3.7%	2	3.3%	2	5.4%	5	4.0%
Complete PostSec (n=124)								
0 (first year)	6	22.2%	18	29.5%	6	16.2%	30	24.0%
1	7	25.9%	14	23.0%	11	29.7%	32	25.6%
2	9	33.3%	17	27.9%	11	29.7%	37	29.6%
3	3	11.1%	10	16.4%	9	24.3%	22	17.6%
4+	1	3.7%	2	3.3%	0	0.0%	3	2.4%
Faculty (n=124)								
Arts	2	7.4%	16	26.2%	7	18.9%	25	20.0%
Business	6	22.2%	10	16.4%	4	10.8%	20	16.0%
Education	5	18.5%	2	3.3%	1	2.7%	8	6.4%
English	0	0.0%	0	0.0%	1	2.7%	1	0.8%
Human Kinesthetics	1	3.7%	4	6.6%	1	2.7%	6	4.8%
Marine Institute	0	0.0%	0	0.0%	1	2.7%	1	0.8%
Nursing	0	0.0%	1	1.6%	1	2.7%	2	1.6%
Pharmacy	1	3.7%	0	0.0%	0	0.0%	1	0.8%
Science (No Psych)	4	14.8%	8	13.1%	7	18.9%	19	15.2%
Psychology	1	3.7%	1	1.6%	3	8.1%	5	4.0%
Undecided	5	18.5%	13	21.3%	8	21.6%	26	20.8%
Unknown	2	7.4%	5	8.2%	3	8.1%	10	8.0%

To consider effects of pre-existing experience with mindfulness practice, students were asked about their current practices with meditation, mindfulness, yoga, and physical exercise. The majority of participants (79.8%) reported having no current mindfulness practice and 9.7% reported a current meditation practice. While 11.2% practiced yoga once or twice weekly, 83.9% denied any current yoga practice. Almost half of participants (45.5%) reported engaging in physical activity three to five times weekly, while 23.6% reported no physical activity. An independent samples t-test revealed no significant difference in mean weekly practice between participants who completed mindfulness reflections and those who did not (see Table 7 below).

Table 7.
Independent samples t-test of pre-existing practice (average times per week) of mindfulness, meditation, yoga, physical fitness, and other activity by group (Mindfulness or No Mindfulness).

	t	df	Sig. (2-tailed)	Mean Difference	SE
Mindfulness Pre	.753	30.860	.457	.329	.438
Meditation Pre	-.636	120	.526	-.093	.146
Yoga Pre	-.350	120	.727	-.064	.183
Physical Activity Pre	-.105	119	.916	-.057	.537
Other Wellness Pre	.437	120	.663	.121	.277

Intervention Group Descriptive Statistics

Table 8 summarizes the self-report mindfulness practice experiences from the 27 participants in the intervention group who chose to complete mindfulness practices and submit reflections. Practice was measured in total minutes and number of sessions and

is presented based on type of practice (i.e., body scan, meditation, yoga, or other activity like mindful baking or dish-washing). In total, participants completed between 1 and 76 sessions of mindfulness, with a mean of 18 sessions. As noted above, there was a generally bimodal distribution, primarily due to participants completing around either 15 reflections (i.e., a course credit of 1%), or up to 75 reflections (i.e., for the full 5% bonus).

Participants completed a mean of 10.30 meditations, 4.26 body scans, 2.74 yoga practices, and .78 other types of mindfulness over the intervention period. Participants completed between 4 and 950 minutes of practice over the semester (M = 191 minutes), with mean practice times of 99 minutes of meditation, 29 minutes of body scan, 40 minutes of yoga, and 23 minutes of "other" types of practice.

Table 8.
Descriptive statistics for intervention group mindfulness reflections.

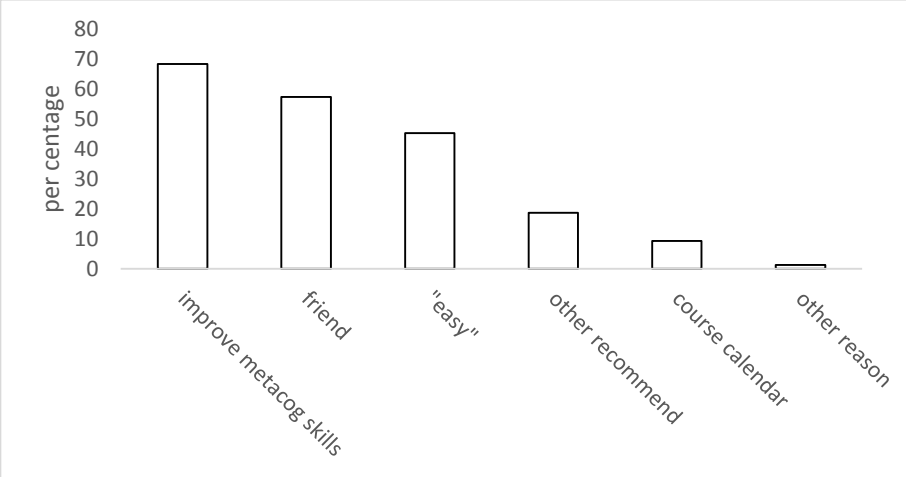
						Skewness		Kurtosis	
	N	min	max	M	sd	statistic	SE	statistic	SE
Body scan sessions	27	0	26	4.26	6.976	2.338	.448	4.923	.872
Body scan minutes	27	0	175	29.26	48.357	2.207	.448	4.124	.872
Med sessions	27	0	42	10.30	11.737	1.294	.448	.861	.872
Med minutes	27	0	870	99.44	176.581	3.494	.448	14.423	.872
Yoga sessions	27	0	16	2.74	4.712	1.920	.448	2.641	.872
Yoga minutes	27	0	245	40.48	70.177	1.949	.448	2.873	.872
Other sessions	27	0	8	.78	1.928	2.983	.448	8.816	.872
Other minutes	27	0	252	22.93	56.411	3.079	.448	10.462	.872
Total Sessions	27	1	76	18.07	21.954	1.671	.448	2.016	.872
Total Minutes	27	4	950	191.19	257.471	1.833	.448	2.775	.872

Engagement Analysis

During the Week 12 post-intervention data collection, participants answered a series of questions regarding their reasons for participating in the study and enrolling in the UCC2020 course. Additionally, participants in the Intervention group were polled on their reasons for completing the mindfulness activities and barriers to completing mindfulness activities. In all cases, participants could select multiple relevant answers.

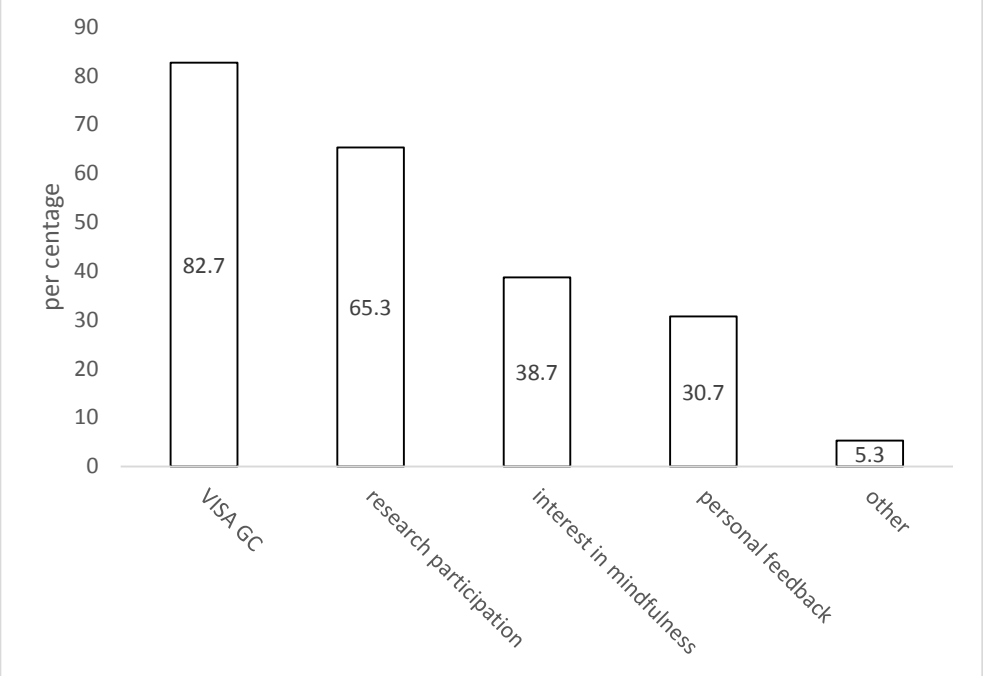
Participant rationale for enrolling in UCC2020 is summarized in Figure 2. The majority of respondents (68.3%) sought to improve their metacognitive or study skills, which was the primary objective of the course. Over half (57.3%) of participants had acted upon the recommendation of a friend, 45.3% reported having "*heard the course was easy*," 18.7% had been encouraged by an instructor or counsellor, and 9.3% reported finding the course in the university's course calendar. Only 1.3% identified an "*other*" reason (i.e., "*fit with my timetable*").

Figure 2.
Self-reported reasons for enrolling in UCC2020 (percentage overall).



Participants could select multiple reasons for participating in the research (see Figure 3). Of the 75 participants who completed the post-test measures, 82.7% identified wanting to win the $100 VISA Gift Card, 65.3% identified interest in participating in research, 38.7% identified interest in mindfulness, 30.7% wanted personalized feedback, and 5.3% selected the "*other*" category (i.e., "*felt like I should*").

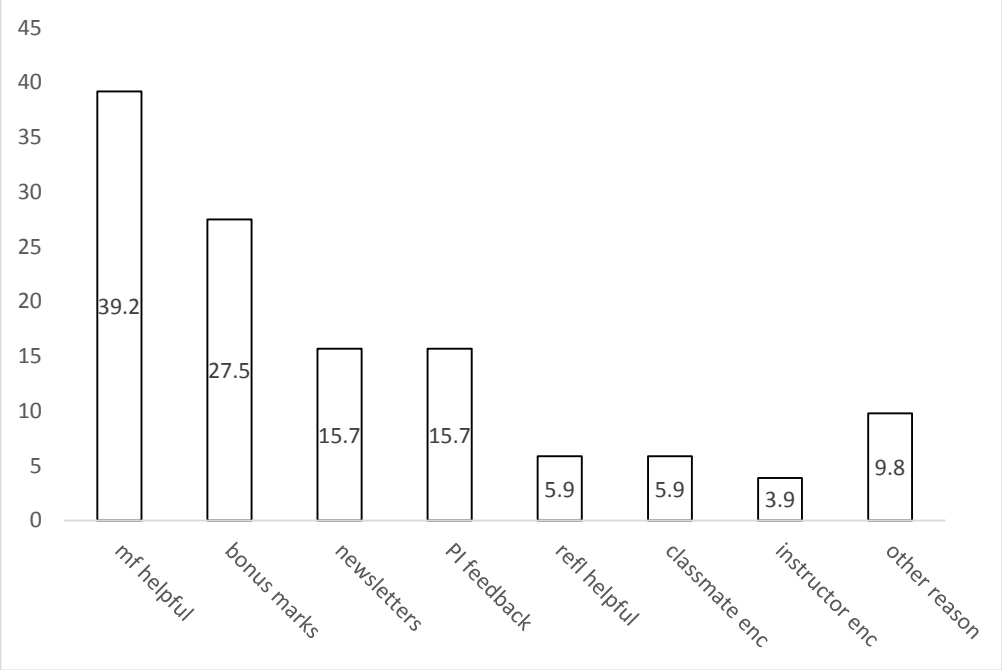
Figure 3.
Self-reported reasons for participation in the current study.



Participants were asked about the factors motivating them to complete reflections (see Figure 4). Most commonly, respondents endorsed finding the mindfulness activities helpful (39.2%, n = 20) and wanting to receive bonus marks in the course (27.5%, n = 14). A smaller number reported that their participation was due to being reminded by weekly newsletters (15.7%, n = 8), finding the reflections helpful

(5.9%, n = 3), motivation from investigator feedback on initial reflections (15.7%, n = 8), and/or encouragement from either class mates (5.9%, n = 3) or the course instructor (3.9%, n = 2). Five participants (9.8%) noted "*other*" reasons, such as a past positive experience with mindfulness.

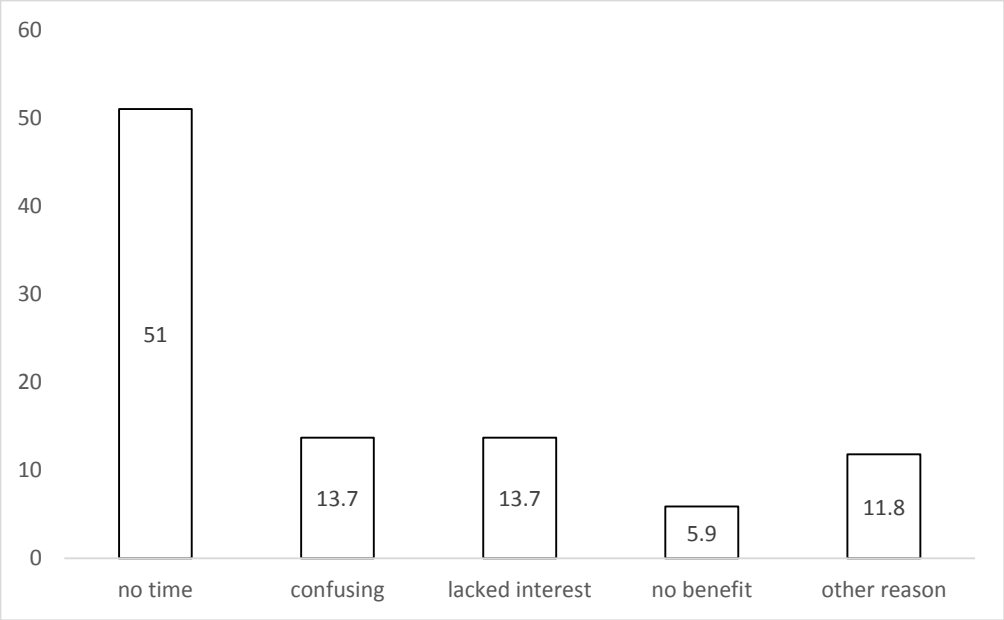
Figure 4.
Self-reported motivating factors to complete mindfulness reflections (percent overall)



When asked about barriers to completing the mindfulness practices and reflections, participants from the Intervention group (i.e., those who did and did not complete mindfulness reflections) identified the following (see Figure 5): insufficient time (51%, n = 26), the reflections being confusing (13.7%, n = 7), lack of interest (13.7%, n = 7), lack of perceived benefit (5.9%, n = 3), or another identified barrier (11.8%, n = 6). For example, one participant reported that they completed some mindfulness activities,

but did not submit any reflections (no reason provided). Another participant described their mindfulness practice as ongoing and constant, which did not lend itself to the format of the experiment.

Figure 5.
Self-reported barriers to completing mindfulness reflections



Hypothesis One: The mindfulness group will report increased levels of mindfulness following the intervention

Level of mindfulness was measured with the Five Facet Mindfulness Questionnaire (FFMQ, yielding a total score and five facet subscale scores), Mindful Attention and Awareness Scale (MAAS), and Southampton Mindfulness Questionnaire (SMQ).

Mindful Attention and Awareness Scale (MAAS). A repeated measures 2X2 ANOVA comparing the Mindfulness and No Mindfulness groups on pre- and post-test mindfulness measures found no significant effect of time or group on MAAS score ($F(1,72) = 1.234$, $p = .270$; $F(1,72) = .393$, $p = .533$).

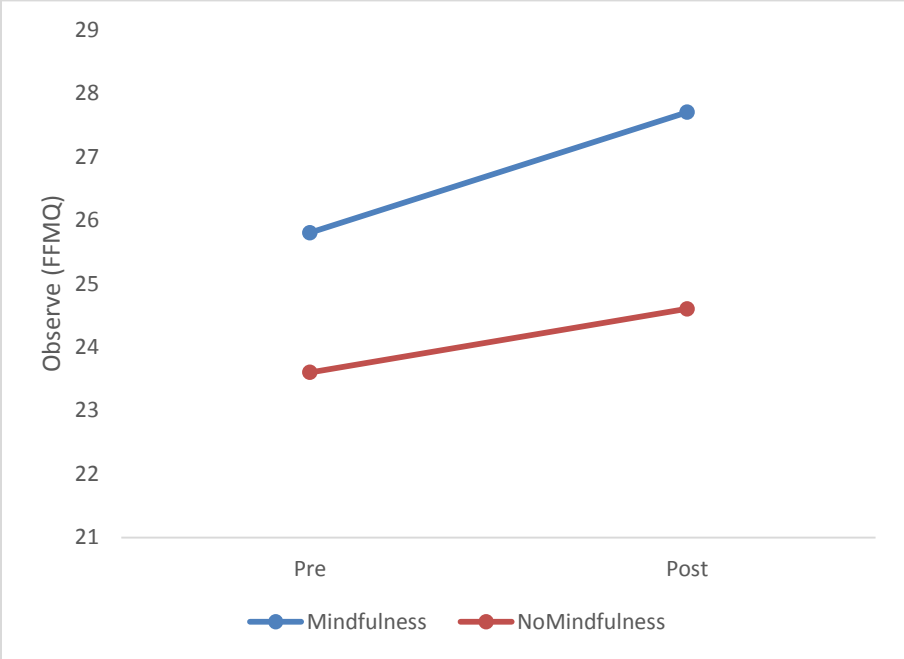
Southampton Mindfulness Questionnaire (SMQ). A repeated measures 2X2 ANOVA comparing the Mindfulness and No Mindfulness groups on pre- and post-test SMQ revealed no significant effect of either time or group on SMQ ($F(1,29) = 2.476$, $p = .126$; $F(1,29) = .425$, $p = .520$).

Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ yields five dimensional subscale scores (Observe, Describe, Act with Awareness, Non-Judge, and Non-React), in addition to a total score. A repeated measures 2X2 ANOVA revealed a significant effect of time on Observe ($F(1,72) = 5.565$, $p=.021$) but no effect of group ($F(1,72) = .540$, $p = .465$) (refer to Figure 6).

Similarly, there was a significant effect of time on Describe ($F(1,72) = 5.824$, $p = .018$), but no effect of group ($F(1,72) = .296$, $p = .588$) (Table 7). Further, there was a significant effect of time on Nonreact ($F(1,72) = 7.925$, $p = .006$) but no effect of group ($F(1,72) = 1.673$, $p = .200$) (Figure 8).

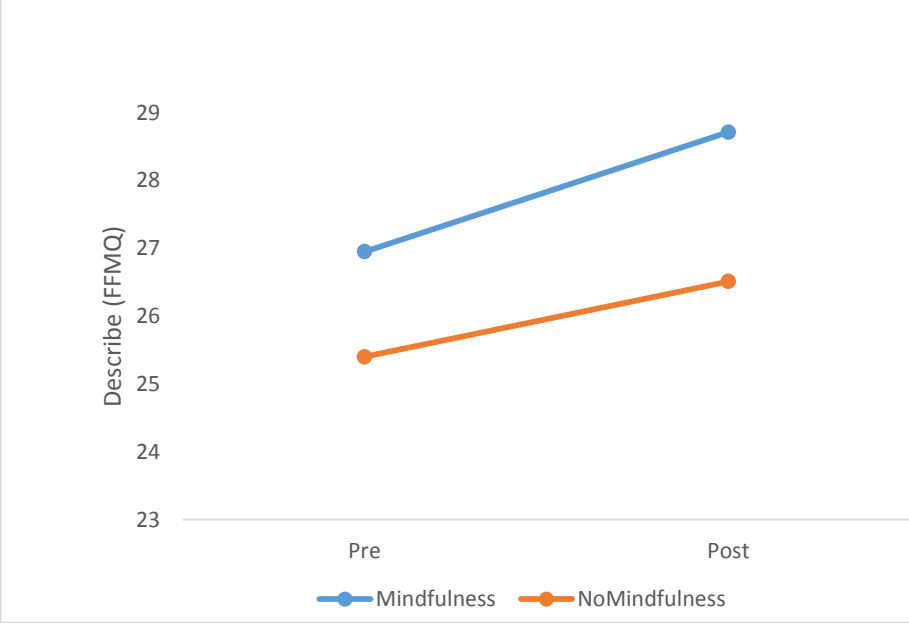
There was no effect of time or group on either Nonjudge ($F(1,77) = .028$, $p = .867$; $F(1,71) = .011$, $p = .916$) or Awareness scores ($F(1,70) = .031$, $p = .860$; $F(1,70) = .001$, $p = .982$). Overall, there was a significant effect of time on Total FFMQ ($F(1,72) = 8.988$, $p = .004$) but not group ($F(1,72) = 1.795$, $p = .185$) as per Figure 9.

Figure 6.
Effect of time and condition on Observe (FFMQ) scores



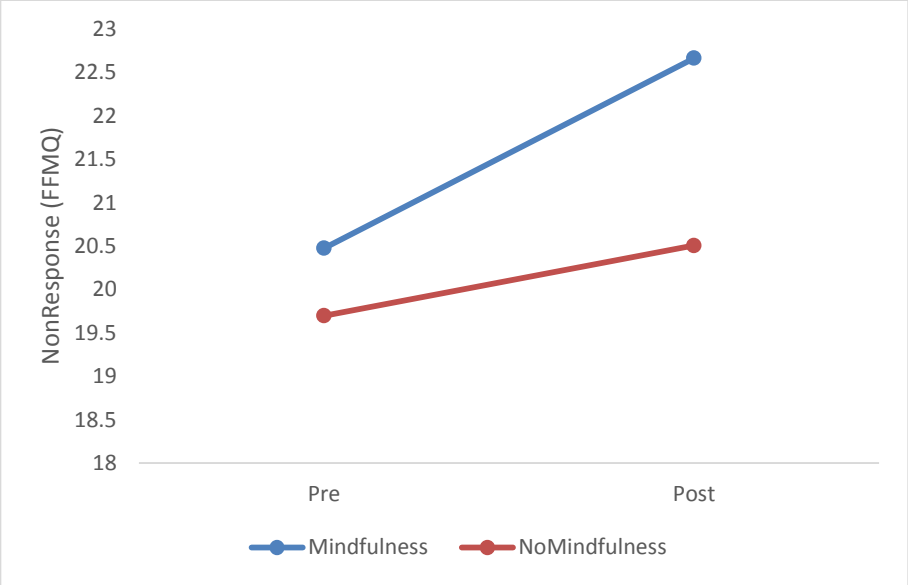
Note: Observed Power = .643 (time), = .112(condition).

Figure 7.
Effect of time and condition on Describe (FFMQ) scores



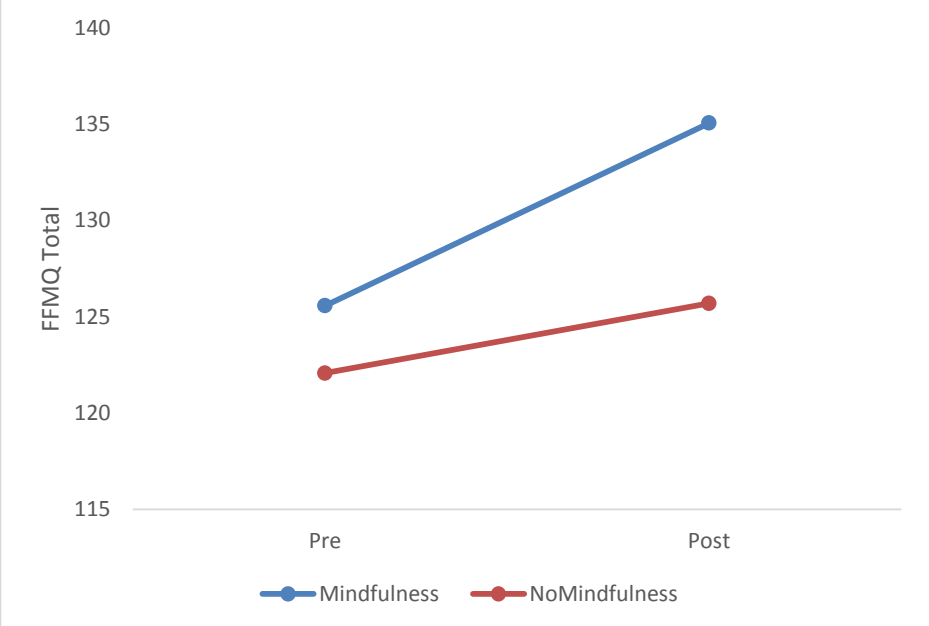
Note: Observed power = .663 (time), = .084 (condition).

Figure 8.
Effect of time and condition on NonResponse (FFMQ) scores



Note: Observed power = .793 (time), = .248 (condition).

Figure 9.
Effect of time and condition on Total FFMQ scores



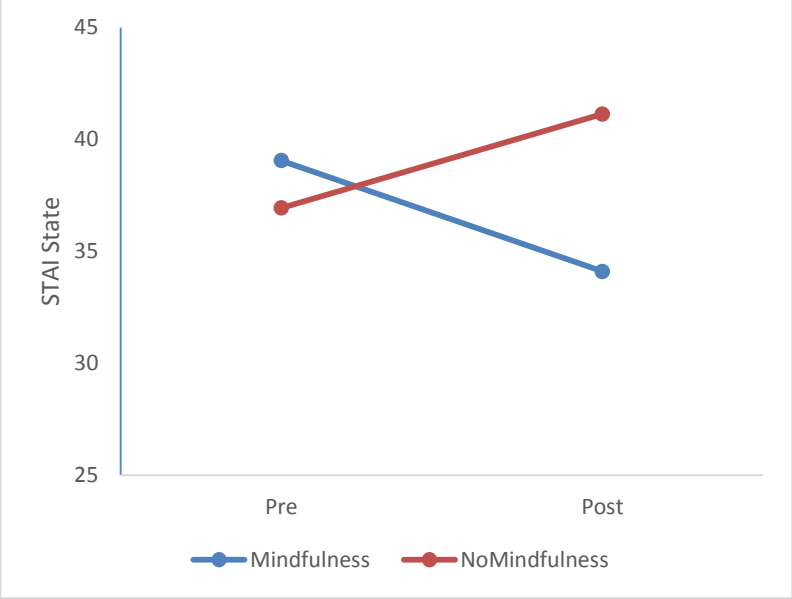
Note: Observed power = .841 (time), = .262 (condition).

Hypothesis Two: The mindfulness group will report decreased levels of psychological distress following the intervention, relative to the control group

The current research measured psychological distress with the STAI (State Trait Anxiety Inventory), PSS (Perceived Stress Scale), and SCL-90 (Symptom Checklist).

State-Trait Anxiety Inventory (STAI). A repeated measures 2X2 ANOVA revealed a significant effect of group on STAI State Anxiety ($F(1,74) = 12.268$, $p = .001$) as per Figure 10. The Mindfulness and No Mindfulness groups reported similar STAI State scores at the pre-test (39.05 and 41.13, respectively). At post-test, the Mindfulness group reported a mean score which had decreased to 34.10. In contrast, the No-mindfulness participants reported increased state anxiety scores (mean of 41.13).

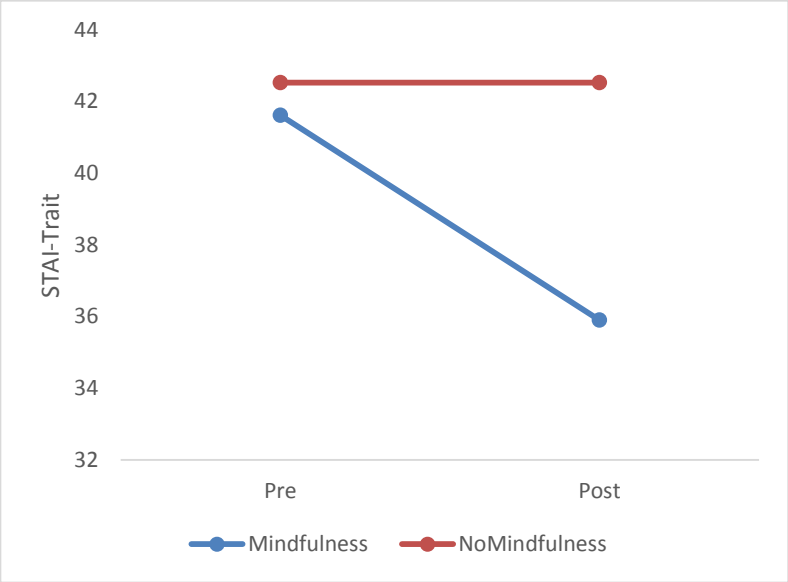
Figure 10.
STAI-State Score over time and condition.



Observed power =.059 (time), and .908 (condition).

A repeated measures 2X2 ANOVA found a significant effect of both time and group by time on STAI Trait anxiety ($F(1,72) = 5.584$, $p = .021$ for both time, and time by group) (Figure 11). The Mindfulness group reported significantly lower trait anxiety scores from pre- to post-test. In contrast, the mean score for the No-Mindfulness group remained unchanged from pre- to post-test (mean = 42.53).

Figure 11.
Effect of time and condition on STAI-Trait Scores



Perceived Stress Scale (PSS). Repeated measures 2x2 ANOVA revealed no significant effect of time or group on PSS scores ($F(1,69) = 2.687$, $p = .106$; $F(1,69) = .682$, $p = .412$). PSS mean scores were 17.52 ±6.887 at pre-test and 18.38 ± 6.909 at post-test.

Symptom Checklist (SCL-90). At pre-test, 52% of respondents met criteria for overall clinical distress (based on author-recommended cut-off scores for the SCL-90), which declined to 40% at post-test. Specifically, participants reported scores at or above

clinical levels (T ≥ 63) most frequently on the Obsessive Compulsive (44.3%), Interpersonal Sensitivity (32.8%), and Depression (32.8%) subscales of the SCL-90. At post-test, the percentage of participants scoring above clinical cut-offs demonstrated a downward trend across all scales, except Psychoticism (which remained consistent), as shown in Table 9. Despite this trend, there were no statistically significant effects of group or time when examined with a repeated measures 2x2 ANOVA.

Table 9.
Percentage of respondents exceeding clinical cut-off score on Symptom Check List(SCL-90) subscales and total Global Severity Index (GSI).

	percentage of respondents exceeding clinical cut-off (T-score >63)	
SCL-90 Subscale	Pre-test n=125	Post-test n=74
Somatization	24.6%	23.3%
Obsessive Compulsion	44.3%	29.7%
Interpersonal Sensitivity	32.8%	25.7%
Depression	32.8%	25.7%
Anxiety	23.8%	17.6%
Hostility	16.4%	8.1%
Phobic Anxiety	25.4%	12.2%
Paranoia	25.4%	21.6%
Psychoticism	27.9%	27.0%
GSI	32.0%	18.9%
PST	24.6%	20.3%
PSDI	22.1%	18.9%
Clinical Distress[ǂ]	52.1%	39.18%

[ǂ] = two or more scales ≥63 or GSI≥64

When the SCL-90 scores were examined via repeated measures 2x2 ANOVA, there was no significant effect of time, group, or interaction of the two on scores of the Somatization ($F(1,67) = 2.343$, $p = .131$; $F(1,67) = .681$, $p = .010$), Anxiety ($F(1,68) = 1.363$, $p = .247$; $F(1,68) = 2.481$, $p = .120$), Hostility ($F(1,68) = .524$, $p = .472$, $F(1,68) = .497$, $p = .483$), Phobia ($F(1,68) = 2.004$, $p = .161$; $F(1,68) = .165$,$p=.686$), Paranoia ($F(1,68) = .081$, $p = .776$; $F(1,68) = .257$, $p = .614$), or Psychoticism scales ($F(1,68) = .059$, $p=.808$; $F(1,68) = .187$, $p = .666$).

Several subscales demonstrated a significant effect of time only (i.e., the entire sample mean scores decreased significantly from pre- to post-test regardless of treatment group), when examined with a repeated measures 2x2 ANOVA. Mean scores on the Depression subscale decreased from a mean of 59.06 to 56.71 ($F(1,68) = 6.859$, $p = .011$) from the pre- to post-test period. Interpersonal Sensitivity means decreased from 58.56 to 56.33 ($F(1,68) = 7.364$, $p = .008$). Obsessive Compulsive subscale means decreased from 61.11 to 59.01 ($F(1,68) = 5.138$, $p < .028$). Finally, there was a statistically significant effect of time on GSI ($F(1,68) = 6.093$, $p = .016$) but no significant effect of group ($F(1,68) = .352$, $p = .555$), with a pre-test mean score of 59.00 which decreased to 56.57 at post-test.

Research Question Three: What is the effect of reported frequency (as measured by number of sessions of practice) of mindfulness practice on measures of mindfulness and distress?

The data were screened to meet the assumptions necessary for hierarchical regression analyses and determined to meet criteria (i.e., including continuous dependent variable, multiple independent variables, independence of observations as measured by the Durbin-Watson statistic, linear relationship between dependant and independent variables, homoscedasticity, no multi-collinearity as indicated by Pearson and VIF scores, no significant outliers as per casewise diagnostics and examination of Cook's distance, and a normative error distribution based on the QQ plots).

Mindfulness Scores and Number of Sessions

As outlined below (Table 10), a multiple regression predicting the post-intervention State Trait Anxiety Inventory Trait score (STAIT post) based on the pre-test score and number of mindfulness sessions practiced was conducted. These variables significantly predicted the STAIT post, $F(73,2) = 24.845$, $p = .043$, $R^2 = 0.405$. Each session of mindfulness practice decreased the expected STAIT post score by .187.

Table 10.
Predictors of post-intervention STAIT score in hierarchical regression.

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.405	.381	24.845	73	2			
STAIT						.623	6.883	.000*
Sessions						-.187	-2.059	.043*

Notes: STAIT = State Trait Anxiety Inventory Trait Scale, * = p > .05.

As outlined below (Table 11), a multiple regression predicting the post-intervention Act with Awareness (ACT) subscale score of the Five Facet Mindfulness Questionnaire on the pre-test score and number of total mindfulness sessions was conducted. These variables significantly predicted the ACT post, F (71,2) = 20.591, p = .045, R^2 = 0.367. For every additional minute of mindfulness practice, the ACT post score increased by .192 (i.e., every ten sessions resulting in an increase of almost two points on the subscale).

Table 11.
Predictors of post-intervention FFMQ ACT subscale score in hierarchical regression (sessions).

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.367	.349	20.591	71	2			
FFMQ						.569	6.021	.000*
Sessions						.192	2.037	.045*

Notes: ACT = Act with Awareness subscale, Five Facet Mindfulness Questionnaire,
* = p > .05.

Scores were further examined using a multiple regression (Table 12 below) predicting the post- Five Facet Mindfulness Questionnaire (FFMQ total score) on the pre-test score and number of total mindfulness sessions. These variables significantly predicted the FFMQ post, F (73,2) = 23.332, p = .006, R^2 = 0.390. For every additional minute of mindfulness practice, the FFMQ score increased by .259 (i.e., every ten sessions resulting in an increase of almost 3 points).

Table 12.
Predictors of post-intervention FFMQ total score in hierarchical regression (sessions).

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.390	.393	23.332	73	2			
FFMQ						.555	6.058	.000*
Sessions						.259	2.833	.006*

Notes: FFMQ = Five Facet Mindfulness Questionnaire total score, * = p > .05.
When both minutes and sessions were added as predictors for FFMQ total score, number of sessions was a more robust predictor and the minutes variable was excluded from the model as a predictor.

Psychological Distress and Number of Sessions

As outlined below in Table 13, a multiple regression was run to predict the post-intervention SCL-90 Obsessive-Compulsive subscale score (OC post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the OC post, F (69,2) = 29.157, p = .024, R^2 = 0.458. For every additional minute of mindfulness practice, the OC post decreased by 0.206 (i.e., therefore, an additional ten minutes of practice would decrease the score by two points).

Table 13.
Predictors of post-intervention SCL-90 Obsessive-Compulsive subscale score in hierarchical regression (sessions).

Model	R^2	R^2adj	F	df1	df2	β	T	sig
1	.458	.442	29.157	69	2			
OC pre						.668	7.488	.000*
Sessions						-.206	-2.312	.024*

Notes: SCL-90 = Symptom Checklist 90, OC = obsessive compulsive subscale, * = p > .05.
When both minutes and sessions were added into a stepwise regression analysis to predict post-OC scores, the minutes variable was excluded from the model as a predictor and sessions remained a more robust predictor of post-intervention OC scores.

Table 14 below outlines a multiple regression predicting the post-intervention SCL-90 Depression subscale score (DEP post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the DEP post, F (69,2) = 24.370, p = .038, R^2 = 0.414. For every additional minute of mindfulness practice, the DEP post score decreased by 0.197.

Table 14.
Predictors of post-intervention SCL-90 Depression subscale score in hierarchical regression (minutes).

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.414	.397	24.370	69	2			
DEP						.646	6.912	.000*
Minutes						-.197	-2.110	.038*

Notes: SCL-90 = Symptom Checklist 90, DEP = Depression subscale * = p > .05.
When minutes and session variables were added into a stepwise regression analysis, the sessions variable was excluded as a predictor; the minutes variable remained a more robust predictor of post-intervention DEP scores.

Multiple regression analysis did not reveal a significant contribution of number of sessions of mindfulness practice on the following post-intervention test scores: State Trait Anxiety Inventory State (STAIS), the Observe, Describe, NonJudge, or NonReact facets of the Five Facet Mindfulness Questionnaire (FFMQ), the Mindful Attention and Awareness Scale (MAAS), The Perceived Stress Scale (PSS), the Southampton Mindfulness Questionnaire (SMQ), or the Somatization, Interpersonal Sensitivity, Anxiety, Hostility, Phobia, Paranoia, or Psychosis subscales or the General Symptom Index 9GSI) scale of the Symptom Checklist 90 (SCL-90).

Research Question Four: What is the effect of duration (measured by overall minutes) of mindfulness practice on measures of mindfulness and distress?

As in the above research question, data were screened to ensure assumptions for hierarchical regression analysis. Multiple regression analyses were carried out for each pre/post intervention test score and the number of minutes practiced. Of the 21 possible outcome variables, there was a statistically significant contribution of mindfulness practice minutes to the depression, obsessive-compulsive, and hostility scores (i.e., decreased distress score) as well as an increase in overall mindfulness (i.e., measured by the Five Facet Mindfulness questionnaire).

Mindfulness Measures and Number of Minutes

As outlined below (Table 15), a multiple regression predicting the post-intervention Five Facet Mindfulness Questionnaire (FFMQ post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the FFMQ post, $F(73,2) = 21.127$, $p = .028$, $R^2 = 0.367$. For every additional minute of mindfulness practice, the FFMQ post score increased by 0.210 (i.e., every ten minutes of practice would increase the FFMQ score by two points).

Table 15.
Predictors of post-intervention FFMQ total score in hierarchical regression (minutes).

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.367	.349	21.127	73	2			
FFMQ						.588	6.282	.000*
Minutes						.210	2.246	.028*

Notes: FFMQ = Five Facet Mindfulness Questionnaire, * = p > .05.
When both minutes and sessions were added as predictors for FFMQ total score, number of sessions was a more robust predictor and the minutes variable was excluded from the model as a predictor.

Psychological Wellness and Number of Minutes

As outlined below in Table 16, a multiple regression was run to predict the post-intervention SCL-90 Obsessive Compulsive subscale score (OC post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the OC post, F (69,2) = 28.608, p = .034, R^2 = 0.453. For every additional minute of mindfulness practice, the OC post decreased by 0.194 (i.e., therefore, an additional ten minutes of practice would decrease the score by almost two points).

Table 16.
Predictors of post-intervention SCL-90 Obsessive-Compulsive subscale score in hierarchical regression.

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	0.453	0.437	28.608	69	2			
OC pre						.669	7.548	.000*
Minutes						-.194	.2.168	.034*

Notes: SCL-90 = Symptom Checklist 90, OC = obsessive compulsive subscale, * = p > .05.
When both minutes and sessions were added into a stepwise regression analysis to predict post-OC scores, the minutes variable was excluded from the model as a predictor and sessions remained a more robust predictor of post-intervention OC scores.

A multiple regression (Table 17, below) predicting the post-intervention SCL-90 depression subscale score (DEP post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the DEP post, F (69,2) = 26.219, p = .011, R^2 = 0.432. For every additional minute of mindfulness practice, the DEP post score decreased by 0.239.

Table 17.
Predictors of post-intervention SCL-90 Depression subscale score in hierarchical regression.

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.432	.415	26.219	69	2			
DEP						.652	7.088	.000*
Minutes						-.239	-2.600	.011*

Notes: SCL-90 = Symptom Checklist 90, DEP = Depression subscale * = p > .05.
When minutes and session variables were added into a stepwise regression analysis, the sessions variable was excluded as a predictor; the minutes variable remained a more robust predictor of post-intervention DEP scores.

Table 18 outlines a multiple regression predicting the post-intervention SCL-90 Hostility subscale score (HOS post) based on the pre-test score and number of mindfulness minutes practiced. These variables significantly predicted the HOS post, F (69,2) = 25.392, p = .042, R^2 = 0.424. For every additional minute of mindfulness practice, the HOS post score decreased by 0.191 (or two points for every ten minutes of practice).

Table 18.
Predictors of post-intervention SCL-90 Hostility subscale score in hierarchical regression.

Model	R^2	R^2adj	F	df1	df2	β	t	sig
1	.424	.407	25.392	69	2			
HOS pre						.651	7.050	.000
Minutes						-.191	-2.068	.042

Notes: SCL-90 = Symptom Checklist 90, HOS = Hostility subscale, * = p > .05.

Multiple regression analysis did not reveal a significant contribution of number of minutes of mindfulness practice on the following post-intervention test scores: State Trait Anxiety Inventory State and Trait scores (STAIT and STAIS), the Observe, Describe, Act with Awareness, NonJudge or NonReact facets of the Five Facet Mindfulness Questionnaire (FFMQ), the Mindful Attention and Awareness Scale (MAAS), The Perceived Stress Scale (PSS), the Southampton Mindfulness Questionnaire (SMQ), or the Somatization, Interpersonal Sensitivity, Anxiety, Phobia, Paranoia, or Psychosis subscales or the General Symptom Index (GSI) scale of the Symptom Checklist 90 (SCL-90).

Frequency (Sessions) and Duration (Minutes)

Multiple regression models revealed a significant contribution of both sessions and minutes to the respective models examining SCL-90 Depression and Obsessive Compulsion scales as well as Five Facet Mindfulness questionnaire scores. To examine any additive effects (of both sessions and minutes) to the pre-intervention test score on the post-intervention score, stepwise regression analyses were carried out for these three cases. Analyses determined that number of sessions was a more robust predictor of FFMQ and OC post scores, and the number of minutes variable was excluded from the

model. In contrast, for DEP post scores, number of minutes was the more robust predictor, and number of sessions was excluded from the model.

DISCUSSION

Study Summary

This quasi-experimental pilot project examined the effect of a 12-week self-directed, web-based mindfulness practice among undergraduate students enrolled in a metacognition course. In the control section of the course, participants completed the coursework as usual with no additional mindfulness practice component. In the experimental sections, participants were encouraged to complete a daily mindfulness practice (either meditation, body scan, yoga practice, or "other" practice of their choice). Course credit was awarded when students submitted reflections detailing the practice, the duration, and a brief comment on any physical, emotional, or cognitive experiences they noticed. The mindfulness resources and principle investigator interaction were informed by recommendations from previous research on web-based mindfulness practice among undergraduates. All participants were asked to complete pre- and post-intervention measures of mindfulness (FFMQ, SMQ, and MAAS) and psychological distress (SCL-90, and STAI), as well as reasons for participating in the study, and motivators and barriers to their mindfulness practice (if applicable). Number of minutes (duration) and sessions (frequency) of practice were also tracked to provide further data on optimal dosage to yield response. This pilot study's goal was to examine

the feasibility and effectiveness of integrating student-driven mindfulness practice as a course component, which would ideally require minimal instructor time while allowing students to gain the benefits of mindfulness practice.

Summary of the Main Findings

The current study found some evidence to support an increase in psychological wellness among students in the Mindfulness Group but failed to find support for increased Mindfulness when only effect of condition was considered. However, once number of sessions and minutes of mindfulness practice were included in the model, participants in the Mindfulness condition reported increased levels of mindfulness and psychological wellness. This is a significant contribution to the literature, because the measurement of sessions (frequency) and minutes (duration) has not been previously examined. The current results may assist in designing more effective self-administered mindfulness interventions for undergraduates. The findings for the hypotheses and research questions are discussed in detail below.

Perhaps the largest weaknesses of the study were difficulties with recruitment, engagement, and response; however, these issues are common in mindfulness research and rates in the current study were comparable to rates reported in similar studies (Cavanaugh et al, 2013; Lauricella, 2013; Morledge et al, 2013), suggesting that difficulties with engagement with mindfulness practices and high attrition rates are specific hurdles to be addressed when designing interventions. The current study

utilized recommendations from previous studies, and highlights several issues to consider in future research specific to web-based, self-directed mindfulness interventions with undergraduate students.

While the bulk of published studies in the area of mindfulness report positive outcomes for psychological health and mindfulness facets, findings in the more specific area of web-based, self-directed mindfulness interventions with undergraduates have been considerably more variable. While some clinicians and popular media tout mindfulness practice as something of a fool-proof panacea, it is important to present lacklustre findings and use them to inform interventions that target commonly encountered pitfalls for the population in question. The current study suggests that mindfulness skills must be delivered in a purposeful way informed by population-specific research, that a "one-size fits all" approach may fail to attract the bulk of participants.

Hypothesis One: Mindfulness Scores

The first study hypothesis was that the reflection group would report a greater increase in mindfulness from pre- to post-treatment than the control group. However, there were no significant changes detected on the Mindful Attention and Awareness Scale (MAAS), or Southampton Mindfulness Questionnaire (SMQ) across time for either group. Contrary to expectations, participants in both conditions reported a significant improvement in their describing, observing, and non-reacting skills and an overall

improvement in total mindfulness measured by the Five Facet Mindfulness Questionnaire (FFMQ).

The increase in several FFMQ scores from pre- to post-test periods may reflect several factors. Firstly, the nature of the course material (meta-cognitive skills) may have affected general or more specific mindfulness skills. Additionally, the mere act of responding to a mindfulness questionnaire may exert positive influence on mindfulness. As noted by Korotitsch and Nelson-Gray (1999), self-monitoring and self-report (without actual intervention) can influence behaviour change, particularly in those interested in mindfulness from the outset. Finally, sign up for the study by self-selection may reflect a mindfulness-orientation bias among the population – particularly since only half of the available sample signed up to participate. It may be that the more psychologically-minded participants, or those more interested in mindfulness signed up for the study, and this therefore impacted results. For example, the pre-intervention baseline measures of mindfulness may have been artificially elevated or otherwise skewed because of self-selection.

A follow-up study where all students were required to engage in mindfulness practice as a component of the course would address the above limitation.

Hypothesis Two: Psychological Distress

The current study measured psychological distress with the State Trait Anxiety Inventory (STAI), the Perceived Stress Scale (PSS), and the Symptom Checklist (SCL-90).

At pre-test, participant scores on the STAI-T were consistent with cross-cultural means for college students (i.e., 39.48 +/- .36 as reported by Baloglu, Abbasi and Masten, 2007). Participants in the mindfulness group experienced a significant decrease in trait anxiety, while the control group reported a significant increase in trait anxiety from pre- to post-treatment. Participants who completed mindfulness reflections perceived themselves as generally less anxious in temperament at post-test, compared to their pre-intervention levels. This is notable because the post-test occurred during the final week of classes, when students typically experience an increase in assignments, evaluation measures, and the approach of final course exams. While Bergen-Cico and colleagues (2013) failed to detect a change after their 5-week intervention, it may be that a longer period of practice was necessary for participants to experience a detectable change in a more general trait-level measure.

While both groups reported similar levels of state anxiety prior to the intervention, the mindfulness group reported a significant decrease in their state anxiety levels at post-test, while the non-mindfulness group remained unchanged. As mentioned above, this is a notable finding as the mindfulness group reported lower levels of acute stress despite the inherent end-of-semester stress of exams and potential increased workload. In summary, the mindfulness group generally perceived themselves as less anxious, both in general (trait) and in the moment (state) at post-test, compared to their pre-test evaluations.

The current study did not find any effect of time or condition on perceived stress. Mean stress scores were higher than general population normative scores at pre-test, which is not surprising given elevated stress documented in undergraduate populations. Similar studies (Cavanaugh et al., 2013; Morledge et al., 2013) have reported significant decreases in PSS scores for mindfulness groups after intervention compared to controls. However, participant means at pre-test in the current study (i.e., 17.52 ±6.887) were notably lower than those found in similar studies with undergraduate populations (i.e., 23.05 ± 6.61 reported by Bergomi et al. (2013), and 21.70 reported by Cavanaugh et al. (2013), indicating that the current participants may have experienced a floor effect. In contrast, the current study's post-test means were reflective of the post-test values reported by Cavanaugh and colleagues. It is unclear what factors may have influenced relatively low baseline stress levels in the current population.

Finally, psychological distress was evaluated with the SCL-90, with no significant effects of time or group on scores. In comparison, Cavanaugh and colleagues (2013) found decreased anxiety and depression scores after their mindfulness intervention as measured by the Patient Health Questionnaire (PHQ-4). Morledge and colleagues (2013) utilized the Psychological Well-Being Self-Acceptance subscale, Subjective Vitality Subscale, and the RAND 36-item Short Form Health Survey (SF-36), and detected significant improvements on these measures for more active mindfulness group participants. In contrast, Bergen-Cico, Possemato, and Cheon (2013) measured

psychological health with the Self-Compassion Scale, and found no significant changes over time.

While no effect of group was detected in the current study (on the SCL-90), mean scores on several scales decreased from pre- to post-test periods, including the Interpersonal Sensitivity, Obsessive-Compulsive, and GSI (Global Severity Index, or degree of symptoms seriousness). It is unclear what factors affected the change in scores. While meta-cognitive skills training (gained from the UCC 2020 course) may have decreased perfectionistic rigidity or overall experience of distress, it's unclear how these skills may have influenced interpersonal relationships. Perhaps there is a connection with skills measured on the Self-Acceptance measure used by Morledge and group (2013), and relationships with others being correlated with certain mindfulness skills.

Despite a lack of statistically significant findings for the main hypothesis, there were some interesting findings in terms of descriptive statistics. Clinical levels of distress were reported by 52% of students at pre-test, which decreased to 40% at post-test. While the SCL-90 measures Anxiety, it was the second-to-last most commonly elevated scale for participants. This finding is consistent with the relatively low scores on the PSS versus similar studies. Yet, participant scores on the STAI state and trait measures reflected national averages among students. Perhaps participants experience relatively lower anxiety, or perceive their anxiety as less problematic in their lives than their counterparts at other schools, but still experienced a decrease in their own relative

state and trait levels after the intervention. Aside from citing colloquial references to easy-going Newfoundland culture, it is unclear what other factors may have influenced the participants' anxiety and stress scores in the current study, compared to similar cohorts in other North American studies.

Research Question Three: Practice Frequency in Sessions

When number of sessions (frequency of practice) was included in a regression analysis, there were significant decreases on the scores of trait anxiety (STAI-T) and Obsessive Compulsion (a subscale of the SCL-90 which reflects rigidity), and an increase in overall level of mindfulness (measured by the FFMQ total scale). These results suggest that more sessions of mindfulness practice (regardless of how long those sessions were), contributes to participants' self-evaluation as less anxious, more flexible, and more mindful.

Research Question Four: Practice Duration in Minutes

In contrast, when number of minutes of total practice (duration of practice) was included in a regression analysis, there was a significant decrease in self-reported Depression and Hostility (SCL-90 subscales). While sessions appeared to have more of an effect on anxiety and flexibility, the total minutes affected scales linked to depressed mood (crying, anhedonia, dysthymia) and general hostility (items reflective of anger). Perhaps anxious-type symptoms respond more effectively to repetitious practice, while negative affective symptoms are more responsive to practices of increased duration. These early findings may help target practice guidelines and resources to specific needs

among undergraduates (i.e., longer mindfulness practices on resource sheets for undergraduates reporting low mood; more frequent practices of any duration for those with high anxiety). Future research which aims to replicate these findings will assist in making recommendations that yield more effective and individualized outcomes for students who struggle to allocate limited time and resources to mindfulness practice.

Discussion of Sample Characteristics

Demographic data was collected during the pre-test period (week 1 in class and online). Efforts were made to select a sample representative of the general undergraduate student population. The age of the current sample ranged from 17 to 32 years, and was divided evenly across years of education, program of study, place of residence (campus residence, off-campus housing, or with parents). The ethnic composition reflected the homogenous background of students in St. John's, Newfoundland. The sample appears reflective of the undergraduate population at Memorial University of Newfoundland, which may allow for generalization of findings to a wider group than in past studies, which typically used non-representative samples.

Gender. A common critique of existing literature has centered around gender imbalance in study samples. In a meta-analysis of stress-relieving and mindfulness interventions among undergraduates (by Regehr, Glancy, and Pitts, 2013), 24.0% of participants identified as male. In contrast, the current study was comprised of 30.3% male participants (including 33.0% male participants in the reflection group). The higher proportion of male participants in the current study may be due to UCC2020 being an

open-access course unaffiliated with any faculty or program, thereby reducing effects of imbalanced gender enrollment observed in many academic programs (Lauricella, 2013; Morledge et al., 2013).

Academic program. A second common critique centres on over-sampling from students registered in psychology, social work, or similar courses, which may result in an over-representation of psychologically-minded participants (i.e., individuals predisposed towards interest in or practice of mindfulness). Of the current sample, 4.0% reported enrollment in a psychology program. Most participants reported enrollment with the Faculties of Arts (e.g., history, philosophy, language, gender studies, sociology, etc.), Science (e.g., chemistry, biology, math, etc.) or Business, with fewer hailing from programs within the faculties of Education or Human Kinesthetics. Therefore, the current study provides more diverse academic representation than is often found in existing studies of mindfulness among undergraduates. Additionally, the current sample may reflect challenges of successfully implementing mindfulness interventions across a general undergraduate population, versus a self-selected or psychologically-minded undergraduate population.

Despite the above argument, the nature of the course material (i.e., metacognitive skills) may have attracted more psychologically-minded students to register for the course, leading to a biased sample. Indeed, the majority (68.3%) of post-test respondents reported that they signed up for the course with the goal of improving their metacognitive or study skills. However, most participants (57.3%) also attributed

course registration to recommendation by a friend, and 45.3% had heard the course was "easy." Other reasons for enrollment included recommendation by a counsellor or instructor (18.7%), interest based on the course calendar description (9.3%), or some other reason (1.3%, such as "*it fit with my time table*"). These responses suggest that students enrolled in the course for multiple and varied reasons aside from the content.

Engagement Statistics

Reasons for research participation. Most participants identified being motivated by the incentive (i.e., random gift card draw for those completing pre- and post-measures), or general interest in research. Fewer reported interest in mindfulness as their reason for participating (38.7%). Despite efforts to counteract this, the current engagement and attrition rates were consistent with previous studies where participants were recruited based on self-identified mindfulness interest (i.e., Cavanaugh et al., 2013; Morledge et al., 2013). Just over 30% reported interest in personalized results feedback as a salient factor, yet only two participants scheduled and attended feedback appointments. This low rate may have been due to feedback sessions being held after classes were finished for the term (to include post-test results); however, it is unclear if more students would have attended a feedback session if offered several weeks later, when the new semester began (or if this would have been too much of a time lag).

Factors motivating intervention participation. The participants completing mindfulness reflections reported that they were primarily motivated by helpfulness of

activities (n=20, 74.0%). Based on an overall positive experience with the intervention, recruitment and retention may have been bolstered by leading a brief, experiential mindfulness activity during the initial recruitment session. Alternately, having a portion of the in-class course material dedicated to teaching several mindfulness activities may have increased self-directed engagement through exposure to mindfulness and (ideally, positive) supported experience with the practice (Lauricella, 2013; Morledge et al., 2013).

Bonus marks were identified as a salient motivator by half of participants who submitted reflections. Participants in the intervention condition who did not submit reflections (i.e., non-reflectors) may have perceived that the required input was not worth the academic reward. It is unclear if participation would have been affected based on total available bonus marks or number of reflections required per bonus mark.

The bulk of participants who submitted reflections did so following reminders in the newsletter about the blocks required for the bonus (i.e., 15 reflections for 1% bonus in the course). Future iterations of the course would likely experience better participation if self-directed mindfulness activities were included as a required portion of the graded syllabus (versus being offered bonus marks).

Several engagement strategies in the current study were derived from recommendations by Morledge and colleagues (2013), based on their 12-week internet-based mindfulness program. Their use of an interactive message board was reported to increase the participant experience and lead to decreased attrition. Even though

participants in the current study attended class together, there appeared to be little sense of community regarding the online material (with only 22.0% reporting encouragement from classmates and/or instructor as a motivating factor to complete reflections). Perhaps this was due to the low overall number of participants completing mindfulness reflections (i.e., 27 people scattered across four randomly-assigned course sections). Almost one third of participants reported being motivated by feedback from the PI, suggesting that this interaction provided a sense of community or accountability for some participants.

Morledge and colleagues (2013) discussed the importance of frequent contact with participants to maximize participation. The current project sought to increase contact through weekly mindfulness newsletters (i.e., sent to participants' email inbox on Sunday evenings). The newsletters were reported to be helpful in motivating practice by almost one third of participants who completed reflections.

Barriers to participation. "Insufficient time" was the most commonly cited barrier to participation among the Intervention group during the post-test measurement period (i.e., both those who did and did not complete mindfulness reflections, n=26, 51.0%). Participants also reported being confused by the process, lack of interest, or lack of perceived benefit as barriers to participation. The weekly newsletters emphasized that mindfulness practice can often create the sense that practitioners have more time, due to effects on attention, concentration, memory, and perceptions of stress. Despite this, the perception of not having enough time to dedicate to practice is

a barrier that must be considered, particularly among a population which frequently reports feeling over-extended and stressed due to academic obligations (Craggs, 2012). For that reason, exposure to mindfulness in class time or during the recruitment may have been beneficial, for participants to experience the benefits of mindfulness while minimizing misconceptions.

Reflection Group Findings

The following sections outline the findings regarding frequency statistics for the Intervention Group (i.e., participants from the 4 intervention class sections who chose to complete mindfulness activities and submit online reflections). Roughly 1/3 of intervention participants completed a reflection.

Length and frequency of practice. In the current study, mindfulness practice averaged 18 sessions, and 191 minutes over 12 weeks with wide ranges of commitment between participants. In contrast, the study by Bergen-Cico and colleagues (2013) had undergraduates practice in a formal group more time over a shorter duration (i.e., approximately 300 minutes over five weeks, or 60 minutes weekly). Despite the longer practice time (versus the current study), the authors concluded that 5 weeks was an insufficient time period to produce robust findings (beyond trends in the predicted directions). Given that the current study detected significant findings across a number of variables with less practice time over a longer period, more-but-shorter-sessions over a longer period may be a more salient factor for producing desired outcomes than a short-but-intense burst of long practices. Indeed, the literature on habit formation

suggests that repetition may be more effective than duration in cultivating long-term change (Lally, vanJaarsveld, Potts, & Wardle, 2009).

Furthermore, Hindman, Glass, Arnkoff, and Maron (2015) found evidence that longer duration of practice improves outcomes by comparing mindfulness and wellness among undergraduates assigned to one of three groups (i.e., formal 45-minute meditation, brief meditation, and waitlist control). The meditation groups met one hour weekly over 6 weeks and were instructed to practice independently between sessions. Researchers reported that both intervention groups were superior to waitlist control; however, formal meditation participants demonstrated more robust findings across more indicators than those who practiced brief meditation strategies. Despite these differences, there were no significant relationships between time spent meditating and changes in mindfulness of psychological distress variables.

Thus, across studies to date it remains unclear to what extent total minutes or total sessions of practice have on outcome variables, and what "optimal" time frames are required to produce changes in mindfulness and/or psychological wellness (i.e., one may require more time than the other).

It is also unclear how type of practice contributes to these findings. In the current study, participants chose to practice meditation most often, followed by body scan, yoga, and "other" types of mindfulness (i.e., mindful baking or dish-washing).

Participants also spent the most time practicing meditation, followed by "other" activities, yoga, and then body scans.

It appears participants were more likely to practice short (about 7 minute) body scan sessions on a more frequent basis. Longer practices were chosen less frequently (yoga or "other" practices averaging 14 and 29 minutes, respectively). The typical meditation practice was about 10 minutes in duration. These results suggest that some types of practice (e.g., meditation or body scan) may be more sustainable for short periods of time (perhaps due to the resources required), while others (e.g., yoga, or mindful practice of everyday experiences) may be more suitable for a longer practice.

An alternate explanation may be that certain practices (such as body scan) are more conducive to shorter periods of practice (than, say, a yoga practice). Participants in the current study may have been biased toward practices of a relatively short duration (versus the 45-minute meditations characteristic of MBSR). Suggested sources in the current study did not exceed 22 minutes in length, based on the assumption that students would prefer and/or be more likely to engage in time-limited practices. This assumption is challenged by Hindman, Glass, Arnkoff, and Maron (2015), where participants in the formal 45-minute meditation condition reported their intervention as more helpful and having better outcomes than the brief mindfulness group. It is unclear how these results may have been affected if adapted into a purely web-based, self-directed practice.

Study Strengths and Limitations

Strengths. The current study sought to implement recommendations from previous similar studies (i.e., such the web-based intervention by Cavanaugh et al, 2013) with the hope of replicating or improving upon previous findings. Additionally, the study was designed to correct for previous gender and academic program imbalance noted in the existing literature (i.e., female-majority and populations from psychology, social work, and associated programs or those self-selecting into a mindfulness study). Indeed, the demographic breakdown of the current study appeared to be more representative of the general undergraduate population (particularly at Memorial University of Newfoundland) than previous studies, which may suggest that results are generalizable to undergraduates in diverse programs (versus undergraduate students in psychology courses or the helping professions, such as nursing and social work). This factor may also partially account for lackluster findings, as previous studies have speculated that females, those in social science programs, and those who self-select in to such studies may experience more robust effects from a mindfulness practice.

Limitations. The current study was limited by small sample size, primarily among the intervention group, as only 29/88 participants submitted mindfulness reflections. This was a pilot project and course instructors were hesitant to require mindfulness practice as part of the course itself. Given the encouraging findings related to state and trait anxiety, and general direction of results at the trend level, this study provides preliminary support that integrating mindfulness as part of undergraduate education

may assist with enhancing psychological wellness. However, future implementation should be mindful of the pitfalls encountered at multiple phases of the intervention; the main limitation of the current study is the possibility of selection bias at the recruitment, engagement, and post-treatment stages.

While the course sections were randomly assigned to either the intervention or control group (with counter-balancing for time-of-day and instructor effects), students within the sections self-selected into participation, which likely dampened efforts for a quasi-experimental design. Future iterations of this research requiring completion of mindfulness practice as a component of the course would address this pitfall.

***Limitation: Recruitment*.** Maximizing recruitment, engagement, and retention were challenges of the current research; however, observed levels were generally consistent with rates reported in the existing literature for mindfulness interventions with undergraduate students. From the outset, just over half of the available sample provided consent to participate and completed the pre-test battery (about 60% of students in the intervention group and 40% in the control group). As mentioned previously, this half of participants may have differed on some relevant measure in the study (for example, greater interest in mindfulness and potential high baseline mindfulness level, or higher psychological distress and potential desire to enroll to gain the benefits of mindfulness, and so on). Given the 50:50 ratio of participants versus non-participators, it is unclear if the study results are truly reflective of the overall available population from UCC2020, or undergraduates as more general group.

Limitation: Attrition. Further complicating this issue was a high level of pre- to post-intervention attrition with approximately 60% of the enrolled participants completing the post-intervention battery at week 12 (i.e., 40% drop-out rate). The current study was aware of attrition as a common limitation of similar research, and attempted to minimize drop-outs by offering incentives to complete both sets of measures (i.e., a chance to win a $100 VISA gift card). Despite these efforts, the current attrition rate remained comparable to existing studies.

Cavanaugh and colleagues (2013) identified attrition as a weakness of their study examining self-guided mindfulness-based interventions with undergraduates. In that study, participants self-selected into the study by responding to recruitment posters for a mindfulness course. Attrition rates were similar to those observed in the current study: of 104 original participants, 52.3% completed both pre- and post-questionnaires (comparable to the current study's 59.2%). Additionally, 57% of the original Mindfulness sample withdrew during the study period (lower than the current study's 69.3% of participants who did not complete mindfulness reflections). Cavanaugh and colleagues (2013) also reported a 70% retention rate of control participants (on par with the current study's 67.6% post-measure response rate).

A 12-week randomized controlled trial by Morledge and colleagues (2013) among adults in the community assigned to a control condition (pre, mid, and post-tests only), internet stress management (ISM) program (structured short mindfulness practices), and ISM plus message board. The investigators reported similar attrition

rates found by both the current study and Cavanaugh and colleagues (2013), with 33% pre/post response among those assigned to the intervention, 38% for those assigned to the program plus message board, and 65% for those in the control condition.

These findings reflect a general challenge in self-directed mindfulness research (Lauricella, 2013), where even participants who sign up for a mindfulness program have higher attrition or non-response rates than those assigned to control conditions, reinforcing the notion of mindfulness as an initially challenging practice (Cohen-Katz, Wiley, Capuano, Baker, Deitrick, & Shapiro, 2005). Additional practice barriers will be discussed below.

Analyses of the current data evealed no significant difference on pre-test measures between those who completed post-tests and those who did not; however, the two groups may have differed on an unknown third variable. In addition, a smaller pool of respondents limited the data available for analysis and compromised statistical power. An intent-to-treat analysis was considered for participants who completed the pre-test only; however, the proportion who dropped out was so large that this was deemed unfeasible.

Limitation: ***Engagement*.** A low level of intervention engagement (measured with mindfulness reflections) was generally present throughout the study. During recruitment, participants were informed that the study would require completing daily mindfulness activities and submitting online reflections. The potential psychological benefits were outlined and participants were compensated with academic incentive

(i.e., 1% additional bonus mark per 15 reflections submitted). Despite this priming and incentive, less than one third of participants in the intervention group completed at least one reflection.

Analyses found no statistically significant differences on pre-test measures between those in the intervention group who wrote reflections (the mindfulness group) versus those who did not (the non-reflection portion of the no-mindfulness group). However, these participants may have differed on some other variable not measured by the current study which may have impacted outcomes (for example: motivation for high academic achievement, extra-curricular involvement, course load, and/or perceived value or expectations of mindfulness).

While most participants who completed reflections found them helpful, many also reported not having time to engage in a mindfulness practice. This suggests that benefits must be particularly salient for students to dedicate limited time and energy resources towards. It is unclear what factors may influence this threshold of perceived benefit.

Barriers to implementation. At a practical level, implementing the current intervention (i.e., mindfulness reflections) would be quite onerous on the course instructor, requiring considerable time (particularly in the first few weeks of the study). Implementation would be more viable if the course was provided with teaching or research assistants who could manage initial in-class introduction to mindfulness practices (i.e., facilitating a body scan, meditation, yoga practice, and other mindfulness

activity for the sake of experiential exposure), feedback for initial reflections, distribution of weekly newsletters, and tracking through the online course platform. Certain aspects of the current study were reported not to be useful, such as reading reflections from the principal investigator. These more time-consuming low-impact aspects could be removed from future iterations of the intervention. Other resources (such as the weekly mindfulness newsletters) are re-usable and would decrease workload for replicating the current study in a modified form. It is unclear how integrating a social media component (i.e., an interactive Facebook group with resources and reminders) would impact retention and engagement; however, there is some support for such efforts in fostering community, support, and accountability (Lauricella, 2013; Morledge et al., 2013).

Clinical Implications

Ironically, the perceived barriers to mindfulness (i.e., not having enough time or energy) are often the very skills that mindfulness practice seeks to improve. The current study underscores the need for mindfulness application and implementation of mindfulness as a preventative measure. Wide-spread empirical support for the practice may lead well-meaning practitioners (i.e. teachers, instructors, clinicians, etc.) to suggest or implement a mindfulness intervention without careful consideration of the population-specific variables that affect utilization and, potentially, efficacy. MBSR is a highly structured and supported intervention, and significant research informed its development, evolution, and application. Deviations or adaptations from the MBSR

curriculum may alter the effectiveness of the intervention, particularly as researchers are still investigating the core aspects of mindfulness which contribute to its efficacy.

This pilot study speaks to potential for lacklustre engagement leading to low statistical power, despite attempts to tailor a program to previously-identified needs within a university population. Nevertheless, data from the current study is encouraging regarding the significant effect of the intervention on state and trait anxiety (compared to controls), and the differential effects of practice frequency and duration on trait anxiety, overall mindfulness (measured by the FFMQ), and symptoms of psychological distress.

Further research is needed to identify barriers and incentives which lead to sustained practice of mindfulness among undergraduate students, which allows them to gain the empirically-supported benefits of such a practice.

Directions for Future Research

Extension of the current pilot. Recruitment and engagement challenges must be addressed through research that uses self-directed mindfulness practice with undergraduates. A logical extension of the current research would involve using the current protocol as a component of UCC2020 (part of the evaluated syllabus as opposed to an adjunct for bonus points) to minimize non-engagement and control for self-selection participation bias. Making mindfulness practice a requirement for all students

would increase participant numbers and statistical power for analysis, addressing one of the limitations of the current study.

Utilizing another open-access course as a secondary control group would assist in evaluating the current study's observed effects of time (i.e., increased mindfulness and psychological wellness) without an effect of group. The metacognitive course material may have benefits which overlap with the efficacy from a mindfulness intervention.

Finally, integrating early experience with mindfulness may assist in managing attrition and maximizing engagement. As argued by the authors of the Southampton Mindfulness Questionnaire (Chadwick, Hember, Mead, Lilley, & Dagnan, 2008), Bergomi and colleagues in their 2012 review, and Kabat-Zinn himself (1982), mindfulness is a findamentally experiential practice. Simply extolling the positive outcomes is unlikely to compensate for the barriers encountered in early practice (i.e., physical and/or psychological discomfort, frustration, self-judgment, allocating time, etc.). If participants are guided through several practices by the course instructor or principal investigator, early structured exposure may increase willingness, confidence, and positive feelings about mindfulness practice. This may in turn increase engagement and decrease attrition (especially in populations who are not being required or compelled to engage in practice as part of an academic course). Danitz and Orsillo (2014) reported that first-year students who participated in a 1.5 hour workshop at the start of the school term resulted in lower depression and higher acceptance scores at the end of semester

(versus waitlist control). Mere exposure to mindfulness skills appeared to result in significant gains in psychological wellness.

General directions for future research. Research efforts to date have supported the general efficacy of mindfulness practice, and it appears that the next challenge is to investigate how to increase motivation to practice. This involves maximizing engagement and making the practice both attractive and sustainable for undergraduates and novice practitioners. Developing a mindfulness practice at an early age may develop lifelong strategies that mitigate chronic stress and associated distress, both of which can impact psychological and physical health.

Experiential exposure (i.e., in-person guided practices at the start of an intervention) and low-barrier integration (i.e., through smart devices and social media communities) will likely be essential features of sustainable self-directed practice, particularly if the goal is fostering long-term habits. Use of a mindfulness app over 10 days demonstrated a small effect on depression and medium effect on positive affect (Howells, Ivzan, & Eiroa-Orosa, 2016); however, authors highlighted the importance of empirically-validated content and matching activities to the consumer for maximum effect. Kavanagh, Hides and Stoyanov (2015) offer a review of current mindfulness apps through iTunes and Google Marketplace, addressing quality. Of over 700 apps, the group highlighted Headspace, Smiling Mind, iMindfulness, and Mindfulness Daily as meeting highest average quality standards. This study suggests that researchers and clinicians need to be as critical about app recommendation and use as they are about

the particulars of a mindfulness intervention. However, despite the apparent accessibility and convenience of technology-facilitated mindfulness practice, an early study using the Headspace app (Taylor, Hagemen, & Brown, 2016) identified lack of time and/or knowledge as barriers to practice, which was also a barrier in the current research. This suggests technology may introduce new barriers (i.e., comfort and knowledge), in addition to the existing barriers of traditional practice (primarily, perceived lack of time).

Technology which uses individual pre-test measures of mindfulness and psychological wellness may be able to provide more targeted recommendations for the mindfulness practitioner. For example, pre-intervention test scores might determine whether the individual would gain more benefit from shorter, more frequent sessions, or longer, more intense sessions. Furthermore, type of intervention (meditation, mindfulness, body scan, or informal mindfulness such as washing dishes) may also affect paticipants differently. Ideally, an individualized mindfulness program delivered via smartphone or tablet app may result in increased enaggement, as participants experience benefits in a more efficient manner.

Experienced mindfulness practitioners have long articulated the benefits of mindfulness, and accumulating scientific research spanning decades has lent support to those claims. Future efforts must focus on addressing barriers while increasing access to these skills. Mindfulness can not be implemented as a “one size fits all” approach; to do so would be inherently mindLESS, and yet, recent studies have reported conflicting

findings as mindfulness and MBSR programs are adapted and diluted to fit the assumed needs and practical realities of various populations. There is certinly benefit to be gained from a regular practice of mindfulness skills, and a future task will involve determining how to teach and encourage these skills across multiple settings, modalities, and stages of life. By cultivating mindfulness practice within our culture's collective consciousness, we may contribute to a foundation for sustainable lifelong psychological and physical health and wellness.

REFERENCES

Astin, J. (1997). Stress reduction through mindfulness meditation: effects on psychological symptomologym sense of control, and spiritual experiences. *Psychotherapy and Psychosomatics, 66*, 97-106.

Austin, J., Saklofske, H., & Mastoras, M. (2010). Emotional intelligence, coping and exam-related stress in Canadian undergraduate students. *Australian Journal of Psychology, 62*(1), 42-50.

Baer, R. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*, 125-143.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: the Kentucky Mindfulness Skills. *Assessment, 11,* 191-126.

Baer, R., Smith, G., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27-45.

Baer, R., Walsh, E., & E.L.B., L. (2008). Assessment of Mindfulness. In F. Didonna, *Clinical Handbook of Mindfulness* (pp. 153-168). New York: Springer.

Baloglu, M., Abbasi, A., Masten, W.G. (2007). A cross-cultural comparison of anxiety among college students. College Student Journal, 41, 977-984.

Barak, A., Hen, L., Boniel-Nissim, M., & Shapira, N. (2008). A comprehensive review and a meta-analysis of the effectiveness of internet-based psychotherapeutic interventions. *Journal of Technology in the Human Services, 26*, 109-160.

Barton, A. (2011). Wrap your mind around this: Meditation changes the brain. *The Globe and Mail*, p. L1.

Bergen-Cico, D., Possemato, K., & Cheon, S. (2013). Examining the efficacy of a brief mindfulness based stress reduction (brief MBSR) program on psychological health. *Journal of American College Health, 61*(6), 348-360.

Bergomi, C., Tschacher, W., & Kupper, Z. (2013). The assessment of mindfulness with self-report measures: Existing scales and open issues. *Mindfulness, 14*, 191-202.

Biegel, G., Brown, K., Shapiro, S., & Schubert, C. (2009). Mindfulness-based stress reduction for the treatment of adolescent psychiatric outpatients: a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 77*(5), 855-866.

Brown, K., & Ryan, R. (2003). The benefits of being present: The role of mindfulness in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822-848.

Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation (Vipasana) and meditation-based psychotherapy: the development of the Freiburg Mindfulness Inventory (FMI). *Journal for Meditaiton and Meditation Research, 1,* 11-34.

Carmody, J., & Baer, R. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 65*, 613-626.

Cavanagh, K., Strauss, C., Cicconi, F., Griffiths, N., Wyper, A., & Jones, F. (2013). A randomized controlled trial of a brief online mindfulness-based intervention. *Behaviour Research and Therapy, 51*, 573-578.

Chiesa, A., & Serretti, A. (2001). Mindfulness based cognitive therapy for psychiatric disorders: A systematic review and meta analysis. *Psychiatry Research, 187*, 441-453.

Christensen, H., Griffiths, K., Mackinnon, A., & al., e. (2006). Online randomized controlled trial of brief and full cognitive behaviour therapy for depression. *Psychological Medicine*, 1737-1746.

Christopher, J., Christopher, S., Dunnagan, T., & Schure, M. (2005). Teaching self-care through mindfulness practices: The applicaiton of yoga, meditation, and qigong to counsellor training. *Journal of Humanistic Psychology, 46*(4), 494-509.

Clark, G., Kelleher, C., Hornbrook, M., & al., e. (2009). Randomized effectiveness trial of an internet, pure self-help, cognitive behavioural intervention for depressive symptoms in young adults. *Cognitive Behavioral Therapy, 38*, 222-234.

Cohen-Katz, J., Wiley, S., Capuano, T., Baker, D., Deitrick, L., & Shapiro, S. (2005). The effects of mindfulness-based stress reduction on nurse stress and burnout: Qualitative and quantitative study, part III. *Holistic Nursing Practice, 2*, 78-86.

Craggs, S. (2012, 10 02). *One-third of McMaster students battle depression: survey*. Retrieved from CBC News:

http://www.cbc.ca/hamilton/news/story/2012/02/10/hamilton-mental-illness-awareness-week.htmlS

Danitz, S.B., & Orsillo, S.M. (2014). The mindful way through the semester: an investigation of the effectiveness of an acceptance-based behavioural therapy program on psychological wellness in first-year students. *Behavior Modification, 38*(4), 549-566.

Davidson, R., Kabat-Zinn, J., Schumacher, J., Rosencrantz, M., Muller, D., Santorelli, E., et al. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*, 364-370.

Downs, M., & Eisenberg, D. (2012). Help seeking and treatment use among suicidal college students. *Journal of American College Health, 60*(2), 104-114.

Dyson, R., & Renk, K. (2006). Freshman adaptation to university life: Depressive symptoms, stress, and coping. *Journal of Clinical Psychology, 62*(10), 1231-1244.

Elliott, T., Shewchuk, R., & Richards, J. (2001). Family caregiver problem solving abilities and adjustment during the initial year of the caregiving role. *Journal of Counselling Psychology, 48*, 223-232.

Feldmen, G. C., Hayes, A. M., Kumar, S. M., Greeson, J. G., & Laurenceau, J. P. (2007). Mindfulness and emotion regulation: the development and initial validation of the cognitive and affective mindfulness scale-revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment, 29,* 177-190.

Garlow, S., Rosenberg, J., Moore, D., Haas, A., Koestner, B., Hendin, H., et al. (2008). Depression, desparation, and suicidal ideation in college students; results from the American Foundation for Suicide Prevention College Screening Project and Emory University. *Depression and Anxiety, 25*, 482-488.

Gluck, T., & A., M. (2011). A randomized controlled pilot study of a brief web-based midnfulness training. *BMC Psychiatry, 11*, 175.

Hayes, A. M., & Feldman, G. (2004). Clarifying the construct of mindfulness in the context of emotion regulation and the process of change in therapy. *Clinical Psychology: Science and Practice, 11,* 255-262.

Hayes, S. (1984). Making sense of spirituality. *Behaviorism, 12*, 99-109.

Hayes, S., Strosahl, K., & Wilson, K. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change.* New York: Guilford.

Hindman, R.K., Glass, C.R., Arnkoff, D.B., & Maron, D.D. (2015). A comparison of formal and informal mindfulness programs for stress reduction in university students. *Mindfulness, 6,* 873-884.

Hoffman, C., Rice, D., & Sung, H. (1996). Persons with chronic conditions: Their prevalence and costs. *Journal of American Medical Association, 276*, 1473-1479.

Howells, A., Ivtzan, I., & Eiroa-Orosa, F.J. (2016). Putting the 'app' in happiness: a randomised controlled trial of a smartphone-based mindfulness intervention to enhance wellbeing. *Journal of Happiness Studies, 17*(1), 163-185.

Johnston-Brooks, C., Lewis, M., Evans, G., & Whalen, C. (1998). Chronic stress and illness in children; The role of allostatic load. *Psychosomatic medicine, 60*, 597-603.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical Considerations and preliminary results. *General Hospital Psychiatry, 4*, 33-47.

Kabat-Zinn, J. (1990). *Full Catastrophe Living: Using the wisdom of your body and mind to face stress, pain, and illness.* New York: Delta.

Kabat-Zinn, J. (1993). Mindfulness meditation: Health benefits of an ancient Buddhist practice. In D. Goleman, & J. Gurin, *Mind/Body Medicine* (pp. 259-276). New York: Consumer Reports Books.

Kabat-Zinn, J., Chapman, A., & Salmon, S. (1997). Relationship of cognitive and somatic components of anxiety to patient preference for different relationship techniques. *Mind/Body Medicine, 2*, 101-109.

Krusche, A., Cyhlarova, E., & Williams, J. (2013). Mindfulness online: An evaluation of the feasibility of a web-based mindfulness course for stress, anxiety and depression. *BMJ Open*.

Lauricella, S. (2013). Mindfulness meditation with undergraduates in face-to-face and digital practice: a formative analysis. *Mindfulness*.

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

Lally, P., vanJaarsveld, C.H.M., Potts, H.W.W., & Wardle, J. (2009). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology,40* (6), 998-1009.

Mani, M., Kavanagh, D.J., Hides, L., & Stoyanov, S.R. (2015). Review and evaluation of mindfulness-based iphone apps. *JMIR mHealth and uHealth, 3* (3), e82. doi: 10.2196/mhealth.4328.

Mayer, E., Craske, M., & Naliboff, B. (2001). Depression, Anxiety and the gastrointestinal system. *Journal of Clinical Psychitry, 62*, 28-37.

Michalsen, A., Ludtke, R., Bohm, K., Warder, H., Langhorst, J., Musial, F., et al. (2008). Effects of 3-month graded iyengar-yoga training on emotional and physical well-being in women with mental distress. *J. Eujim, 8*, S38-39.

Monshat, K. (2012). *design and refinement of the MATE program: mindful awareness training and education. How do young people understnd and practise mindfulness?* University of Melborne.

Morledge, T., Allexandre, D., Fox, E., Fu, A., Higashi, M., Kruzikas, D., et al. (2013). Feasibility of an online mindfulness program for stress management - a randomized, controlled trial. *Annals of Behavioral Medicine, 46*, 137-148.

Nonis, A., Hudson, I., Logan, B., & Ford, W. (1998). Influence of perceived control over time on college students' stress and stress-related outcomes. *Research in Higher Education, 39*(5), 587-605.

Powell, J., Hamborg, T., Stallard, & al., e. (2013). Randomized controlled trial of internet-based stress management. *Journal of Medical Internet Research, 15*(e2).

Regehr, C., Glancy, D., & Pitts, A. (2012). Interventions to reduce stress in university students: A meta-analysis. *Journal of Affective Disorders, 148*, 1-11.

Reid, D. (2013). Teaching mindfulness to occupational therapy students: Pilot evaluation of an online cirriculum. *Canadian Journal of Occupational Therapy, 80*(1), 42-48.

Samuelson, M., Carmody, J., Kabat-Zinn, J., & Bratt, M. (2007). Mindfulness-based stress reduction in Massachusetts correctional facilities. *The Prison Journal, 87*(2), 254-265.

Sauer-Zavala, S., Walsh, E., Eisenlohr-Moul, T., & Lykins, E. (2013). Comparing mindfulness-based intervention strategies: Differential effects of sitting meditation, body scan, and mindful yoga. *Mindfulness, 4*, 383-388.

Scully, D., Kremer, J., Meade, M., Graham, R., & Dudgeon, K. (1998). Physical exercise and psychological well being: A critical review. *British Journal of Sports Medicine, 32*, 111-120.

Ser-Zavala, S., Walsh, E., Eisenlohr-Moul, T., & Lykins, E. (2012). Comparing midnfulness-based intervention strategies: Differential effects of sitting meditation, body scan, and mindful yoga. *Mindfulness, 4*, 383-388.

Shaffer, H., LaSalvia, T., & Stein, J. (1997). Comparing hatha yoga with dynamic group psychotherapy for enhancing methadone maintenance treatment: A randomized clinical trial. *Alternative Therapeutic Health Medicine, 3*, 57-66.

Shapiro, S., Carlson, L., Astin, J., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*, 373-386.

Shewchuk, R., Richards, J., & Elliott, T. (1998). Dynamic processes in health outcomes among caregivers of patients with spinal cord injuries. *Health Psychology, 17*, 125-129.

Smith, M., Redd, W., Peyser, C., & al., e. (1999). Post traumatic stress disorder in cancer: A review. *Psychooncology, 8*, 521-537.

Spielberger, C. (1989). *State-trait anxiety inventory: Bibliography* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C., Gorsuch, R., Lushene, R., Vagg, P., & Jacobs, G. (1983). *Manual for the state-trait anxiety inventory.* Palo Alto, CA: Consulting Psychologists Press.

Teasdale, J., Segal, Z., & Williams, J. (1995). How does cognitive therapy prevent relapse and why should attentional control (mindfulness) training help? *Behavior Research and Therapy, 33*, 225-239.

Taylor, M., Hageman, J.R., & Brown, M. (2016). A mindfulness intervention for residents: relevance for pediatricians. *Pediatric Annals, 45*(10), 373-376.

Vadiraja, H., Raghavendra, R., Nagebdra, H., & al, e. (2009). Effects of a yoga program on cortisol rhythm and mood states in early breast cancer patients undergoing adjuvant radiotherapy: A randomized controlled trial. *Integrative Cancer Therapies, 8*(1), 37-46.

Walach, H., Buhheld, N., Buttenmuller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness - the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences, 40,* 1543-1555.

West, J., Otte, C., Geher, K., Johnson, J., & Mohr, D. (2004). Effects of hatha yoga and African dance on perceived stress, affect and salivary cortisol. *Annual Behavioural Medicine, 28*(2), 114-118.

Wolkowitz, O., Epel, E., & Reus, V. (2001). Stress-hormone-related psychopathology: Pathophysiological and treatment implications. *World Journal of Biological Psychiatry, 2*, 115-143.

Zetterqvist, K., Maanmies, J., Strom, L., & al., e. (2003). Randomized controlled trial of internet-based stress management. *Cognitive Behavior Therapy, 32*, 151-160.

Appendix A

Consent Form

MEMORIAL UNIVERSITY

Student Affairs and Services
University Counselling Centre
St. John's, NL Canada A1C 5S7
Tel: 709 864 8874 Fax: 709 864 3011 www.mun.ca/counselling

Consent to Take Part in Research

TITLE: Evaluating the effects of an introduction to Mindfulness on health and wellness in students registered in UCC 2020: Applied Cognitive and Affective Learning Strategies

INVESTIGATOR(S):

Graduate Student: Tricia Teeft, PsyD Graduate Student, Memorial University of Newfoundland (MUN)

Faculty Supervisor: Beth Whelan, Ph.D., R. Psych., Assistant Professor, MUN Counselling Centre

This study invites students who are enrolled in two different sections of UCC 2020: Applied Cognitive and Affective Learning Strategies, to take part in a research study. Taking part in this study is voluntary and will not affect your grade in the UCC2020 class.

Before you decide whether you would be willing to participate, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

Please read this carefully. Take as much time as you like. If you like, take it home to think about for a while. Mark anything you do not understand, or want explained better. After you have read it, please ask questions about anything that is not clear.

The researchers will:

- discuss the study with you
- answer your questions
- keep confidential any information which could identify you personally
- be available during the study to deal with problems and answer questions

1. **Introduction/Background:**
   Mindfulness practice has been found to reduce anxiety and stress and to improve mood and academic performance in university students. Few studies have examined how mindfulness affects undergraduate students and the current study wants to investigate the effects of daily mindfulness on over-all health and wellness between two groups of university students aged 18 and over.

2. **Purpose of study:**
   The purpose of this study is to 1) evaluate the impact of a weekly mindfulness mediation practice on student health and wellness over the course of one academic term 2) evaluate if there is an increase in mindfulness over the course of one academic term 3) explore the relationship between amount of mindfulness practice and student health and wellness.

3. **Description of the study procedures:**
   If you are eligible and decide to participate, you will be asked to complete some brief questionnaires regarding your general health and wellness, which will take place in the classroom following class time on the first and last days of class. If you are unavailable for either of these times, the interviewer may contact you to set up an individual appointment at your convenience, to be carried out at the UCC at the Memorial University of Newfoundland (MUN). Alternately, these measures could be filled out securely on D2L and sent directly to the project researcher.

   <ADDED TEXT FOR INTERVENTION/EXPERIMENTAL COURSE SECTIONS>

   You will be prompted to complete a daily mindfulness meditation practice that will be available on-line through D2L on ePortfolio. While no grades are associated with the mindfulness meditations or reflections, the practice is a valuable contribution to the strategies in UCC2020. If you choose not to participate in the research study, no feedback from the researcher will be provided about your journal entries – they are for your benefit only. If you choose to participate, the researcher will have access to your entries and provide feedback throughout the course. The course instructor will not read or provide feedback about your entries, in order to maintain confidentiality of participants and not affect the research results.

   The mindfulness activities include meditation, body scans (a method of drawing attention to individual body parts to increase awareness of how they feel – tense, heavy, light, etc.), and yoga, and cover various themes and will be varied in length (anywhere from 3 min – 30 min). You may choose the length and type of activity you try each day. You will be required to write a brief journal entry documenting what mediation you completed and you will be asked to reflect on the process of doing the meditation. These activities will usually require no more than 30 minutes per day during the course of the study.

   At the end of the course, you will be asked to complete the same questionnaires that you completed at the beginning of the study. These measures may also be completed securely on D2L and sent directly to the researcher. If you choose, a researcher will meet with you individually to provide personalized feedback about your mindfulness practice and effects on your health and wellness. This meeting would be scheduled at your convenience and take place at the UCC or an office in the Science Building at the Memorial University of NL.

4. Length of time:

The following are estimates of time required for each activity included in this project:

- Initial questionnaires: approximately 30 minutes
- Follow-up questionnaires: approximately 30 minutes
- Optional individual feedback session: 30 minutes

<VERSION FOR INTERVENTION/EXPERIMENTAL COURSE SECTIONS>

The following are estimates of time required for each activity included in this project:

- Initial introduction to mindfulness: 15 minutes (course component)
- Initial questionnaires: approximately 30 minutes (research participants only)
- Daily mindfulness practice: 5-30 minutes maximum per day for 11 weeks (course component)
- Daily journal entry: 5-10 minutes maximum per day for 11 weeks (course component)
- Follow-up questionnaires: approximately 30 minutes (research participants only)
- Optional individual feedback session: 30 minutes (research participants only)

5. Possible risks and discomforts:

One possible risk is that you may feel uncomfortable by some of the items on the questionnaires. You have the right to refuse to answer any question. Completion of the initial questionnaires may reveal that you have signs that indicate that you are experiencing difficulty with general health and wellness. If this is the case, we will speak with you privately to share this information and to offer referral information for resources and services that may be helpful to you.

Participation in this study may involve unforeseen risks. If any adverse events occur that might be related to the research study, you should bring them to the attention of the researcher (Tricia Teeft) who will inform Beth Whelan, Ph.D., the director of the research project.

6. Benefits:

It is not known whether this study will benefit you.

7. Liability statement:

Signing this form gives us your consent to be in this study. It tells us that you understand the information about the research study. When you sign this form, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

8. What about my privacy and confidentiality?

Protecting your privacy is an important part of this study. Every effort to protect your privacy will be made. However, it cannot be guaranteed. For example, we may be required by law to allow access to research records.

When you sign this consent form you give us permission to

- Collect information from you
- Share information with the people conducting the study
- Share information with the people responsible for protecting your safety

Access to records
The principle researcher will see study records that identify you by name.
Other people may need to look at the study records that identify you by name. This might include the research ethics board. You may ask to see the list of these people. They can look at your records only when supervised by the primary researcher or her supervisor.

Use of your study information
The researcher will collect and use only the information needed for this research study.

This information will include your:

- date of birth
- gender
- ethnicity
- number of years of education
- faculty
- place of residence (on or off campus)
- the results of pre and post questionnaires

Your name and contact information will be kept secure by the researchers (Tricia Teeft and Elizabeth Whelan) in Newfoundland and Labrador. It will not be shared with others without your permission. Your name will not appear in any report or article published as a result of this study.

Information collected for this study will kept for seven years**.**

If you decide to withdraw from the study, the information collected up to that time will continue to be used by the research team. It may not be removed. This information will only be used for the purposes of this study.

Information collected and used by the research team will be stored in a locked cabinet in the Counselling Centre at Memorial University of Newfoundland. Elizabeth Whelan is the person responsible for keeping it secure.

Your access to records
You may ask the director of the research project to see the information that has been collected about you.

9. Questions or problems:

If you have any questions about taking part in this study, you can meet with the investigator or the academic supervisor who is in charge of the study at this institution. These persons are:

Beth Whelan, (709) 864 3501 **Tricia Teeft, tricia.teeft@mun.ca**

Or you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study. This person can be reached through:

Ethics Office, Health Research Ethics Authority

709-777-6974 or by email at info@hrea.ca

After signing this consent you will be given a copy.

Signature Page

Study title: Evaluating the effects of Mindfulness on health and wellness in students registered in UCC 2020.

Name of principal investigator: Tricia Teeft

To be filled out and signed by the participant:

	Please check as appropriate:
I have read the consent.	Yes { } No { }
I have had the opportunity to ask questions/to discuss this study.	Yes { } No { }
I have received satisfactory answers to all of my questions.	Yes { } No { }
I have received enough information about the study.	Yes { } No { }
I have spoken to Tricia Teeft or Elizabeth Whelan and they have answered my questions or concerns.	Yes { } No { }
I understand that I am free to withdraw from the study • at any time • without having to give a reason • without affecting my future care	Yes { } No { }
I understand it is my choice to be in the study and that I may not benefit.	Yes { } No { }
I understand how my privacy is protected and records kept confidential	Yes { } No { }
I agree to take part in this study.	Yes { } No { }

_____ _____ _____

Signature of participant Name printed Year Month Day

<u>To be signed by the investigator or person obtaining consent</u>

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

_____ _____ _____

Signature of investigator Name printed Year Month Day

Telephone number: (709) 864 3501 Email: tricia.teeft@mun.ca

Appendix B

Orientation Handout to Mindfulness

What is Mindfulness?

"Mindfulness means paying attention in a particular way;
On purpose, in the present moment, and nonjudgmentally."

- Jon Kabat-Zinn, founder of the Mindfulness-Based Stress Reduction Program

The Benefits of Mindfulness

Practising mindfulness helps you:

- feel less stressed out and anxious
- to become more connected to yourself, to others and to the world around you
- to learn that everything changes; that thoughts and feelings come and go like the weather
- to have more balance, less emotional volatility
- to experience more calm and peacefulness
- to develop self-acceptance and self-compassion
- feel more happy and satisfied with your life
- have better physical and mental health

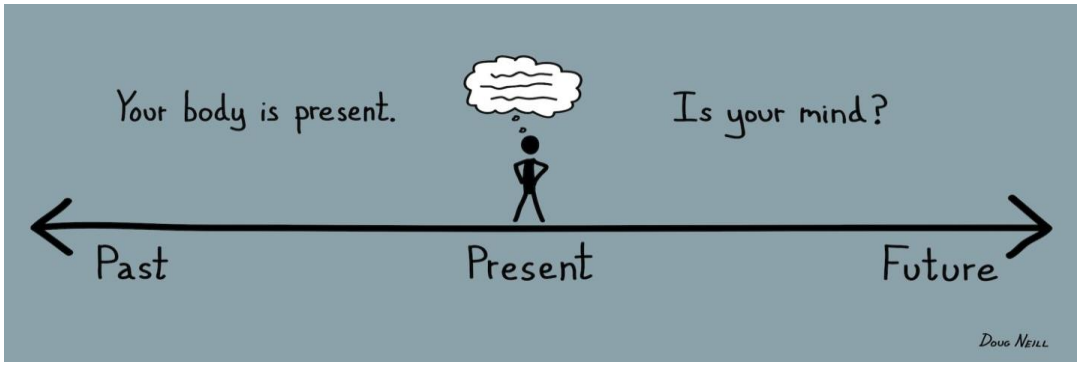
What is Mindfulness?

HAVE YOU EVER...

- ...driven somewhere, arrived at your destination, and realized you totally "zoned-out" during your drive?
- ...eaten a meal, and realized you don't even remember how it tasted?
- ... had a conversation, and realized you totally missed or forgot what the other person was talking about?
- ...spent 3 hours on Facebook and have no idea what you looked at?!?!

These are examples of how easy being "MindLESS" is: doing things without thinking!

Simply: Mindfulness is when you are living in the here and now.



Many people spend a lot of time thinking about things that have happened in the past or worrying about the future. When we are consumed with things that have already happened or have yet to happen, we spend a lot of energy on things that can't be changed. This can make people feel overwhelmed, anxious, depressed, and powerless.

Mindfulness activities train the mind to come back to the present moment, the moment where we have power.

Mindfulness involves activities like ***meditation*** (a state of awareness that can be guided or unguided), ***body scans*** (guided attention to various parts of the body and the sensations that arise), and ***yoga*** (postures to connect your mind, body, breath).

Lots of mindfulness activities ***use breath to connect to the present moment***. Focusing on your inhales and exhales is a great way to stay in the moment when you are getting pulled back into the past, or forward into worries of the future.

Focusing on each breath allows you to ***notice your thoughts without becoming tangled in them***. Thoughts come and go – you don't need to engage a thought, judge a thought (as "good" or "bad"), you are not defined by that thought. Thoughts come and they go; you have a choice whether to act on them or not.

Mindfulness is about observation without criticism; ***being kind to yourself***. Mindfulness allows you to catch negative thought patterns before they tip you into a downward spiral. It begins the process of putting you back in control of your life.

Thoughts may trigger emotions. Some may be good emotions, some may be felt as negative emotions – but these emotions are all part of the experience of being present. Mindfulness helps you recognize emotions without becoming tangled up in them, and accepting these emotions as states that will come and go.

Myths of Mindfulness

• ***Meditation is not a religion***. Mindfulness is simply a method of mental training. Many people who practice meditation are religious, but many atheists and agnostics are meditators too.

• ***You don't have to sit cross-legged on the floor*** (like the pictures you may have seen in magazines or on TV), but you can if you want to. Many people sit on chairs or lie down, but you can also practice bringing mindful awareness to whatever you are doing on the bus or while walking to work. You can be mindful more or less anywhere.

• ***Mindfulness practice does not take a lot of time*** – 3 minutes a day!- but you have to do it regularly to see the benefits.

• ***Meditation is not complicated***. It is not about 'success' or 'failure'. Even when meditation feels difficult, you'll have learned something valuable about how you think.

Appendix C

Daily Mindfulness Resource List

Guided Meditation

Practice in a quiet, private area where you will not be disturbed. Sit or lie down in a comfortable position. You may choose to use a pillow to support your back while seated in a chair, or fold a blanket under your seat if sitting on the floor. Start with 3 deep, mindful breaths. Eyes may be closed, lowered, or remain open.

Guided Breathing Space – Female Guide – 3 m - http://www.youtube.com/watch?v=Ula0njZIOh4

Short Breathing Meditation – Female Guide – 3 m - http://www.youtube.com/watch?v=cDflnqo0TQs

Ocean Guided Meditation – Deepak Chopra – 4 m - http://www.youtube.com/watch?v=D56tUOdpgts

Mindfulness Meditation – Deepak Chopra – 4 m - http://www.youtube.com/watch?v=2RvtDFfLFIk

5 minutes Off – Male Guide – 5 m - http://www.youtube.com/watch?v=Q2UKw8tFYyY

Gratitude Meditation – 6 m- http://www.youtube.com/watch?v=szMGyEUtbag

Calming Meditation – Female Guide – 8 m - http://www.youtube.com/watch?v=rxcKyzZYJ04

Meditation for Clarity, Focus – Female Guide – 10 m - http://www.youtube.com/watch?v=moBLrox7bwk

Guided Lifescape Meditation – Kabat-Zinn – 12 m - http://www.youtube.com/watch?v=qT6JyyeoPw0

Healing Meditation – Male Guide – 16 m - http://www.youtube.com/watch?v=rEXa_3ELy_o

Guided Mindscape Meditation – Kabat-Zinn – 20 m– http://www.youtube.com/watch?v=4vgKzXdwtRE

Guided Bodyscape Meditation –Kabat-Zinn– 20 m- http://www.youtube.com/watch?v=4jmG3UFZGNU

Guided Breathscape Meditation – Kabat-Zinn – 20 m - http://www.youtube.com/watch?v=aS5QpPRFdbg

Creativity Meditation – Male Guide – 22 m - http://www.youtube.com/watch?v=MCwX_zjgcdw

If you prefer a **silent or unguided meditation**, use an alarm or phone to set a timer for a fixed amount of time – 3 minutes, 8 minutes, 20 minutes – meditator's choice! I like to set the alarm to something soft and calming to gently bring me back to awareness (instead of my usual morning alarm).

Body Scan

The Body Scan in intended to help you become aware of your body and your connection to it. You can practice seated or laying – try both. Wear comfortable clothing and practice in a quiet space. You may become quite relaxed but try to remain aware and focused.

3 minute Body Scan – Elisha Goldstein - http://elishagoldstein.com/videos/3-minute-body-scan/

5 minute Body Scan – Elisha Goldstein - http://elishagoldstein.com/videos/5-minute-body-scan/

5 minute Body Scan – Female Guide - http://www.youtube.com/watch?v=tsfjUN5Bre8

7 minute Body Scan – Female Guide - http://www.youtube.com/watch?v=UuglYkvPXQw

10 minute body scan- Elisha Goldstein - http://elishagoldstein.com/videos/10-minute-body-scan/

10 minute Body Scan – Greg DeVries - http://www.youtube.com/watch?v=obYJRmgrqOU

15 minute Body Scan – Laura Patriquin - http://www.youtube.com/watch?v=hm2Wymc0FtQ

18 minute Body Scan – Meditation for Real People - http://www.youtube.com/watch?v=pX9iZWtCwQo

25 minute Body Scan – Kabat-Zinn - http://www.youtube.com/watch?v=AKQAmtfra3k

Hatha Yoga

15 minute vinyasa (postures that are linked with movement and breath) videos to guide your yoga practice (http://www.youtube.com/user/melaniecaines). Change into some comfortable clothes that let you move freely, unroll your yoga mat if you've got one or practice in a room with a sticky floor you can grip to. Here are a few of my favourite flows, depending on what I am in the mood for.

Yoga for Desk Dwellers: http://www.youtube.com/watch?v=-9bsoXQGIaI

Peaceful, Soothing Flow: http://www.youtube.com/watch?v=atCfut6VOAg

Fiery Core Strength Flow: http://www.youtube.com/watch?v=o2SoiYbnYdI

Uplifting Energizing Flow: http://www.youtube.com/watch?v=NuwkKCT79Bo

Good Morning! Flow: http://www.youtube.com/watch?v=EKvK5FAToJc

Happy Hips: http://www.youtube.com/watch?v=afJ1vXL2NE0

Stretchy Goodness: http://www.youtube.com/watch?v=P-vAONnbYqA

Yoga for Neck and Shoulders: http://www.youtube.com/watch?v=-gHLNDGouVw

Yoga for Runners: http://www.youtube.com/watch?v=XitxRg8jpcY

Immune System Boost: http://www.youtube.com/watch?v=mo5KTNf-Ixc

DOWNLOADS

There are more resources available for download at http://www.freemindfulness.org/download that you can load onto your ipod, tablet, smartphone, or computer for use on-the-go, between classes, at the library, or at home.

If you find any other great mindfulness resources that really resonate with you, please share with myself or your classmates! I'll be updating the list over the term.

Appendix D

Instructions for Daily Mindfulness Reflections

Daily Mindfulness Reflections

For <SEMESTER>, UCC2020 is part of a pilot program investigating the effectiveness of Mindfulness on student health and wellness.

What does this mean for you?

- **Complete a daily mindfulness activity**.
  See the "Daily Mindfulness Resources" document for links.

- On ePortfolio, **create a Reflection.**

WHAT TO INCLUDE IN YOUR REFLECTION:
1. The **activity** you chose (ie. Body Scan) 2. How **long** it was (ie. 4 minutes) 3. A brief **comment** on what came up for you. One or two sentences is fine. (ie. "My breaths feel slower, fuller, and calmer" or "I felt really anxious and my thoughts were racing" or "I feel less stressed out" or "I feel more focused and attentive").

- **Share it with me** (Tricia Teeft) on ePortfolio or by email (mindfulmun@gmail.com)!

What do you get out of it?

- Mindfulness has been proven to **lower stress and anxiety**!

- I will provide regular, personalized **feedback**.

- Up to **5% bonus in addition to your course mark** will be awarded for a maximum of one reflection per day, every day of the course. The bonus is awarded depending on how many reflections you hand in (if you do them all, you receive the whole 5%).

12 weeks * 7 days = 84 possible practice days

75 reflections = 5% bonus
60 reflections = 4% bonus
45 reflections = 3% bonus
30 reflections = 2% bonus
15 reflections = 1% bonus

This bonus will be applied to your final grade in the course. For example, if you earned an 80%, the 5% bonus would give you an 85% grade overall.

- If you fill out the pre- and post- measures (the package of questionnaires) you ALSO receive a **chance to win a $100 VISA gift card**, and a **voluntary in person feedback session** on your results at the end of the semester (of the questionnaires and your mindfulness reflections).

How to Share Your Reflections

Using ePortfolio

ePortfolio is a section on your <**My Home**> page of D2L (the top menu on the right side).

You will access it on the same page you would use to access the material for your specific courses. MyHome is the first page that pops up when you sign in to D2L.

Your instructor has no access to these reflections, ensuring your confidentiality.

REFLECTIONS

Click on <Reflection> to type in your reflection (1-2 sentences about your thoughts, the activity, and number of minutes) and follow the prompts to save it.

Once back at your <my items> screen, click the small arrow to the right of your newest reflection and click SHARE.

Search for me (Tricia Teeft) and share your reflection.

COLLECTIONS

Alternately, you can create a collection (ie. "Jane Doe's Reflections") by clicking <New> and <Collections> and share the entire collection with me (Tricia Teeft). Simply add your new reflection into the collection, and it will be shared with the others and you won't have to do it each time.

EMAIL: If ePortfolio gives you problems, you can email your reflections to mindfulmun@gmail.com

Appendix E

Semi-Structured Reflection Feedback Template

Hi <INSERT STUDENT NAME>,

<REFLECTION BASED ON WHAT THEY WROTE, e.g., It sounds like the activity increased your attention to your breath.>

<CLARIFY/PROVIDE INFO IF NEEDED, e.g., "Although relaxation can have benefits, mindfulness is about more than being relaxed. Mindfulness helps you becoming aware of both positive as well as negative feelings, and becoming accepting and nonjudgmental of them.">

<QUESTION THAT PROMPTS DEEPER REFLECTION, e.g., "Were there any sensations or feelings that accompanied those thoughts?>

-Trish

Appendix F

Response After Fifth Reflection Template

Hi <INSERT STUDENT NAME>,

Now that you've completed 5 reflections and had some feedback, you are well into your regular mindfulness practice! I'll be sending out a weekly newsletter to check in, along with some of my favourite mindfulness quotes, thoughts, or visuals. If you have any questions as you continue through the semester, you can always contact me at tricia.teeft@mun.ca, mindfulmun@gmail.com, or here on D2L!

Good luck - remember, even if you miss a few days, try to keep up with the practice. Research tells us that the more consistently you practice, the lower your stress levels and higher your satisfaction with life will be!

-Trish

Appendix G

Example of Weekly Mindfulness Newsletter

Hello UCC2020 Mindfulness adventurers!

This newsletter is being sent to check in on your progress, provide some inspiration, or potentially give you the nudge to start or re-start your Mindfulness Practice.

How is it going for those of you who have started? It has been so inspiring to share in your journey so far through your reflections. Are you noticing any difference in your day to day thoughts, feelings, and physical sensations? Or are things the same as they've been? Both of these outcomes are fine – simply checking in is helpful and useful!

For those of you who haven't started or are having difficulty practicing daily: is there anything I can help with? Resources, answers, information? Don't hesitate to email. You can send reflections on ePortfolio or to mindfulmun@gmail.com.

QUOTE AND IMAGE OF THE WEEK:

"The best way to capture moments is to pay attention. This is how we cultivate mindfulness. Mindfulness means being awake. It means knowing what you are doing."

— Jon Kabat-Zinn, Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life

RESOURCE OF THE WEEK: Group Meditation on campus!

Memorial meditates
Each weekday, Memorial meditates group leader, Yvonne Collett, holds a brief introduction beginning at 12 noon to familiarize newcomers to the process of meditation. At 12:15 p.m., meditation begins. We simply sit in silence. You can sit on one of our mats on the floor or you can sit in a chair. Those familiar with meditation arrive a few minutes before 12:15 p.m for the sitting.

Group meditation
Monday to Friday (drop in)
12:00 -12:15 p.m. Program introduction; 12:15 -12:45 p.m. Meditation

UC-2001 (MUNSU Council Chambers, down the corridor left of MUNSU office)

Sessions are free. No experience is necessary. No preparation is required.

To be added to our **Memorial meditates** e-mail list, contact Yvonne at ycollett@mun.ca

QUESTION OF THE WEEK:

"Hi Trish. Why is Yoga considered 'Mindfulness', but other physical activity (like my gym workout) isn't? What is so special about yoga anyway?"

This is a really good, really common question!

I'm going to paraphrase Jon Kabat-Zinn (Mindfulness guru) on the subject (http://www.makingsenseofmentalhealth.org/articles/mindfulyoga.pdf).

- Yoga is not about doing something "right" or "wrong". It is not about an end goal. It is about honoring where your body is in a given moment in time.
- The word "yoga" means "union": a connection of the body, the mind, and the breath. When these things are in the same place, at the same time, working together, this IS the definition of Mindfulness!
- Even if yoga is practiced for the physical fitness benefits, students of yoga are opened up to the possibilities of connection with the breath and a deeper understanding of the self – your strengths, your limits – both on your mat and off your mat in the world.
- Yoga has been extensively studied with chronic illness, mental health, and wellbeing – we KNOW that yoga can help these concerns and issues.

That's it for this week. Good luck, Mindfulness Warriors! -- Trish

Appendix H

Template Response for Clinically-Elevated SCL-90 Score

Hi <STUDENT NAME HERE>,

First: thank you so much for taking the time to respond to the survey.

Secondly: your scores on some of the measures of distress were elevated, so I wanted to email you to let you know about free, on-campus services which are available to all students. The University Counselling Centre (5th floor of the UC) has daily walk-in appointments available every day from 9-1 and 2-5. Alternately, you are welcome to call Dr. Beth Whelan from 830-430, Monday to Friday, at 709-864-3501 to follow up (she is the research supervisor and a clinical psychologist). Finally, the city has a wonderful mental health 24 hour crisis line at 1-888-737-4668.

Thanks again for participating, and let me know if you have any questions.

- Trish

Appendix I

Pre-Test Demographic Questionnaire

1. **How old are you?** _____ years.

2. **How do you identify your gender?**

   - ○ Female
   - ○ Male
   - ○ Other

3. **Where is your primary place of residence while attending school?**

   - ○ On-campus residence
   - ○ Off-campus housing
   - ○ With parent(s) or legal guardian(s)

4. **What is your cultural background?**

   - ○ Born in Canada
   - ○ Landed immigrant
   - ○ International student
   - ○ Other (please specify): _____

5. **What program are you registered in (ie. Psychology, sociology, business, kinesiology)?**

   - ○ Unknown
   - ○ Undecided
   - ○ Please Specify:_____

6. **How many years of post-secondary education have you completed?**

   - ○ 1
   - ○ 2
   - ○ 3
   - ○ 4
   - ○ Other (please specify):_____

7. **How many times per WEEK do you currently practice MINDFULNESS?**

_____ times per week.

8. **How many times per WEEK do you currently practice MEDITATION?**

_____ times per week.

9. **How many times per week do you currently practice YOGA?**

_____ times per week.

10. **How many times per week do you currently engage in PHYSICAL ACTIVITY (such as going to the gym, playing sports, etc)?**

Do not include yoga in this answer.

_____ times per week.

11. **How many times WEEKLY do you currently engage in any OTHER WELLNESS PROGRAM** (such as Weight Watchers, drumming circle, seeing a psychotherapist or counsellor, etc).

_____ times per week.

Please list these activities:

Appendix J

Post-Test Engagement Questionnaire

What was your reason for participating in this research? (you can select more than one)

1. ☐ I would like to win that awesome $100 VISA gift card!
2. ☐ I'm interested in the personalized feedback session on the results of my measures at the start and end of the semester.
3. ☐ I am interested in Mindfulness.
4. ☐ I like participating in research.
5. Other (Please Specify)
   _____

Why did you take UCC2020? (you can select more than one)

1. ☐ It was recommended to me by a friend.
2. ☐ It was recommended by an instructor or counselor.
3. ☐ I found it in the course calendar/online class listings.
4. ☐ I heard it was an easy class.
5. ☐ I wanted to improve my meta-cognition and study skills.
6. Other (Please Specify)
   _____

If you completed Mindfulness reflections, what motivated you? (you can select more than one)

1. ☐ Bonus marks in the class.
2. ☐ I found the Mindfulness activities helpful.
3. ☐ The weekly newsletters.
4. ☐ Reading Trish's reflections.
5. ☐ Getting feedback from Trish.
6. ☐ Talking about it with my classmates.
7. ☐ The course instructor encouraged me.
8. Other (Please Describe):_____

If you did NOT complete Mindfulness activities, why not? (you can select more than one)

1. ☐ It wasn't offered to my class (Mike Doyle's lunch time section).
2. ☐ It was too confusing.
3. ☐ I didn't have time.
4. ☐ I'm not very interested in Mindfulness.
5. ☐ I didn't think there was any benefit for me.
6. Other (Please Specify):_____

Are you interested in the individual 15-30minute follow-up session for your personal results?

**NOTE: this is not a psychological assessment or clinical counseling session. This session will communicate the results of your surveys and the effect of any mindfulness you completed over the 12 weeks. Sessions will be scheduled in April 2014.

Please enter your contact information (phone and/or email) below **if you want to book a follow-up session.**

NAME: _____

CONTACT:_____

Appendix K

Perceived Stress Scale (PSS)

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?..... 0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life? 0 1 2 3 4

3. In the last month, how often have you felt nervous and “stressed”?.....0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems? 0 1 2 3 4

5. In the last month, how often have you felt that things were going your way? ..0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do?.....0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

.....0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things? 0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control? 0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?.....0 1 2 3 4

Appendix L

State Trait Anxiety Inventory (STAI)

Self-evaluation Questionnaire
STAI Form Y-1

A number of statements which people have used o describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at *this* moment. There are no right or wrong answers. Do not spend too much on any one statement but give the answer which seems to describe your feelings best.

1 Not at all 2 Somewhat 3 Moderately So 4 Very Much So

1. I feel calm.
2. I feel secure.
3. I feel tense.
4. I feel strained.
5. I feel at ease.
6. I feel upset.
7. I am presently worrying over possible misfortunes.
8. I feel satisfied.
9. I feel frightened.
10. I feel comfortable.
11. I feel self-confident.
12. I feel nervous.
13. I am jittery.
14. I feel indecisive.
15. I am relaxed.
16. I feel content.
17. I am worried.
18. I feel confused.
19. I feel steady
20. I feel pleasant.

STAI Form Y-2

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

21. I feel pleasant.

22. I feel nervous and restless.

23. I feel satisfied with myself.

24. I wish I could be as happy as others seem to be.

25. I feel like a failure.

26. I feel rested.

27. I am “calm, cool, and collected.”

28. I feel that difficulties are piling up so that I cannot overcome them.

29. I worry too much over something that doesn’t really matter.

30. I am happy.

31. I have disturbing thoughts.

32. I lack self-confidence.

33. I feel secure.

34. I make decisions easily.

35. I feel inadequate

36. I am content.

37. Some unimportant thoughts runs through my mind and bothers me.

38. I take disappointments so keenly that I can’t put them out of my mind.

39. I am a steady person.

40. I get in a state of tension or turmoil as I think over my recent concerns and interests.

Appendix M

Mindful Attention and Awareness Scale (MAAS)

Day-to-Day Experiences

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
Almost Always	Very Frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

1. I could be experiencing some emotion and not be conscious of it until some time later.

2. I break or spill things because of carelessness, not paying attention, or thinking of something else.

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

4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.

5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.

6. I forget a person's name almost as soon as I've been told it for the first time.

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

8. I rush through activities without being really attentive to them.

9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.

10. I do jobs or tasks automatically, without being aware of what I'm doing.

11. I find myself listening to someone with one ear, doing something else at the same time.

1	2	3	4	5	6
Almost Always	Very Frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

12. I drive places on 'automatic pilot' and then wonder why I went there.

13. I find myself preoccupied with the future or the past.

14. I find myself doing things without paying attention.

15. I snack without being aware that I'm eating.

Appendix N

Five Facet Mindfulness Questionnaire (FFMQ)

Description: This instrument is based on a factor analytic study of five independently developed mindfulness questionnaires. The analysis yielded five factors that appear to represent elements of mindfulness as it is currently conceptualized. The five facets are observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience.

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.

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

_____ 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.

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

_____ 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 O

Southampton Mindfulness Questionnaire (SMQ)

Usually when I experience distressing thoughts and images… (please circle)

	Strongly Disagree	Disagree	Disagree Somewhat	Neither Agree nor Disagree	Agree Somewhat	Agree	Strongly Agree
1. I am able just to notice them without reacting	0	1	2	3	4	5	6
2. They take over my mind for quite a while afterwards	0	1	2	3	4	5	6
3. I judge the thought/ image as good or bad	0	1	2	3	4	5	6
4. I feel calm soon after	0	1	2	3	4	5	6
5. I am able to accept the experience	0	1	2	3	4	5	6
6. I get angry that this happens to me	0	1	2	3	4	5	6
7. I notice how brief the thoughts and images really are	0	1	2	3	4	5	6
8. I judge myself as good or bad, depending on what the thought/ image is about	0	1	2	3	4	5	6
9. I 'step back' and am aware of the thought or image without getting taken over by it	0	1	2	3	4	5	6
10. I just notice them and let them go	0	1	2	3	4	5	6
11. I accept myself the same whatever the thought/image is about	0	1	2	3	4	5	6
12. In my mind I try and push them away	0	1	2	3	4	5	6

13. I keep thinking about the thought or image after it's gone	0	1	2	3	4	5	6
14. I find it so unpleasant I have to distract myself and not notice them	0	1	2	3	4	5	6
15. I try just to experience the thoughts or images without judging them	0	1	2	3	4	5	6
16. I lose myself in the thoughts/images	0	1	2	3	4	5	6