

The Effects of Brief Mindfulness Induction and Psychological Stress Manipulation on Perceived
Stress

By

Kyle Wilson

A thesis submitted in partial fulfillment
of the requirements for the degree of
Masters of Arts (MA) in Psychology

The Faculty of Graduate Studies
Laurentian University
Sudbury, Ontario, Canada

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THESIS DEFENCE COMMITTEE/COMITÉ DE SOUTENANCE DE THÈSE
Laurentian Université/Université Laurentienne
 Faculty of Graduate Studies/Faculté des études supérieures

Title of Thesis Titre de la thèse	The Effects of Brief Mindfulness Induction and Psychological Stress Manipulation on Perceived Stress	
Name of Candidate Nom du candidat	Wilson, Kyle	
Degree Diplôme	Master of Arts	
Department/Program Département/Programme	Psychology	Date of Defence Date de la soutenance December 08, 2016

APPROVED/APPROUVÉ

Thesis Examiners/Examineurs de thèse:

Dr. Cynthia Whissell
(Supervisor/Directeur(trice) de thèse)

Dr. Run-Min Zhou
(Committee member/Membre du comité)

Dr. Robert Sinclair
(Committee member/Membre du comité)

(Committee member/Membre du comité)

Dr. Roxanna Vernescu
(External Examiner/Examineur externe)

Approved for the Faculty of Graduate Studies
 Approuvé pour la Faculté des études supérieures
 Dr. David Lesbarrères
 Monsieur David Lesbarrères
 Dean, Faculty of Graduate Studies
 Doyen, Faculté des études supérieures

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Acknowledgements

I would like to take this page to acknowledge those who have helped me write this thesis paper. First and foremost, I would like to thank my thesis supervisor Dr. Cynthia Whissell and my two committee members Dr. Robert Sinclair and Dr. Run-Min Zhou. Unquestionably, without their input this thesis would be of a substantially lesser quality. Secondly, I would like to thank my family and friends for providing me with much needed, and at times very timely, resources; from simply acting as a sounding board, to preparing and cooking meals for me during periods of looming deadlines, it is all equally appreciated. Finally, I would like to thank my Master's colleagues and Laurentian professors alike, for they helped create an enlightening atmosphere which allowed my creativity to flow and my mind to prosper. Thank you to all.

Abstract

The effects of a brief mindfulness induction and psychological stress manipulation on perceived stress were studied using a sample of 51 Laurentian University Undergraduate Psychology students. Participants were subjected to either to a mindfulness manipulation condition (a focused attention task – an analogy of mindfulness induction – or a free mind wandering task), followed by a stress manipulation condition (either the Trier Social Stress Test (TSST) or an activity-matched placebo (TSSTp)). Trait mindfulness (covariate), state mindfulness (manipulation check), perceived stress (manipulation check/dependant variable), and mood measures (dependant variable) were administered. Both mindfulness induction and stress induction manipulation checks were significant, indicating that participants understood the instructions, and the manipulations provided significant measured changes between groups. The stress manipulation check was significant in the expected direction, such that those in the stress experimental group rated as more stressed than the control group; however, the mood induction was significant opposite to expectations, such that the mind-wandering condition elicited significantly higher state mindfulness scores than the focused-breathing condition. There was no significant main effect of mindfulness on perceived stress scores, and contrary to the main hypothesis, there was no significant interaction between mindfulness condition and stress condition on perceived stress scores. Results of the mindfulness manipulation check suggest that the brief mindfulness manipulation utilized was not sufficient enough to produce measurable differences in mindfulness scores; however, the unexpected significance of the control group scores, coupled with a significant negative correlation between the trait and state mindfulness measures, may reflect discrepancies between the two measures of mindfulness and ultimately a difference between schools of mindfulness, or it may reflect an artifact of the methodology used.

The lack of significant results concerning mindfulness and perceived stress scores suggest that either 1) a brief 15-minute implementation of mindfulness may not be sufficient enough to buffer against immediate future stress, or 2) there were issues/confounding variables with the methodology used. There were no significant results concerning the mood measures. Results and future research are discussed.

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Introduction

This thesis was designed to examine the effects of a brief 15-minute mindfulness induction on self-reported stress scores of participants subjected to a social-evaluative situation. The study utilized a 2 x 2 (mindfulness condition x stress condition) design. Participants were first subjected to either a focused attention exercise (an analogy of mindfulness) or a mind wandering exercise (time-matched placebo). Following the mindfulness condition, participants were then either subjected to a stressful task (Trier Social Stress Test; TSST; Kirschbaum, Pirke, & Hellhammer, 1993), or a placebo matched control (TSSTp; Het et al., 2009). The main dependent variable of interest of this study was participants' perceived stress scores. This introduction will begin with a brief overview of mindfulness, and proceed to an in depth analysis of different types of mindfulness. Stress literature will then be introduced and merged with mindfulness in a literature review of mindfulness-based stress reduction research. This introductory section will end with a brief literature review of the conceptual and operational definitions of mindfulness.

Mindfulness

In recent years, scientific interest in mindfulness has increased at an almost exponential rate (Black, 2010). As a major subject of research interest, mindfulness-based paradigms were the topic of 52 papers in 2003, rising to 477 by 2012 (Pickert, 2014). Part of this recent rise in mindfulness literature is due to initial findings that mindfulness can help improve a wide spectrum of both mental and physical health outcomes (Brown, Ryan, & Creswell, 2007; Ludwig & Kabat-Zinn, 2008). Physically, Kabat-Zinn's seminal research found that mindfulness mediation led to significant improvements in chronic back pain (Kabat-Zinn, 1982). Since then, research has found that mindfulness can lead to significant improvements concerning HIV-

pathogenesis in HIV-positive adults (Creswell, Eisenberger, & Lieberman 2007, 2009; SeyedAlinaghi, Jam, Foroughi, Imani, Mohraz, Djavid, & Black, 2012), can help patients with Psoriasis heal faster (Kabat-Zinn, Wheeler, Light, Skillings, Scharf, Copley, & Bernhard, 1998), and can ease symptoms of fibromyalgia (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007). Mentally, mindfulness has been shown to reduce rates of substance abuse (Bowen, Witkiewitz, Dillworth, Chawla, Simpson, Ostafin, & Marlatt, 2006), depression relapse (Teasdale, Moore, Hayhurst, Pope, Williams, & Segal, 2002), anger associated with schoolyard bullying (Heppner, Kernis, Lakey, Campbell, Goldman, Davis, & Cascio, 2008; Kelley and Lambert, 2012), and symptoms of anxiety (Peterson and Pbert, 1992), and to assist in coping with negative emotions that arise due to illness (Speca, Carlson, Goodey, & Angen, 2000; Carlson, Speca, Faris, & Patel, 2007). Mindfulness training has also been shown to promote higher, more stable scores on measures of self-esteem (Heppner, 2006), and increase immune system functioning (Davidson, Kabat-Zinn, Schumacher, Rosenkranz, Muller, Santorelli, & Sheridan, 2003).

Although there is a significant and rapidly expanding body of research concerning this construct, mindfulness is still a recently-surfaced concept in Western society, particularly when compared to its Eastern counterpart (Schmidt, 2011). In some Eastern societies, especially those that practice Buddhism (Thera, 1960), mindfulness is a fundamental core aspect of religion, practiced for centuries. The word *mindfulness* originates from the Pali word *Sati* (Finot, 1925), which has been identified in some of the earliest known Buddhist documents, originating from as early as the first century BCE (Nagrajji, 1970). Significantly, most of the earliest-documented literature discussing mindfulness is written in this language. *Sati* (mindfulness) is one of the seven factors of enlightenment of the Buddhism doctrine (Thera, 1960). In the Eastern

Hemisphere, mindfulness has been traced back to before the Common Era, but in Western scientific literature mindfulness only surfaced during the early 1980's (Brown & Engler, 1980; Langer & Weinman, 1981; Kabat-Zinn, 1982). Perhaps the most influential study to date is Kabat-Zinn's aforementioned 1982 study, in which he found that a mindfulness program led to significantly reduced back pain reported by patients who were afflicted by chronic back pain. The study utilized a rudimentary mindfulness program, which over the next 20 years, would evolve into the Mindfulness Based Stress Reduction (MBSR) program. MBSR is currently one of the most prevalent and successful mindfulness techniques (Lamothe, Rondeau, Malboeuf-Hurtubise, Duval, & Sultan, 2016). Scientific interest in mindfulness has continued to expand ever since.

Eastern and Western Mindfulness Doctrines – The Tale of Two Minds

In the Eastern Hemisphere, mindfulness assumes many broad definitions, usually being impacted by the religion, tradition, and morals of society (Brown, Ryan, & Creswell, 2007). While all Eastern definitions share a similar, spiritually-based foundation, these definitions are usually broad and do not translate well to a scientifically-driven operationally-definable construct (Brown et al., 2007). When reviewing Western scientific literature on mindfulness, the dichotomy between the two doctrines can be observed (Djikic, 2014). One school of thought, pioneered by John Kabat-Zinn, is congruent with Eastern mindfulness, which places emphasis on internal states and meditation (Kabat-Zinn, 1990; Bishop, Lau, Shapiro, Carlson, Anderson, Carmody, & Devins, 2004). A contrasting doctrine, pioneered by Langer, conceptualizes mindfulness not by meditation and internal states, but by the capacity one has to make distinctions about their surrounding environment (Langer, 1989; Langer & Abelson, 1972).

Although these two disciplines of mindfulness are often referred to as Eastern and Western mindfulness, these distinctions are most likely merely a label, only being labelled as such due to where the concept originated. In actuality, mindfulness is a multifaceted concept and although there is significant overlap between both disciplines, there are also significant differences between the two types of mindfulness, whatever you wish to label them. While John Kabat-Zinn defines mindfulness as a form of self-regulation of attention that is present-oriented and is characterized by curiosity, openness, and acceptance (Bishop et al., 2004), Langer operationally defines mindfulness as drawing novel distinctions about stimuli, which results in one being situated in the present, sensitive to context and perspective, and guided by rules and routines (Langer, 2009). Although they both require cognitive self-regulation and attentional regulation, there are clear differences between both doctrines.

The reasons why people begin practicing mindfulness, whether of Eastern and Western origins, usually overlap. In Eastern societies, people often aspire to become mindful for spiritual reasons; for transformation and for liberation, and the catalyst for this desire to change is the desire to remove *Dukkha*, also known as suffering, from their lives (Mosig, 1989). *Dukkha*, is considered to include physical events – deaths, old-age, sickness, for example – as well as the accompanying negative emotions to which these events give rise. Many negative events are unavoidable in nature (e.g., the inevitable death of a parent). Eastern mindfulness doctrine acknowledges this, tending to place a greater emphasis on the emotions that arise from negative events rather than the negative events themselves (Djickic, 2014). The way to do this, is through cultivation of non-judgmental acceptance. In Western societies, alleviated negative emotions has a somewhat different objective. Rather than cultivating non-judgmental acceptance, Western culture seeks to reduce psychological stress (Shapiro, 1992). While psychological stress can be

conceptualized as a form of suffering, Eastern mindfulness practices place emphasis on the minimizing the influence of distressing events. Using the example of breaking a bone, Eastern mindfulness would emphasize the mitigating of negative mental states, while Western mindfulness would emphasize avoiding the situation and therefore not breaking the bone to begin with. The belief of Western mindfulness practices is that the actor plays a more active role and that the actor places him or her-self in a stressful situation through being mindless or through a lack of attention to their surroundings and poor decisions that result from this inattentive behaviour (Langer, 1989). Furthermore, Langer states that this mindlessness causes people to anchor their cognition in the past, subjecting themselves to categorical thinking and thus “blinding” (Langer, 1989) them to the reality of the present. While the goal of Eastern mindfulness is to reduce suffering through introspection and the modulation of internal cognitions, the goal of Western mindfulness is to reduce psychological stress through attention to one’s environment and the prevention of behaviours which precede psychological stressful scenarios. Therefore, although both disciplines have a mutual stage of increased awareness, the central difference between the two disciplines can be attributed to a difference of loci of control (Djicic, 2014). While Eastern mindfulness places the locus of control mentally, Western mindfulness tends to place the locus of control more physically; in their observable behaviours. Using an example of a person sitting in rush hour traffic, Eastern mindfulness would view traffic as unavoidable, thus focusing and believing that perceived stress is caused by the emotions that are elicited due to the traffic, while Western mindfulness would play a more active role, proposing that if one paid more attention, they could anticipate the traffic and act accordingly to avoid it, therefore avoiding the stressor.

Evolutionarily, many cognitive and behavioural tendencies stay relatively stable over one's lifetime, due to the fact that many aspects of our environment remain somewhat stable (Buss, 1995). For example, one's food and mating preferences do not fluctuate significantly throughout one's life course (Buss, 1995). However, with the rapidly changing world of the late 20th and early 21st century, the propensity of humans to behave habitually, without adequate attention to the present (mindlessness) tends to be a significant cause of anxieties and uncertainties (Howell & Buro, 2011). Additionally, humans often unconsciously react to their environment (Bargh & Chartrand, 1999; Milgram, 1963), which may increase mindlessness (Dijikic, 2014). Langer (Langer 2000; Langer and Piper, 1987) even goes so far as to hypothesize that the Western educational system is set up in such a way that it is conducive to this type of mindlessness, by encouraging attentional allocation to fixed aspects of stimuli, such as dates and events, rather than the dynamic, variable aspects such as how states of affair change and the reasoning behind it. Western mindfulness offers a potentially useful tool to keep the organism aligned with the present, thus reducing cognitive dissonance (Festinger, 1962) and buffering against stress and negative affect.

Conversely, Eastern mindfulness adopts a more passive doctrine, in which the solution to the problem, and therefore the focus of mindfulness, lies within acceptance of events. The negative emotions in response to the loss of a loved one can be replaced by acceptance of the self, environment, and experiences (Walsh & Shapiro, 2006). One of the fundamental aspects of Eastern mindfulness may be one of the most troubling aspects of it, from a Westerner perspective; the passivity or fatalism of the approach and the cultivation of stillness and acceptance (Walsh & Shapiro, 2006). There are certain events in one's life that cannot be changed, such as the eventual death of a parent or the conflict of beliefs and morals with other

people. Thus, while Western mindfulness is achieved through challenge and activity, Eastern mindfulness is achieved through acceptance and passivity (Djikic & Langer, 2007).

While it is clear that Eastern mindfulness predominantly focuses on one's internal states, ideally resulting in acceptance and non-judgment of events, Western mindfulness focuses on external states, ideally resulting in increased external attention and more congruent behaviour. However, it has been hypothesized that Western mindfulness may also lead to more non-judgmental internal states (Langer, 1993). When a parent passes away, it is often a fallacy to believe that one could have prevented a death, especially when a death is due to old age. Western mindfulness can modulate affect through the active recognition of opposing viewpoints. Mindless people tend to have thinking rooted in the past (Langer, 1989), thus when negative events happen, mood congruency effects may be stronger (Drace, 2013), and they may be less likely to adopt opposing viewpoints, in theory amplifying their negative affect. Somewhat like balancing a math equation, through the process of active attention and awareness towards the present, a broader understanding of a situation can be obtained leading to a more neutral emotional response through recognition of both positive and negative perspectives. While a person practicing Eastern mindfulness may focus solely on the negative feelings that arise from losing a loved one, acting retroactively to neutralize and accept these feelings, a person practicing Western mindfulness would be more likely to view the situation from multiple perspectives, effectively neutralizing the situation through the recognition of multiple viewpoints. For example, someone practicing Western mindfulness may be distraught by the death, but through the acknowledgment that the loved one was in chronic pain, and the pain has now ended, may relieve some perceived stress. Someone practicing Eastern mindfulness may focus on the negative emotions, realize that without negative emotions, positive emotions would

not feel so positive, or even that negative emotions may be an indicator of how much they felt for the deceased, and within those thoughts, solace and acceptance might be found.

Thus far, it has been demonstrated that both mindfulness disciplines arose due to similar problems, and that both disciplines arrived at similar outcomes, although through somewhat different mechanisms and approaches. Research has found evidence that both styles of mindfulness can produce similar results: for example, both approaches have been found to lead to improvements in memory (Langer, 2000; Murphy & Donovan, 1997) and concentration (Carson, Shih, & Langer, 2001; Murphy & Donovan, 1997), decreases in pain perception (Langer, 2000; Kabat-Zinn, 2003), and reductions in pain among the elderly (Langer, Beck, Janoff-Bulman, & Timko, 1984; Alexander, Langer, Newman, Chandler, & Davies, 1989). However, although not as extensively researched, results obtained from the two types of meditation have found evidence for a measurable difference between the two doctrines. Christopher and colleagues (Christopher, Charoensuk, Gilbert, Neary, & Pearce, 2009) administered the Kentucky Inventory of Mindfulness Skills (KIMS) and the Mindfulness Attentional Awareness Scale (MAAS) – two Western developed mindfulness scales – to 24 monks and multiple American college students. While the Buddhist monks produced significantly higher scores than the American population on two of the measures, the MAAS and KIMS awareness subscales, as expected, the monks produced significantly lower scores on the KIMS observing, KIMS describing, and KIMS accepting subscales. The authors also unexpectedly found that within subjects, the KIMS observing subscale was negatively correlated with the KIMS accepting subscale for both the monks and American students. The authors proposed that this correlation may have occurred within the sample of American students due to a lack of meditation experience. Additionally, Baer and colleagues found results similar to this

pattern in 2004 (Baer, Smith, & Allen, 2004), in a follow up study which found that with experienced meditators these correlations are reversed (Baer, Smith, Lykins, Button, Krietemeyer, Sauer, & Williams, 2008). However, the authors could not find any literature to explain this trend in the sample of monks. They proposed that, in regards to the Buddhist monks, the negative correlation between observing and accepting may have been due to the inherent doctrinal difference of Western mindfulness, stating that while the KIMS' questions may be sufficient at measuring mindfulness as it relates to impacts on psychological stress, they may not be sufficient enough to pick up on qualities of Eastern mindfulness; qualities of impermanence rather than stress reduction. The authors further concluded that the monks may have scored lower on the three subscales compared to the American students not because of qualities of absolute mindfulness acquisition, but because of the item content. Additionally, these differences may have been due to differing response styles of the participants. For example, Buddhist monks may be less extreme in answer styles, while American students may be more likely to answer along the extreme ends of the scales.

Trait and State Mindfulness

In addition to cultural differences of mindfulness, mindfulness can also be considered either a trait or state quality. Brown, Ryan, and Creswell (2007) observed that there is variation between how researchers define mindfulness, and that the differences tend to lead to either a state or trait conceptualization. While some researchers conceptualize mindfulness as an unconscious mental state, others view it as a set of conscious skills and techniques. Trait mindfulness tends to be more holistic, being an inherent mental state, while state mindfulness is seen as more acquired, more of a set of skills and techniques (Gehart, 2012). Black (2011) stated

that a trait conceptualization of mindfulness lends itself more readily to an Western-type of mindfulness, leading to a definition which resembles an inherent, cognitively holistic capacity that only some people can attain. Whereas in Eastern society, researchers have translated mindfulness into a more measurable, more operationally definable concept, which is more state-like. In the context of state and trait mindfulness, trait mindfulness is considered to be a tendency for one to enter a state of mindfulness more frequently with ease, while a mindful state is defined as a period of increased present-moment awareness (Gehert, 2012). Furthermore, a person may demonstrate trait mindfulness more frequently with regular mindfulness practice, environment, and potentially genetics (Smalley & Winston, 2010). While some have shown that trait mindfulness scores remain fairly stable over time (Brown & Ryan, 2003), others have demonstrated that mindfulness-based approaches can increase trait mindfulness scores (Carmody, Reed, Kristeller, & Merriam, 2008; Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010). Buddhist-based theories of mindfulness propose that repeated practices of mindfulness, or repeated events of increases in state mindfulness, can translate to increased everyday mindfulness, or trait mindfulness (Davidson, 2010), through the process of neuroplasticity (Garland, Gaylord, Boettiger, & Howard, 2010).

Bishop et al. (2004) proposed a two-component model of mindfulness: the first component is the self-regulation and orientation of one's attention towards the present moment and immediate environment, and the second component is a cognitive orientation characterized by acceptance, curiosity, and openness to experiences. The first component, self-regulation of attention, is the basis of Western-Langerian mindfulness (Langer, 1989), and appears to be more of a state component. The second component is comprised of openness to experience, curiosity, and agreeableness; aspects of the Big Five personality traits (Costa & McCrae, 1992) that have

been shown to stay relatively stable through one's life (Markey, Markey, & Tinsley, 2004; Shiner & Caspi, 2003). Additionally, in regard to the second component, Bishop and colleagues asked participants to avoid producing a specific internal state, such as relaxation, but rather to passively take notice of their stream of cognition. This suggests a measure tapping into trait qualities (Bishop et al., 2004).

Further evidence that trait and state mindfulness are different but related concepts comes from studies that measure trait mindfulness scores prior to requiring a mindfulness manipulation. Shapiro and colleagues (Shapiro, Brown, Thoresen, & Plante, 2011) found that participants with higher levels of trait mindfulness at pretest showed a larger increase in mindfulness after manipulation, suggesting that those with higher trait mindfulness scores have cognitive thinking styles that more frequently mirror mindfulness and are thus more readily able to become mindful when instructed.

Stress

Psychological stress is defined as the feeling one has when one perceives that environmental demands tax or exceed their adaptive capacity (Cohen, Janieki-Deverts, & Miller, 2007). Globally, stress has been estimated to be the primary cause of 40% of all workplace turnovers and 50% of instances of absenteeism, costing the global economy between 250-300 billion per year (Roberts, Grubb, Grosch, 2012). In Canada, it has been estimated that stress costs the private sector \$222 million - \$2.75 billion annually, and the public sector \$2.74-8.25 billion annually, totalling anywhere from \$2.9-11 billion dollars annually (Shain, 2008). Both on a national scale, and an individual scale, stress is a prevalent issue. A Statistics Canada poll found that 23% of Canadians rated most days as being "quite a bit" or "extremely" stressful (Compton,

2011). Of the 23% of the population that answered as significantly stressed, 62% attributed their stress to work, 12% attributed their stress to financial reasons, and another 12% attributed their stress to a lack of time. Since the average Canadian spends 32% of their time at work (Compton, 2011), it can be argued that 20% of the general Canadian population is significantly stressed due to work, or a lack of resources related to work. Additionally, since 50% of Canadians live paycheck-to-paycheck (Canadian Payroll Association, 2013), for many of these stressed individuals removing the stressor may not be an economically feasible option. An American study (US Department of Health and Human Services, 2011) found that while approximately 20% of the population suffers from some type of mental illness, only 37% of this 20% receive help, with the remaining 63% (28.5 million people) receiving no formal help. When polled to discover why so many mental health needs patients were not receiving treatment, researchers found that 50% of those untreated could not afford the cost, an additional 8% said that insurance did not cover treatment, and 15% did not have the time to seek treatment. Thus, while advanced medications and treatment plans may be beneficial, they may not be feasible for a significant proportion of people. For many, work cannot be avoided and stress will continue to be present. In these situations, it is not an issue of removing the stressors from one's life, but an issue of managing and coping with the unavoidable stressors. Additionally, people need relatively inexpensive, and relatively timely methods of dealing with these stressors.

Many studies have shown a correlation between stress and the development of mood disorders such as anxiety and depression (Maldonado, 2014; Calabrese, Molteni, Racagni, & Riva, 2009). In 2005, Godin and colleagues (Godin, Kittel, Coppieters, & Siegrist, 2005) conducted a one-year follow-up of 2000 employees and found that job stress was significantly

correlated with all five mental health markers they measured (depression, anxiety, somatisation, chronic fatigue, and psychotropic drug use).

Mindfulness may be a feasible option to help people deal with unavoidable stresses of work. Kuyken and colleagues (Kuyken, Hayes, Barrett, Byng, Dalglish, Kessler, & Causley, 2015) compared a mindfulness-based approach of relapse resistance to a costly 2-year maintenance antidepressant treatment and found no significant differences between the two, suggesting that two-years worth of medication could be replaced with approaches significantly cheaper without increasing relapse probability. Another study found that supervisors' trait mindfulness scores were positively correlated with job satisfaction, need satisfaction, performance measures, and organizational citizenship behaviours of their workers (Reb, Narayanan, & Chaturvedi, 2014). Comparing stress-reduction techniques can pose many problems, due to the broad nature of stress (Van der Hek & Plomp, 1997). There are many different types of stress, many different ways in which people exhibit stress, and many different ways in which people deal with stress (Haslam, Jetten, O'Brien, & Jacobs, 2004). However, recent meta-reviews suggest that cognitive therapies generally have the largest effect sizes compared to other traditional therapies (Mimura & Griffiths, 2003; Bhui, Dinos, Stansfeld, & White, 2012). A study conducted by Regehr, Glancy, and Pitts (2013) found that within a university population, cognitive, behavioural, and mindfulness approaches all produced similar magnitudes of decreased anxiety levels. When comparing cognitive-behavioural therapy (CBT) to Mindfulness-Based Stress Reduction (MBSR), researchers found that the two approaches have similar outcomes for substance use disorders (Brewer, Sinha, Chen, Michalsen, Babuscio, Nich, & Rounsaville, 2009), stress and anxiety disorders (Sundquist, Lilja, Palmér, Memon, Wang, Johansson, & Sundquist, 2015), and insomnia treatment (Garland, Carlson, Campbell, 2014).

When studying veterans with anxiety disorders, it was found that CBT outperformed MBSR in terms of arousal levels while anxious, but MBSR outperformed CBT in terms of worrying about future anxiety attacks and comorbid emotional disorders (Arch, Ayers, Baker, Almklov, Dean, & Craske, 2013). When using a population of depressed patients, it was found that for mild to moderate depression CBT outperformed MBSR, however, MBSR outperformed CBT with moderate to severely depressed patients (Arch & Ayers, 2013). Through this literature, it appears as though mindfulness-based therapy can have significant clinical application towards stress reduction.

Mindfulness-Based Stress Reduction

Mindfulness-Based Stress Reduction is a formal, eight session program created by John Kabat-Zinn (1979). The goal of the program is to achieve “moment-to-moment, non-judgmental awareness.” The program is centered around three techniques: body scanning, meditation, and yoga. During the first four sessions, emphasis is placed on body scanning: directing one’s attention to different parts of one’s body. Usually, the participant (who is lying on their back) begins by focusing their attention on their toes, gradually moving their focus upwards from body part to body part, as they get closer to their head (Pickert, 2014). Once participants have gained experience directing attention towards different parts of their bodies, they are then taught to meditate. It is the meditational process which has been the subject of most controlled research on mindfulness (Ospina, Bond, Karkhaneh, Tjosvold, Vandermeer, Liang, & Klassen, 2007). When meditating, participants are instructed to simply be aware of their cognitive states, to non-judgmentally observe when the mind wanders onto different topics, and to gently bring their attention back to the current state when they have found that it has wandered. The third main

technique of MBSR is yoga, which is a more dynamic exercise which integrates components of both body scanning and meditation together.

A meta-analysis of 20 controlled and uncontrolled studies, using a wide variety of sample populations, found that on average mindfulness-based approaches had an effect size of 0.5, significant with a $p < 0.001$ (Grossman, Niemann, Schmidt, & Walach, 2004). Another meta-review conducted in 2010 by Hoffman and colleagues (Hofmann, Sawyer, Witt, & Oh, 2010) compared found MBSR elicited significant differences of a medium-sized effect on anxiety and depression scores between pre-intervention and post-interventions testing. They also found significant small to medium effect sizes of both classical treatment and MBSR compared to a waitlist control group.

While most research focusing on mindfulness has utilized the 8-week MBSR program, there is also a significant body of research utilizing short duration mindfulness programs. These programs are usually three to four sessions in length, and are adaptations of the longer 8-session MBSR. One study, which utilized a population of nurses across a four-session mindfulness program, found improvements in burnout symptoms, relaxation scores, and life satisfaction scores (Mackenzie, Poulin, and Seidman-Carlson, 2006). With smokers interested in quitting, a three-session mindfulness program lead to participants smoking significantly fewer cigarettes during the ensuing 7-day period, as compared to a control group. Within a general population, a three-session mindfulness program significantly reduced participants pain ratings to shocks (Zeidan, 2010), suggesting that participants who underwent mindfulness training experienced aversive stimuli as less aversive and evinced an increased tolerance for these aversive stimuli. Additionally, Zeidan and colleagues (Zeidan, Johnson, Gordon, & Goolkasian, 2010) found that

four-session mindfulness led to reductions in fatigue and anxiety, in addition to improvements in visuo-spatial functioning, working memory, and executive functioning.

Recently brief one-session mindfulness inductions have become topics of research interest (Arch & Craske, 2010). While the literature concerning one-session mindfulness is still relatively sparse, Arch and Craske (2010) found that one session mindfulness can lead to reductions in negative responses to laboratory stressors compared to the control group in anxious and non-anxious participants alike. Erisman and Roemer (2010) found similar results, finding that those in the experimental group had reductions in negative affect when presented with negative stimuli, and displayed a greater willingness to continue viewing these stimuli after just one session of mindfulness. When generalized, it could be hypothesized that people would be less negatively effected by workplace stress and would have greater tolerance levels, possibly preventing workplace burnout as per the Mackenzie and colleagues nurse participant study (Mackenzie, Poulin, & Seidman-Carlson, 2006). Finally, Zeidan and colleagues (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010) found that those in the experimental group had reduced anxiety levels compared to a control group.

Cognitive Mechanism Behind Mindfulness

Although there is a plethora of data supporting the health benefits of mindfulness, the mechanisms underlying mindfulness are still relatively unknown (Tang & Posner, 2013). The Stress Buffering hypothesis (Cohen and Wills, 1985) provides a potential pathway and mechanism which could explain mindfulness's effects on health (Brown, Goodman, & Inzlicht, 2012; Creswell, 2014). While the majority of studies examining mindfulness and various health outcomes have been conducted with diseases that are known to be triggered/exacerbated by

stress (Cohen, Janicki-Deverts, & Miller, 2007), very few studies directly examine the effects of mindfulness on psychological stress. One critical utilized a brief three-session mindfulness meditation training program as well as the Trier Social Stress Test (TSST) with 66 university students (Creswell, Pacilio, Lindsay, & Brown, 2014). Half of the participants completed a three-session adaptation of the MBSR, while the other half completed a three-session analytical cognitive training program. At the culmination of training, participants were then subjected to the TSST, a social stress paradigm (discussed in detail in the Methods section). Following this, markers of psychological stress were measured. The researchers found that when compared to the cognitive training control group, the mindfulness group reported feeling less psychologically stressed. Trait mindfulness has also been found to correlate with reduced biological psychological stress markers when presented with physical stressors (Arch and Craske, 2010) as well as social stressors (Brown et al., 2012).

Filling a void in the scientific literature, Shapiro and colleagues (Shapiro, Carlson, Astin, & Freedman, 2006) proposed one of the first theories of mindfulness. While most research had examined the effects of mindfulness on various behavioural and physical measures, the authors attempted to operationalize mindfulness, postulating that mindfulness consists of three dimensions: intention, attention, and attitude (IAA). Intention, Shapiro and colleagues wrote, is what one hopes to achieve through mindfulness. The authors recognized that mindfulness practices of Western societies may not have the same spiritually-rooted intentions that Eastern mindfulness practice have (e.g. to obtain enlightenment, acceptance, and compassion for all things). Shapiro (1992) earlier found that middle-aged Americans tend to begin mindfulness with the intention of self-regulation, which eventually becomes a desire for self-exploration, before finally evolving into the pursuit of self-liberation. He also found that intentions correlated with

outcomes. Many definitions of mindfulness, and many practices, tend to overlook this component (Bishop et al., 2004). The second dimension, attention, is one of the most prominent concepts in mindfulness literature. It is a necessary component of both Kabat-Zinn's body scanning and focused-attention mediational exercises, and Langer's external awareness to one's environment. Cognitive behavioural therapy revolves around one attending to internal and external behaviours, and through awareness comes change (Shapiro et al., 2006). Attention leads to recognition and, depending on the intention, results in growth. The last dimension, attitude, is also of critical importance. It is believed that if one has a negative demanding attitude towards mindfulness, mindfulness practice can have an effect opposite to the intention (Kabat-Zinn, 2003). Interestingly, the Japanese characters for mindfulness are comprised of two figures, a mind and a heart (Kabat-Zinn & Santorelli, 1999). Although one might have the correct intentions, an incorrect attitude may be counter productive, as there is an enhanced capacity to form connections due to the constant "spot-light" of attention during mindfulness practice (Walther, Rutishauser, Koch, & Perona, 2005). Selective visual attention enables learning and recognition of multiple objects in cluttered scenes. It has been proposed that with the correct attitude, and the promotion of non-judgement, an environment of acceptance with less emotion can be cultivated, allowing for more in-depth analysis and further progress.

Through this theory, a person who practices Eastern-based mindfulness achieves their goal of non-judgment, acceptance, and compassion through attentively and continually bringing their mind back to patience and compassion. Alternatively, a person practicing Western-based mindfulness achieves their goal of reducing psychological stress even through the process of proactively and constantly attending to the environment to reduce erroneous behaviours that can lead to psychologically stressing situations, or retroactively through the recognition of

multiple different perspectives. Although both schools of mindfulness propose different intentions and loci of control, they share the commonalities of emphasis on attention, and a constructive attention-guiding attitude.

Mindfulness and Stress

Meditation, a central part of mindfulness-based programs and the most widely researched analogy of mindfulness, has been shown to increase alpha and theta wave states within the frontal lobe (Stigsby, Rodenberg, & Moth, 1981; Cahn & Polich, 2006), and increase topographical activation of the cingulate cortex and prefrontal cortex (Hölzel, Ott, Hempel, Hackl, Wolf, Stark, & Vaitl, 2007; Chiesa & Serretti, 2010; Pagnoni, Cekic, & Guo, 2008). Additionally, long-term meditators have been found to have significant activity changes in their hippocampus (Fox, Nijeboer, Dixon, Floman, Ellamil, Rumak, & Christoff, 2014), an area involved in stress and memory processing. Studies specifically researching MBSR have found comparable results, finding that MBSR leads to significant increases in anterior cingulate cortex and prefrontal lobe activity; these are two prominent areas associated with attention (Hölzel, Carmody, Vangel, Congleton, Yerramsetti, Gard, & Lazar, 2011; Hölzel, Hoge, Greve, Gard, Creswell, Brown, & Lazar, 2013). In the context of the Stress Buffering Hypothesis (Cohen & Wills, 1985), researchers hypothesized that mindfulness plays a proactive top-down role, as well as a retroactive bottom-up role (Creswell & Lindsay, 2014). Mindfulness has been shown to activate brain areas that are also implicated in stress-regulation, most notably the lateral prefrontal cortex (Creswell et al., 2007). While it has been found that activation in the prefrontal cortex can predict improvements in clinical symptoms (Holzel et al., 2013), it is proposed that because of shared processing tasks of this area, the increased activity during mindfulness practice

may promote activation of the shared connected networks implicated in stress-regulation processing (Creswell & Lindsay, 2014). From a bottom-up perspective, mindfulness may exert influence on the cascade of peripheral stress-response networks. The amygdala is an inarguably important component of peripheral stress responses (Roosendaal, McEwen, & Chattarji, 2009; Ferry, Roosendaal, & McGaugh, 1999). It has been found that mindfulness alters the function and structure of the amygdala (Arnsten, 2009) and that more mindful individuals have lower resting amygdala activation levels (Way, Creswell, Eisenberger, & Lieberman, 2010). This altered activity of the amygdala and the anterior cingulate (Taren, Gianaros, Greco, Lindsay, Fairgrieve, Brown, & Bursley, 2015), may translate into less network activation of peripheral stress cascades, leading to less sympathetic nervous system activation (Creswell & Lindsay, 2014).

Returning to the dichotomy of Eastern and Western considerations of mindfulness, the sum of brain areas known as the default mode networks (DMN) - which consists of the cingulate cortex, prefrontal cortex, and angular gyrus (Andrews-Hanna, Smallwood, & Spreng, 2014) - is often associated with mindfulness (Gusnard, Raichle, & Raichle, 2001). The DMN is related to spontaneous thoughts and mind-wandering (Fox et al., 2015; Mason, Norton, Van Horn, Wegner, Grafton, & Macrae, 2007), and has been found to activate during certain introspective tasks such as mentalizing, self-referential thought, and projecting oneself into the future (Amodio & Frith, 2006; Buckner & Carroll, 2007). Some styles of mindfulness, such as meditation which encourages focusing on a specific object, such as focused breathing, decreases DMN activity. Other types of meditation, such as open meditation or free mind wandering meditation, do not suppress activation of the DMN (Brewer, Worhunsky, Gray, Tang, Weber, & Kober, 2011). Since stress has been found to impair broad, general attentional processes (Sänger, Bechtold, Schoofs,

Blaszkevicz, & Wascher, 2014), while improving selective attention (Chajut & Algom, 2004), the DMN may be one important brain network in which mindfulness styles differ from each other, and one possible explanation as to why Western mindfulness, which focuses on reducing stress, tends to emphasize a more external broad attentional approach.

Present Study

The main objective of this study was to examine whether a brief one session mindfulness induction was impactful enough to 1) sufficiently induce mindfulness, as measured by a state mindfulness measure, and 2) significantly reduce perceived psychological stress, as measured by Visual Analog Scales. The second hypothesis of this study was that the brief mindful induction would alter mood, as compared to the control group, such that the experimental group would have more positive scores after the stress manipulation. State mindfulness, manipulated via a 15-minute analogy of mindfulness script (adapted from Arch & Craske, 2006), and psychological stress, manipulated via the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993) were the two independent variables used in this study. Mood states, as measured by the Present Mood State Inventory (Sinclair, Mark, Enzle, Borkovec, & Cumbleton, 1994) and, perceived psychological stress, as measured by three stress-related visual analog scales (as per Cresswell et al., 2014) were the two main dependent variables. The hypothesis was that participants in the mindfulness group would have lower perceived stress scores, especially after a stress manipulation as well as a more positive mood, in comparison to the control group.

Methods & Procedure

Participants

Fifty-one lower-year Laurentian University psychology undergraduate students were recruited. Thirty-six participants were female, and 15 participants were male. The age range of participants was 18-32 years with a $M = 20$ years and 4 months, and $SD = 3$ years and 4 months. Participants were recruited via in-class announcements and accompanying sign-up sheets. Prospective participants were asked to not sign up if they had 1) prior meditation experience 2) any diagnosed mood disorders within the last six months, or 3) any diagnosed neurological disorders within the last six months. Data from five participants were removed from the data analysis; one participant believed that he/she was being videotaped during the stress manipulation control (explained in detail later), two had mental disabilities/learning disorders, one was visibly nervous and could not complete the stress manipulation, and one displayed a bizarre answering pattern on the questionnaires and only answered in extremes. Upon completion of the experiment, participants were awarded one research participation mark towards an eligible class of their choosing.

Environment

A small, moderately lit room was used throughout the entirety of the testing session. The classroom had seating for roughly 20 persons, a projector and computer console near the front of the room, and a large window on one of the side walls. The main criteria for room choice were twofold: the room had to be devoid of potentially distracting stimuli (i.e. background noise, art, and uncommon equipment/structure), and the room had to house a computer.

Trait Mindfulness Scale (Appendix A)

After signing consent forms, participants filled out the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003) under the mild deception of collecting some simple background and baseline information. The MAAS is a 15-item scale which measures core characteristics of dispositional mindfulness; namely, open and receptive awareness and attention to the present. Questions are answered along a 6 point Likert scale, with a score of 1 indicating “almost never” and a score of 6 indicating “almost always”. The measure has been validated with a sample of 2277 college students [$M = 3.83$, $SD = .70$] (Brown & Ryan, 2003).

Mindfulness Manipulation (Appendix B)

Following the administration of the MAAS, participants were subjected to the first manipulation. All participants were played audio-taped instructions through the classroom’s audio system and were asked to perform the exercise to the best of their ability. Participants were told that the purpose of the audio-taped instructions were to reduce inter-participant variability and reduce the likelihood of extraneous variables influencing all future results. The example that one participant may be attending the testing session directly after attending an unengaging class or after taking a nap, while another participant may be attending the testing session directly after writing a test or exercising at the gym was used in order to increase the believability of the deception. Half the participants were played audio taped instructions advocating the focusing of attention towards an internal state (breathing; a brief mindfulness induction script adapted from Arch and Craske, 2004), while the other half of participants were played an audio script advocating unfocused attention and free mind wandering. The scripts are as follows:

Focused attention script (an analogy of mindfulness, adapted from Arch and Craske, 2004):

“For the following duration of time, I would like you to breathe at a comfortable rate. While breathing, focus on the sensations of the breath entering and leaving your body. There are various components to a breath; there is the nose or mouth component, the lung component, and the diaphragmatic component. You may also wish to pay attention to other physical sensations, such as how various muscles move in direct relation to your breath, this is also fine. When you notice that your awareness is no longer on the physical sensations of breath, take a moment to understand where your mind has wandered, why it may have wandered there, and then gently bring your awareness back to the sensation of breathing. A bell will chime every minute to remind you of your task”

Mind wandering (control) script:

“For the duration of time, I would like you to let your mind wander. Let your mind wander wherever it goes. Just think like you would during a typical day, let your mind wander wherever it would wander to on a typical day. Please do not pull out your cell phone or any other source of material. This waiting period is simply meant to establish more of an equal baseline between participants. A bell will chime every minute to remind you of the task.”

Following confirmation that participants understood the instructions, a minute bell chime was started and the experimenter left the room. After 15 minutes, the experimenter re-entered the room.

State Mindfulness Scale (Appendix C)

After the Mindfulness manipulation, participants were given the Toronto Mindfulness Scale (TMS; Lau et al., 2006). The TMS is a 13-item scale which measures state mindfulness, and to date is the only valid scale which measures state mindfulness (Bergomi, Tschacher, & Kupper, 2013). The scale contains two subscales: a decentering subscale and a curiosity subscale. All questions are answered along a 5-point Likert scale. Scores of 1 represent “not at all” while scores of 5 represent “frequently”. Norms for participants with under a year of meditation experience are as follows: for the curiosity subscale $M = 16.42$, $SD = 9.42$; and for the decentering subscale $M = 23.29$, $SD = 7.81$ (Lau et al., 2006).

Present Mood State Inventory – Brief (Appendix D)

The Present Mood State Inventory – brief (PMSI-b) was administered alongside the TMS and is four-item scale which measures current mood. Questions are answered along a 5-point scale, and there are two 2-item subscales; affect and arousal. This inventory is an adaption of the longer 20-item full length inventory (Sinclair et al., 1994) and was used along with the full length PMSI, which was administered after the stress manipulation, as a within subjects measure.

Stress Manipulation (Appendix E)

Following the TMS and the PMSI-b, participants were subjected to either the Trier Social Stress Test (TSST; Kirschbaum et al., 1993), or the TSST-placebo (TSST-p; Het, Rohleder, Schoofs, Kirschbaum, & Wolf, 2009). The TSST is two-stage paradigm. The first stage involves a five-minute oral presentation and the second stage involves a five-minute oral arithmetic task. The paradigm was developed with the intent that both stages are to be presented in front of a panel of three live judges, which adds a sense of social-evaluative threat to the

paradigm (Kirschbaum et al., 1993). For the purpose of this study, instead of a panel of judges, a video camera and tripod – connected to the computer via HDMI – was used. Participants were told that three professors, out of a larger pool of willing professors, would be given live access to the video stream. The use of the video camera was justified as necessary, due to the individual nature of testing (over 50 individual testing sessions), the sporadic availability of the room, the busy schedules of professors, and the potentially confounding variable of testing without a constant number of judges/different judges present. Because the sample population was primarily psychology undergraduate students, it was suggested to participants that the professors were from the psychology department. Participants were also told that they would be judged on verbal content, as well as non-verbal content. For the five-minute oral presentation task, participants were asked to speak about psychology. They were told that they would be given three minutes to prepare notes on the back of their consent form. After the three-minute period was complete, participants were unexpectedly told to flip their consent forms over just before beginning their presentation. Participants were instructed to complete the full five-minutes, and if they paused for ten seconds they were told pre-planned prompts such as “please continue” or “the five minutes is not over yet”. During the second phase of the TSST, the arithmetic task, participants were asked to begin at 1037 and count backwards in increments of 13 as quickly as possible. Should they make a mistake, they were notified that they would have to start again at 1037.

For the placebo version, participants also had to complete a five-minute oral presentation as well as a five-minute arithmetic task, however, under different circumstances than the experimental group. For the oral task, participants were asked to talk about recent pieces of entertainment they had experienced; movies, television shows, books etc..., and during the arithmetic task participants were asked to start at 0 and count upwards by increments of 15. For

both tasks the video camera was removed and the experimenter vacated the room. To account for this seemingly bizarre task (speaking/performing verbal arithmetic in an empty room) participants were told that these tasks had been found to induce certain, localized activation of specific brain regions, which previous research had found to correlate with future measures that they would be told about once testing finished.

Visual Analog Scales (VAS) (Appendix F)

Directly after completion of the stress manipulation, participants were given a sheet of paper containing three 140mm VAS. A VAS is a horizontal line with anchors at each end of the line, usually the left-most end of the line is a neutral anchor (feeling neutral) while the right-most anchor is the not-baseline anchor (feeling good/bad). The three VAS's measured stress, anxiety, and insecurity (Cresswell et al., 2014), and have been shown to significantly positively correlate to heart rate and blood pressure (Hellhammer and Schubert, 2012).

Present Mood State Inventory

To conclude the testing session, participants were given the PMSI full version; A 20-question mood measure with an affect and arousal subscale (Sinclair et al., 1994). Similar to the brief version, questions are answered along a five-point scale. Participants are asked to answer statements relative to how they are feeling right now, today. For example, the first statement is "Very bad". A score of 1 indicates "strongly disagree" while a score of 5 indicates "strongly agree".

Grouping

The final grouping of participants were as follows:

	No-Stress	Stress
Mind Wandering	n=11	n=12
Focused Attention (Mindful)	n=13	n=10

Figure 1. Grouping of Participants Mindfulness Condition by Stress Condition)

Results

Manipulation Checks

The analysis of results began with a manipulation check. A 2x2 mindfulness condition by stress condition factorial between subjects ANOVA on state mindfulness scores was computed to insure that the manipulation produced significant changes between groups. The analysis revealed a significant effect of mindfulness condition on state mindfulness scores [$F(1,44) = 4.40, p = 0.04$] such that the mind-wandering group [$M = 43.87, SEM = 1.47$] had more elevated mindfulness scores than the focused-attention group [$M = 38.26, SEM = 1.14$] (figure 2). An ANCOVA, identical to the above ANOVA except with trait mindfulness as the covariate, also produced similar results.

A 2x2 stress condition by self-reported stress scores factorial between subjects ANOVA revealed a significant effect of stress condition on perceived stress scores [$F(1,45) = 20.51, p < 0.001$] such that the stressed group [$M = 9.15, SEM = 0.63$] had more elevated perceived stress scores than the placebo group [$M = 5.35, SEM = 0.55$] (figure 3).

As indicated by these results, both manipulations produced significantly different scores between groups, however, only the difference between groups after the stress manipulation was in the predicted direction (Figure 2 and Figure 3).

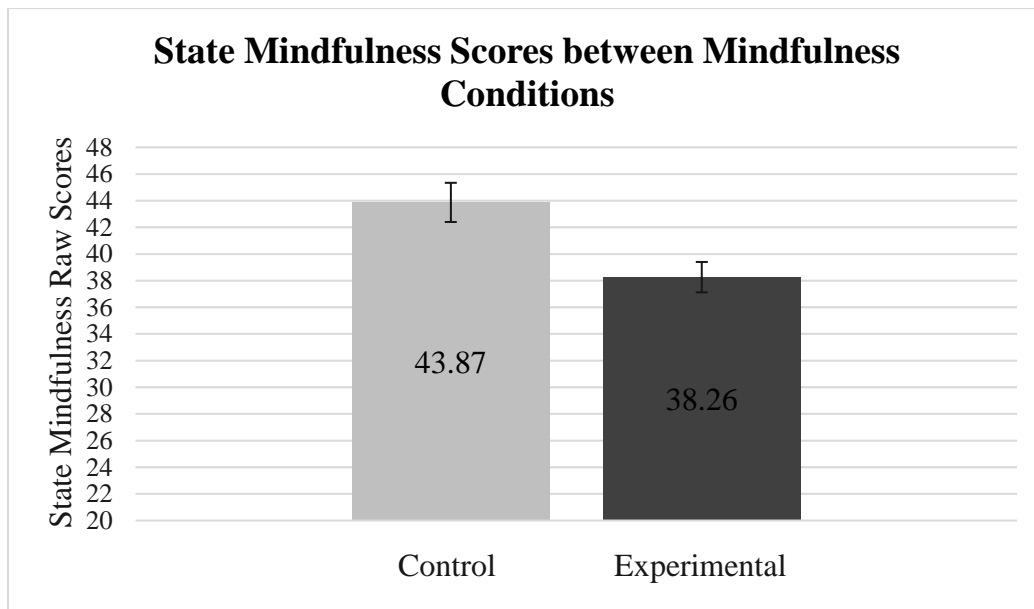


Figure 2. Means for State Mindfulness Scores Broken down by Mindfulness Condition

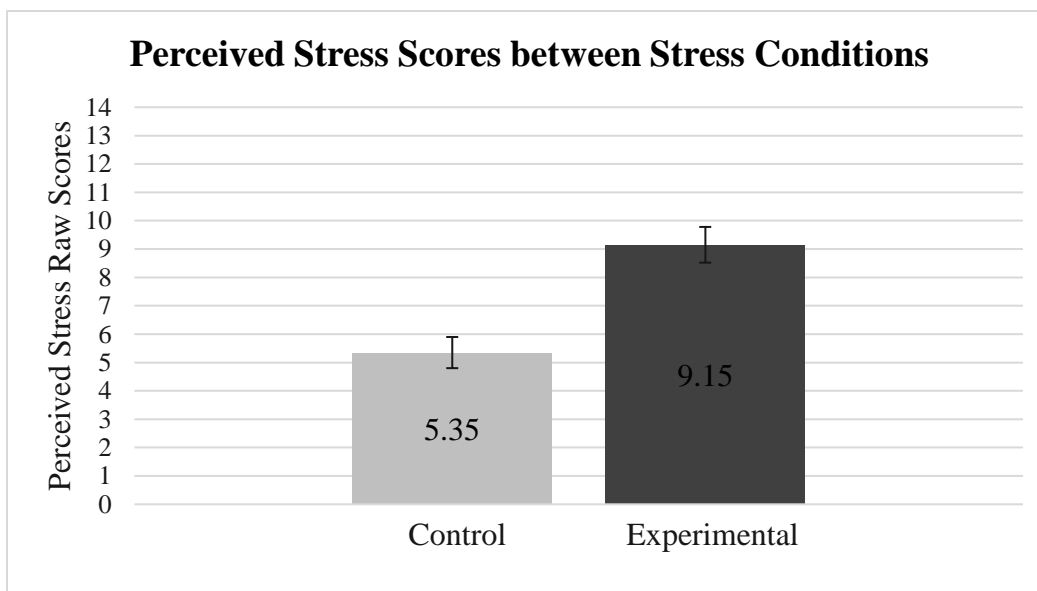


Figure 3. Means for Perceived Stress Scores Broken down by Stress Conditions

Main Results

Stress VAS scores were significantly correlated with both anxiety VAS scores [$r = .756$, $p < .01$] and insecurity VAS scores [$r = .638$, $p < .01$]. Although all analyses were computed with all three VAS's as dependent variables (when applicable), for simplicity, all further results will discuss only the stress VAS; if the stress VAS was statistically significant, so were the other two VAS, and vice versa. All results are shown in Table 1.

Mindfulness Condition and Perceived Stress. To test the main hypothesis that a brief mindfulness induction would buffer against perceived psychological stress, a mindfulness condition x stress condition (2x2) MANOVA on VAS scores was computed. Reporting only on the VAS stress scale, significant multivariate effects The MANOVA revealed a significant main effect of stress condition [Pillias' Trace = .48, $F(2, 40) = 12.27$, $p < 0.001$, $\eta^2 = 0.48$] - such that the stressed group [$M = 9.15$, $SEM = 0.63$] had more elevated perceived stress scores than the placebo group [$M = 5.35$, $SEM = 0.55$] - no main effect of mindfulness condition [$F = .18$, $p = 0.91$, $\eta^2 = 0.13$], and no significant interaction between mindfulness condition and stress condition [$F = 1.69$, $p = 0.19$, $\eta^2 = 0.11$]. These results suggest that mindfulness condition had no significant effect on perceived stress levels. When the same analysis was run, with trait mindfulness added in as a covariate, results were similar; a significant effect of Stress was found [Pillias' Trace = 0.32, $F(2, 40) = 9.28$, $p < 0.001$, $\eta^2 = 0.32$], there was no significant effect of mindfulness [$F(2,40) = 3.14$, $p = 0.236$, $\eta^2 = 0.07$], and no significant interaction [$F(2,40) = 1.62$, $p = 0.212$, $\eta^2 = 0.75$].

Mood. Two 3-way, mindfulness condition x stress condition x mood scores (2x2x2) mixed measures ANOVAs were computed to examine the effects of mood. The mood scores were the within subjects factor, while the mindfulness and stress condition were between

subjects factors. One ANOVA utilized the affect subscales of the PSMIb and PSMI, while the other ANOVA utilized the arousal subscales. Two separate analysis's were computed because the scale used was not developed to be used as a sum of both subscales, but rather both subscales measure two distinct factors. The mood affect ANOVA produced no significant results. The mood arousal ANOVA produced a significant main effect of arousal [$F(1,42) = 6.76, p = 0.01 \eta^2 = .139$] such that participants felt more aroused after the stress manipulation [$M = 3.23, SD = .50$] than before the stress manipulation [$M = 2.95, SD = 0.63$]. All other results were non-significant.

Supplementary Analysis

Mindfulness. To try and discover more information regarding the unexpected mindfulness manipulation check results, a Pearson's Correlation was computed between the trait and state mindfulness scales. A significant negative correlation between the trait mindfulness scales (MAAS), and the state mindfulness scale (TMS) was found [$r = -0.43, p < 0.01$].

State Mindfulness x Perceived Stress. A median split was conducted on state mindfulness scores. Participants were dichotomised into either a high state mindfulness or a low state mindfulness group. State mindfulness scores ranged from 20 to 58, had a mean of median of 41.32 (which was used as the cut-point), and a SD of 7.73, which left 23 participants in each group. An ANOVA for stress condition x dichotomised state mindfulness scores on perceived stress scores also revealed no significant results [$F(1,41) = 2.31, p = 0.136 \eta^2 = 0.52$]. However, although state mindfulness scores did not predict self-reported stress scores in the expected direction, a Pearson's correlation found that state mindfulness scores correlated weakly in a positive direction with self-reported stress scores [$r = 0.37, p < 0.05$].

Trait Mindfulness x Mindfulness Condition. There was a significant difference of trait mindfulness scores between the mindfulness groups [$F(1,44) = 9.84, p < 0.01, \eta^2 = 0.18$] such that the mind wandering group [$M = 3.70, SD = 0.70$] had lower trait mindfulness scores than the focused-attention group [$M = 4.03, SD = 0.63$]. Although participants were randomly assigned to groups, it appears that is random sampling did not work

ANOVAs			
Analysis	F	Sig.	η^2
Mindfulness manipulation x State mindfulness	(1,44) 4.40	0.04	-
Stress manipulation x Stress VAS	(1,45) 20.51	<0.001	-
Mindfulness condition & Stress condition x Stress VAS	0.18	0.91	0.13
Mindfulness condition & Stress condition x PSMI/ PSMIb Affect (within subjects)	(1,42) 0.37	0.55	0.01
Stress condition x PSMI/ PSMIb Arousal (within subjects)	(1,42) 6.76	0.01	0.14
Mindfulness condition & Stress condition x PSMI/ PSMIb Arousal(within subjects)	(1,42) 0.20	0.66	0.01
Correlations			
Analysis	R	Sig.	η^2
Stress VAS & anxiety VAS	0.76	<0.01	-
Stress VAS & insecurity VAS	0.68	<0.01	-
State mindfulness & stress VAS	0.37	0.011	-
State mindfulness & anxiety VAS	0.38	0.009	-

State mindfulness & insecurity VAS	0.35	0.018	-
Trait mindfulness & state mindfulness	-0.43	<0.01	-
Trait mindfulness & stress VAS	-0.21	0.162	-
Trait mindfulness & anxiety VAS	-0.35	0.016	-
Trait mindfulness & insecurity VAS	-0.34	0.023	-

Table 1. Results from various ANOVAs and correlations

Discussion

The purpose of this study was to examine whether or not a brief induction of mindfulness would mitigate perceived psychological stress of an immediately ensuing stressful situation. The hypothesis was that there would be a significant interaction between mindfulness and stress conditions on perceived psychological stress and mood, such that there would be no significant difference between mindfulness conditions during the placebo stress condition, but there would be significant differences between the mindfulness conditions after the experimental (TSST) stress condition. The direction of these significant differences were hypothesized to be as follows: the focused attention group would have significantly lower perceived stress scores as well as significantly more positive affect than the mind wandering group. The hypothesis was based on previous research which had found that a three-session mindfulness program led to significantly reduced perceived stress scores (Creswell et al., 2004) as well as significantly improved mood scores (Arch & Craske, 2006). Both manipulations showed effects, however, while the stress manipulation was significant in the expected direction, the mindfulness manipulation was significant in the direction contrary to expectations. Participants in the control group scored as being more state mindful than participants in the experimental group. Possible explanations as to why this pattern may have occurred are explored in detail in the following sections. This research was conducted with the awareness that there was a probability that a one-session induction of mindfulness would not be sufficient to influence perceived stress scores, as there are few research papers concerning brief one-session mindfulness treatments, however, the research had not yet been conducted.

There were no significant differences between mindfulness conditions for perceived stress scores nor was there an interaction between mindfulness conditions and stress conditions

on perceived stress scores. Concerning mood, mindfulness also produced no significant results. The only significant result concerning mood was that participants felt more aroused after the stress manipulation than before. Interestingly, there was a significant negative correlation between the trait mindfulness measure and the state mindfulness measure. This negative correlation may have been an artifact of the failed random sampling and the mindfulness manipulation simply acted as a distractor task, however this is discussed in detail in the following sections.

Issues/Limitations

One explanation for the lack of significant results may be the weak power of the one-session mindfulness induction, however, there may be other reasons. As exemplified by one participant who was assigned to the free mind wandering condition, the environment in which the study was conducted may have had a significant influence. After testing was finished, a participant began explaining that he was very wary and aware of his surroundings. Throughout all testing sessions, there was a faded blue folder behind the computer's monitor (another professor's notes), the participant disclosed that he was questioning the placement of the folder, believing that it had been placed there on purpose, and that the study had been designed to influence his/her mental state in subtle ways. Additionally, after some initial trial sessions for the placebo stress condition – in which participants had to speak about a recent piece of entertainment they had experienced and perform arithmetic in an empty room – it was discovered that extra emphasis had to be placed on the fact that they were not being videotaped or recorded in any way. The very environment of a psychological testing scenario may have induced mindfulness through a heightened awareness and curiosity, which may have mitigating the

differences between the mindfulness conditions. As mentioned earlier, the two subscales of the TMS were curiosity and decentering, which were both significantly higher than the experimental group after the mindfulness manipulation. The environment may have fostered curiosity, while the lack of bring the attention to the body (focused breathing) may have promoted decentering. The fact that there were significant differences of trait mindfulness scores between the mindfulness groups, such that the free mind-wandering group had lower trait mindfulness scores than the focused-attention group (even though participants were randomly assigned), higher trait mindfulness scores may have caused participants in the experimental group to become more engaged in the experimental manipulation. This narrows their range of attention to their task while the control group, who scored lower on trait mindfulness and were asked to let their mind wander openly, may have been more prone to boredom, and since they were tasked with an unengaging task, may have searched more actively to find stimulation than if they had rated higher on trait mindfulness.

Another possible issue may have been that the experimental group was more internally aware and attended to feelings of stress more than the control group did. Although this is one of the goals of the mindfulness (to make one more aware), this may have negated the neurological effect of mindfulness. Stated alternatively, the experimental group may have been more mindful in a way that wasn't picked up by the TMS, and although this mindfulness may have reduced perceived stress, it may have also increased sensitivity to stressor. If both groups had equal awareness to the stress, the mindfulness group may have then had lower perceived stress scores. As mentioned earlier, it has been found that moments of increased state mindfulness lead to neurological differences that correspond to reduced stress response activation (Creswell et al., 2007; Creswell & Lindsay, 2014). Research has also found that that private self-consciousness

can positively correlate with negative self-evaluations and perceived stress, specifically if the stress is conceptualized as being unavoidable (Kivimäki, M., & Lindström, 1995). Creswell et al. (2014) found that mindfulness training results in reduced perceived psychological stress perceptions but higher salivary cortisol levels. They proposed that the mindfulness training may have led to more engagement as well as more active coping during the TSST task, explaining both the increased cortisol levels and reduced perceived stress. Perhaps a brief 15-minute mindfulness induction is sufficient enough to increase task engagement, but not sufficient enough to induce active coping mechanisms. Additionally, Mindfulness-Based Stress Reduction therapy (MBSR) is an eight-session guided program, it has been found that after a full program of MBSR, mindfulness scores and well-being scores were positively correlated with time spent practicing mindfulness in between sessions (Carmody & Baer, 2008). Using the example of a new baseball player, playing one game may help familiarize one with the game (leading to higher scores on a pen and paper baseball measure) but may not be sufficient enough for the formulation of accurate ball-tracking schemas. Similarly, one-session mindfulness may be a necessary first step, but not sufficient enough to foster the development of active coping mechanisms.

Additionally, the population used – undergraduate psychology students – may not be reflective of the general population. For example, it has been found that adolescents have increased sensitivity to social evaluative stress (Sumter, Bokhorst, Miers, Van Pelt, & Westenberg, 2010), which is the kind of stress the TSST manipulates. With a different population, perhaps a population with an older mean age and of varying professional backgrounds, significant results may have been obtained in the expected direction.

Although unexpected, the negative correlation between the trait and state mindfulness scales may illuminate a major issue regarding the scientific body of literature concerning mindfulness. As mentioned in detail during the introduction, there appear to be two distinct doctrines of mindfulness in the literature; an Eastern, more holistic, trait-like concept of mindfulness; and a Western, operationally definable, state-like concept of mindfulness (Djikic, 2014). Eastern mindfulness places greater emphasis on internally directed attention while Western mindfulness places greater emphasis on attention directed towards the external environment (Bishop et al., 2004; Langer, 1989). The trait mindfulness scale used, the MAAS, is more western-orientated, with questions such as “I break or spill things because of carelessness, not paying attention, or thinking of something else” and “I drive places on ‘automatic pilot’ and then wonder why I went there”. As noted earlier, Western mindfulness places emphasis on the notion that the actor plays an active role, placing themselves in stressful situations through behaviours that arise from the lack of attention to their environment (Langer, 1989). Conversely, the state mindfulness scale used, the TMS, is more Eastern-orientated with questions such as “I was more concerned with being open to my experiences than controlling or changing them” and “I was curious about my reactions to things”. As noted earlier, there were significant differences between the MAAS and the Kentucky Inventory of Mindfulness Skills scale (KIMS; Christopher et al., 2008) suggesting that the MAAS was more closely aligned with Eastern concepts of mindfulness than the KIMS. Results of this study suggest that the MAAS more closely aligns with Western styles than the TMS. It may be possible that the questionnaires used were not measuring the correct characteristics of mindfulness. Although this is out of the scope of this research paper, future research concerning concept validity is needed and could have significant implications on both past and future mindfulness research.

Implications

Results of this study suggest that a brief 15-minute mindfulness induction is sufficient enough to produce significant measurable differences in mindfulness, as measured by a state mindfulness scale. However, the fact that the control group produced significantly higher state mindfulness scores than the experimental group suggests either 1) There are construct validity issues with the measure used (TMS), 2) Arch and Craske's 2006 mindfulness script may be based upon a western mindfulness doctrine, or 3) the environment of psychological testing may have caused the control group (who were not subjected to a focused attention manipulation) to become more aware than the experimental group; in this case, the focused attention task may have acted as a distractor task, prohibiting the curiosity and awareness that the environment of psychological testing naturally fosters. This study may therefore provide empirical support to future studies that wish to examine brief one-session mindfulness inductions while utilizing a different design, or different measurement tools.

While the unexpected results may be attributable to issues with the TMS, a difference in theory between the script and the TMS, or due to environmental influence; it may also be attributable to a lack of effect of the manipulation. While other short manipulations may work, the one employed in this study, one of simple instructions only at the onset of the manipulation, may not be sufficient enough. Perhaps a guided tape, with instructions all the way through the manipulation may be more attentionally captivating and more specific in its effect.

Additionally, the mindfulness induction did not significantly influence perceived stress levels. Taken solely at face value, this suggests that one 15-minute mindfulness induction was not sufficient to buffer against future stressful situations. This may be influential in directing

future research away from the use of one-session mindfulness within the context of stress relief, or it might call for an altered brief mindfulness induction script, one that better encapsulates the essence of MBSR into a brief period of time. However, due to the finding of the mindfulness induction, this conclusion should not be made without further consideration. This research could also support future studies that wish to study mindfulness and the formation of active coping mechanisms.

Additionally, there are no known publicized uses of the Trier Social Stress test with only a video recorder. Results from the stress VAS suggest that live judges do not have to be present during testing, simply deceiving the participants into believing that the professors are present through video connect is sufficient enough to induce stress. Results of this study could impact future stress related studies by making research less resource demanding and easier to perform.

It is of the opinion of the researcher that the most impactful finding of this study is the negative correlation found between mindfulness measures. There is a significant body of research concerning different doctrines of mindfulness, the roots of these doctrines, and conceptualizations of these doctrines. This research could either 1) call for future reviews and comparisons of different mindfulness measures and their Eastern/Western concept validity or 2) be used to support future findings and/or explain past findings with respect to the measures being used.

Future Research

Based on these results, there are several suggestions for future research. The simplest avenue for future research would be to conduct the same experiment on a larger, more diversified

population. As noted earlier, adolescents react differently to stress than older adults, perhaps performing the same experiment on a population which reacts differently to stress may yield significant results. Perhaps older adults have already developed the necessary coping mechanism required, allowing for mindfulness to exhibit stress buffering properties as proposed by Creswell et al. (2014). Similarly, salivary cortisol measures may provide information that simple self-reported stress levels are unable to measure. Also, a more naturalist environment may promote differences between mindfulness conditions, as well as increasing external validity (as per most laboratory studies). As discussed earlier, the environment of a psychological testing session may have caused increased awareness in the control group, mitigating the differences between the control and experimental group. If these three changes are made, and insignificant results are still found, then it may be that the mindfulness manipulation is simply insufficient as a buffer against stress. In this case, perhaps a modified or new mindfulness script could be created which better encapsulates the essence of the MBSR program. The length of the script and training session could also be extended. Significant main effects of stress condition were found. As noted earlier, there are currently no published papers concerning the use of the TSST with only a video camera. Future research could use the TSST in tandem with a video recorder while measuring various biological measures to help validate the use of the TSST with only a video camera. For example, heart rate, blood pressure, and salivary cortisol measures would provide useful data (Creswell et al., 2014). Finally, not directly pertaining to this study, future research should be conducted on the different types of mindfulness, their accompanying measures, and the concept validity of these measures. Measures are the lens through which concepts are observed, and if a measure is not valid, then the information regarding the concept may be flawed, skewed, or even completely unrelated to the concept in question. Somewhat akin to wearing sunglasses, if

someone has never seen the world without sunglasses on and has only ever had visual access to the world through the use of sunglasses, then they would have no reason to dispute the belief that world was dark and tinted.

Conclusion

To conclude, through the use of a 15-minute brief mindfulness induction script and the Trier Social Stress Test as the independent variables, and three stress related VAS and two mood measures as the dependent variables, this study's goal was to observe how a one-session brief mindfulness induction would influence perceived stress and mood levels of participants subjected to a stressful situation. Results indicated that both manipulation checks were significant, although the mindfulness manipulation check was significant in the opposite direction of the hypothesis; those in the control group scored higher in state mindfulness than the experimental group. Mindfulness had no main effect, or stress-interaction, on perceived stress scores or mood scores. Concerning the VAS measures, all three produced similar results, suggesting that using three VAS may be redundant and unnecessary. While the manipulation check was effective, indicating that there were significant differences of perceived stress between the stress manipulation groups, the mindfulness manipulation had no main effect or interaction on perceived stress. Concerning mood, the only significant result found was that participants scored as being more aroused after the stress manipulation compared to before. Interestingly, a significant negative correlation was found between the trait mindfulness and state mindfulness measure, suggesting an incongruity of concept validity between tests. This research provides useful insight into the use of the TSST without a live panel of judge's present, and the differences between different mindfulness measurements. Although further research and

literature reviews are required, this negative correlation may illuminate a much larger issue concerning mindfulness measurement tools. This study may provide valuable and necessary insight needed to direct future research and further our knowledge of mindfulness. Mindfulness is a concept which has been receiving exponentially increasing interest within the past few decades due to its beneficial properties.

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Appendix

Appendix A – Mindfulness Attention Awareness Scale

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 Almost Always	2 Very Frequently	3 Somewhat Frequently	4 Somewhat Infrequently	5 Very Infrequently	6 Almost Never
I could be experiencing some emotion and not be conscious of it until some time later.	1	2	3	4	5	6
I break or spill things because of carelessness, not paying attention, or thinking of something else.	1	2	3	4	5	6
I find it difficult to stay focused on what's happening in the present.	1	2	3	4	5	6
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1	2	3	4	5	6
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1	2	3	4	5	6
I forget a person's name almost as soon as I've been told it for the first time.	1	2	3	4	5	6
It seems I am "running on automatic," without much awareness of what I'm doing.	1	2	3	4	5	6
I rush through activities without being really attentive to them.	1	2	3	4	5	6
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.	1	2	3	4	5	6
I do jobs or tasks automatically, without being aware of what I'm doing.	1	2	3	4	5	6
I find myself listening to someone with one ear, doing something else at the same time.	1	2	3	4	5	6
I drive places on "automatic pilot" and then wonder why I went there.	1	2	3	4	5	6
I find myself preoccupied with the future or the past.	1	2	3	4	5	6
I find myself doing things without paying attention.	1	2	3	4	5	6
I snack without being aware that I'm eating.	1	2	3	4	5	6

Appendix B – Scripts for Mindfulness Manipulation

All Participants

“As per many psychological studies that involve human participants in which mood can play a moderating factor, a 15-minute wait period will be implemented. This is in order to have all participants in a more similar state of mind of mind. For example, some participants might be coming here straight from the gym, while others may have just woken up.”

Experimental Group

“For the following duration of time, I would like you to breathe at a comfortable rate. While breathing, focus on the sensations of the breath entering and leaving your body. There are various components to a breath; there is the nose or mouth component, the lung component, and the diaphragmatic component. You may also wish to pay attention to other physical sensations, such as how various muscles move in direct relation to your breath, this is also fine. When you notice that your awareness is no longer on the physical sensations of breath, take a moment to understand where your mind has wandered, why it may have wandered there, and then gently bring your awareness back to the sensation of breathing. A bell will chime every minute to remind you of your task”

Control Group

“For the duration of time, I would like you to let your mind wander. Let your mind wander wherever it goes. Just think like you would during a typical day, let your mind wander wherever it would wander to on a typical day. Please do not pull out your cell phone or any other source of material. This waiting period is simply meant to establish more of an equal baseline between participants. A bell will chime every minute to remind you of the task.”

Appendix C – Toronto Mindfulness Scale

Instructions: We are interested in what you just experienced. Below is a list of things that people sometimes experience. Please read each statement. Next to each statement are five choices: “not at all,” “a little,” “moderately,” “quite a bit,” and “very much.” Please indicate the extent to which you agree	Not at all	A little	Moderately	Quite a bit	Very much
1. I experienced myself as separate from my changing thoughts and feelings.	0	1	2	3	4
2. I was more concerned with being open to my experiences than controlling or changing them.	0	1	2	3	4
3. I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or	0	1	2	3	4
4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things	0	1	2	3	4
5. I was curious to see what my mind was up to from moment to moment.	0	1	2	3	4
6. I was curious about each of the thoughts and feelings that I was having.	0	1	2	3	4
7. I was receptive to observing unpleasant thoughts and feelings without interfering with them.	0	1	2	3	4
8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.	0	1	2	3	4
9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.	0	1	2	3	4
10. I remained curious about the nature of each experience as it arose.	0	1	2	3	4
11. I was aware of my thoughts and feelings without over identifying with them.	0	1	2	3	4
12. I was curious about my reactions to things.	0	1	2	3	4
13. I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to.	0	1	2	3	4

Appendix D – Present Mood State Inventory

Please circle the appropriate number on each of the following scales that best describes how you feel right now, today.

	Strongly disagree		Neither agree nor disagree		Strongly agree
1. Very bad	1	2	3	4	5
2. Very sedate	1	2	3	4	5
3. Very good	1	2	3	4	5
4. Very aroused	1	2	3	4	5
5. Very negative	1	2	3	4	5
6. Very active	1	2	3	4	5
7. Very positive	1	2	3	4	5
8. Very passive	1	2	3	4	5
9. Very alert	1	2	3	4	5
10. Very happy	1	2	3	4	5
11. Very sad	1	2	3	4	5
12. Very tired	1	2	3	4	5
13. Very miserable	1	2	3	4	5
14. Very quiet	1	2	3	4	5
15. Very activate	1	2	3	4	5
16. Very glad	1	2	3	4	5
17. Very inactive	1	2	3	4	5
18. Very unhappy	1	2	3	4	5
19. Very pleased	1	2	3	4	5
20. Very stimulate	1	2	3	4	5

Appendix E – Trier Social Stress Test: Protocol & Script

Experimental group

“This next phase of testing involves the 5-minute oral presentation and mathematical task I told you about earlier. This camera here (I will point to Canon Rebel T6i camera placed at the front of the room) is connected to my computer and will live feed out to three psychology professors who are acting as my panel of judges. They will be judging you based on verbal and non-verbal communication. This feed will not be recorded, and is only streaming to these three professors through a secure connection. Additionally, all these professors have signed ethics forms for my study, and are adhering to the exact same ethical guidelines that I am. Due to geographical and schedule restraints, coupled with the fact that I am testing multiple participants over multiple days and time slots, we decided that it would be easier to have all professors watching via video recorder, rather than having them present sometimes while absent other times. Again I would like to stress that your participation is strictly voluntary and you can leave at any time without penalty, however, your participation is greatly appreciated. The 5-minute presentation is being left fairly open ended; we would like you to present on psychology in general. Think of this as an oral presentation for a class, however it’s only 5-minutes long. You will have 5-minutes to write points down and prepare before you begin. Do you have any questions? Okay, let’s begin.”

After the 5-minute preparation time, their notes will be removed and they will be asked to begin.

There are scripted prompts urging the participant to continue if they stop early, these scripts are appended on the following page.

“Okay, half way done. This next stage involves math. Just like the presentation, we would like you to try and complete this math for 5-minutes. I would like you to start at 1,022 and count backwards in increments of 13 as quickly as possible. When you make a mistake, you will be asked to start again at 1,022. Any questions? Okay, please begin when you are ready.”

Control Group

“This next phase of testing will involve two routine behavioural tasks, both for 5-minutes. (The Canon Rebel T6i camera will be removed). What I would like you to do for this first part is to speak about a recent movie or novel you have read. Although this may seem like a pointless task, it is relevant, as this study is concerned with understanding changes to emotional stimuli, and one line of theory believes that the physical action of speaking produces significant changes to activation of the brain. So, while no one will be present in the room with you, I urge you to continue to speak verbally about your topic. You will have 5 minutes to write points down

and prepare before you begin. I will re-enter the room after 5-minutes. Are there any questions? Okay, let's begin."

"Okay, half way done. This next stage involves some routine math. Just like the presentation, I would like you to try and complete the math for 5-minutes. Again, just like the oral presentation, the same line of theory posits that math as well produces significant activation changes to the brain. I would like you to start at 0 and count upwards by increments of 15. Again, I will not be present in the room with you, but I the physical act of verbally performing the math is a crucial part to this study. Any questions? Okay, please begin when you are ready."

Prompts

If a participant stops early, after a 20 second period of silence these prompts will be read out one per pause.

"You still have some time left, please continue!"

"Can you tell me more?"

"Can you expand on that?"

"Please keep talking!"

"I will let you know when time is up."

Appendix F – Visual Analogue Scales

The following three scales measure a certain characteristic on a continuum. The left side of the scale is not at all, while the right side is very, or highly experiencing said characteristic. I would like you to make a tick on the scale that is representative of how you are currently feeling.

