MINDFULNESS AND ATTENTIONAL CAPABILITIES UNDER CONDITIONS OF ANXIETY

Sarah Bert Templeton

A Thesis Submitted to the
University of North Carolina Wilmington in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts

Department of Psychology

University of North Carolina Wilmington

2010

Approved by

Advisory Committee

Dr. Karen Daniels

Dr. Julian Keith

Dr. Richard Ogle
Chair

Accepted by

DN: cn=Robert D. Roer, o=UNCW, ou=Dean of the Graduate School & Research, email=roer@uncw.edu, c=US
Date: 2010.10.28 10:51:54 -04'00'

Dean, Graduate School

TABLE OF CONTENTS

ABSTRACT iv

DEDICATION v

ACKNOWLEDGMENTS vi

LIST OF TABLES vii

INTRODUCTION 1

Historical Roots of Mindfulness 2

Measuring Mindfulness 4

Evolution of Mindfulness in Psychology 5

Attention and Mindfulness 7

METHODS 12

Participants 12

Measures 13

Procedure 15

RESULTS 16

DISCUSSION 19

REFERENCES 23

ABSTRACT

Mindfulness is a theoretically ancient construct which has begun to form roots in Western psychology within the last twenty years. The current study sought to determine the relationship between individual differences in mindfulness on an attentional blink task in the context of anxiety. Sixty participants were randomly selected from the undergraduate research pool and were divided into either an anxiety group or a control group. All participants were assessed for mindfulness and performed the Attentional Blink task. It was hypothesized that those participants in the anxiety induction group, who rated higher in mindfulness, would show less interference on the Attentional Blink task. Concurrently, it was predicted that individual differences in mindfulness would exist and would appear when participants were tested at baseline. While individual differences in mindfulness were found in the population, the hypothesis that a relationship between mindfulness and attentional blink would first, exist and second, manifest more strongly under conditions of anxiety was not supported. Unexpectedly, significant correlations were found in the control group suggesting that the anxiety induction may have erased any relationship between mindfulness and performance on the attentional blink task.

DEDICATION

I would like to dedicate this thesis to my family for the path they have helped me pave and their willingness to always help me back up after I fall. Thank you for believing in me when I wasn't sure I had anymore left.

ACKNOWLEDGMENTS

I would like to acknowledge the support, belief, and hours of wisdom that I have received from my advisor Dr. Richard Ogle without whom none of this probably would have happened. I would like to acknowledge the support and dedication of my committee members Dr. Julian Keith and Dr. Karen Daniels who helped me through the world of programming and the conscious evolution of my thoughts and ideas. I would also like to acknowledge Nicole Merrigan for her hard work and dedication over the summer which I know was not easy. Lastly I would like to acknowledge the staff at Coastal Horizons who continued to push me and had faith that I would complete this thesis.

LIST OF TABLES

Table Page

1. Pearson's Correlation Matrix for Control Condition……..……17

2. Pearson's Correlation Matrix for Experimental Condition……18

"All that we are is the result of what we have thought. The mind is everything. What we think, we become" The Buddha.

Historical Roots and Buddhist Definition of Mindfulness

Entrenched in the roots of Buddhism is the concept of mindfulness. Thich Nhat Hanh, a Vietnamese Buddhist writer, describes mindfulness as "dwelling fully in the present moment; accepting without judgment or reaction" (Hanh 1998). As applied to the practice of meditation, mindfulness is a state of being, a presence. While Buddhists practice the art of being here now, psychologists study individual's ability to do the same. In Buddhist practice, right mindfulness is one of eight practices on the path to right living. Right mindfulness is the ability to accept everything without judgment or reaction, the practice of mindfulness is essentially the core, or heart, of the Buddha's teachings. To practice in this way is to live a life in the present moment and awakened to the full spectrum of experience that exists in the now. Jon Kabat-Zinn (2003) suggests that mindfulness allows us to "rapidly discover [that our experience] is severely edited and often distorted through the…unexamined activity of our thoughts and emotions." Kabat-Zinn (2003) suggests that mindfulness is the fundamental attentional stance underlying all streams of Buddhist meditative practice.

Mindfulness meditation relates back to Theravada Buddhism, the oldest tradition, and is known as sattipatana vipassana, or insight meditation (Kabat-Zinn 1982). This form of meditation is a more flexible form that teaches the individual to be aware of his or her thoughts, feelings, and desires without attachment or judgment of right or wrong, good or bad. It teaches the practitioner to be a quiet observer, watching thoughts and feelings pass without becoming wrapped up in them. In *The Heart of the Buddha's Teachings*, Thich Nhat Hanh suggests that

the practice is to find ways to sustain appropriate attention, i.e. not allowing oneself to become swept away in the chatter of the mind.

Mindfulness can be seen as deliberate attention which Kabat-Zinn (2003) states is of universal necessity, suggesting that "we are all mindful to one degree or another moment by moment. [Mindfulness] is an inherent human capacity." Though mindfulness and meditation are rich traditions within the Buddhist community, and have been practiced for over 2500 years, mindfulness as a theoretical construct is fairly new to Western society. The practice of mindfulness and Buddhist philosophy have migrated to the United States over the past forty years igniting interest in people from all walks of life including the medical and psychological community.

Western Attempts at Defining Mindfulness

At present the psychological definitions that exist for the construct of mindfulness are more philosophical in nature than operational and rely on the central tenant of awareness or attention. Kabat-Zinn (2003) for example, defines mindfulness as "awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment." Marlatt and Kristeller (1999) define it as "bringing one's complete attention to the present experience on a moment-to-moment basis." Bishop et al. (2004) define mindfulness as "the self-regulation of attention, which involves sustained attention, attention switching, and the inhibition of elaborative processing." While these definitions help to understand the direction and focus of the concept of mindfulness, the question still arises as to what exactly mindfulness is, how it works, and what is an agreed upon measure to operationally define the concept?

As Hayes and Shenk (2004) point out, mindfulness does not stem from the roots of basic science, in fact the idea and the techniques in which mindfulness is based "originated before modern science itself even existed" (p. 249). This fact alone makes empirical validation difficult when trying to define a concept that is based on simply being. Hayes and Wilson (2003) explain that mindfulness is conceptualized as both a "technological method and as a psychological process" which they suggest adds to the confusion of how to operationally define the construct. In order to define mindfulness as the psychological processes it elucidates, those processes must be broken down into observable and definable measures.

The consensus among those who study mindfulness is that, though it is hard to define and not easily measured, a variety of executive functions are probably involved in the ability to be mindful. Some such functions include the planning and organization of behavior including: attention, emotional regulation, and decision making. Posner and Rothbart (2007) liken these executive functions to a network, where repeated use or exercise of emotions, thoughts, and behaviors strengthens the connections to one another; for example, the emotion of anxiety and the thoughts and behaviors connected to it, when repeatedly exercised will create a more anxious individual. They suggest that the practice of meditation may lessen or weaken these links in such a way that they become less powerful and invasive in one's life.

The concept of "appropriate attention" can be seen in Western psychological therapies such as Acceptance and Commitment Therapy (Hayes, Strosal, & Wilson 1999) and Dialectical Behavior Therapy (Linehan 1993), empirically validated treatments for a variety of disorders, such as Borderline Personality Disorder, depression, and anxiety. All of these therapies employ sustained attention on the present moment and the reality of individual's current experience. It is the creation of therapies such as these that have, as Hayes and Shenk (2004) describe, become

the working models that then spur empirical work. It is from these models that current research rests mostly on attentional processes in an attempt to establish agreed upon criteria to define and measure the concept of mindfulness. As Bishop et al. (2004) suggest

> As long as fundamental questions concerning construct specificity and operational definitions remain unaddressed it is not possible to undertake important investigations into the mediating role and mechanisms of action of mindfulness or to develop instruments that allow such investigations to proceed. Thus we must move toward a definition that is more precise and that specifies testable theoretical predictions for the purpose of validation and refinement. (p. 231)

Measuring Mindfulness

The difficulty finding an agreed-upon definition of mindfulness extends to the measurement of mindfulness as well. It is this lack of an agreed upon measure that spurred the creation of several mindfulness instruments such as the: 1) Mindful Attention Awareness Scale (Brown & Ryan 2003), a 15 item questionnaire that measures attention to and awareness of present moment experiences; 2) The Freiburg Mindfulness Inventory (Buchheld, Grossman, & Walach 2001), a 30 item questionnaire that measures openness to negative experience and ability to observe the present moment without judgment; and 3) The Toronto Mindfulness Scale (Bishop et al. 2003) a 10 item questionnaire used to assess mindfulness after a meditation training. It assesses sensation, thoughts, and feelings as well as acceptance and openness to these experiences. Each of these instruments, however, is seen as unidimensional, and because mindfulness has been described as a multidimensional or multifaceted construct, an assessment that identifies and measures these separate factors may be more psychologically sound and valid (Baer, Smith, & Allen, 2004).

Building on the theory that mindfulness is a multifaceted construct, Baer, Smith, and Allen (2004) set out to design an instrument that would assess "the general tendency to be mindful in daily life, to be understandable to both clinical and general populations regardless of meditation experience, and to measure several components of mindfulness." Within this framework the Kentucky Inventory of Mindfulness Skills was developed to assess the general question of what individuals do when being mindful and what factors are involved in this process. The KIMS closely models DBT's view of mindfulness which focuses more on short trainings rather than long meditation practices; as such, the KIMS may be a better measure to assess individual differences within the population without mindfulness training.

Baer et al. (2004) identified four factors that emerged in the literature with internal consistency and good test-retest reliability within their measure; these factors are observing, describing, acting with awareness, and accepting without judgment. Observing in this context refers to noticing or attending to stimuli such as thoughts, emotions, and sensations. Describing relates to the ability to label or explain the experienced observations. Acting with awareness is described as undivided focused attention on present moment activity or the ability to fully focus with awareness on one thing at a time. Accepting without judgment is the ability to experience the present moment from a non-evaluative or non-judgmental place; to simply be a part of the experience without attempting to change or alter it in any way. Baer found that this four factor model was shown in a number of samples to fit the data better than a single factor model.

Evolution of Mindfulness in Psychology and Psychotherapies

The majority of research has focused on mindfulness and attention and how they are affected by one another. The first mindfulness based therapy to be used in the United States was Mindfulness Based Stress Reduction (MBSR) by Kabat-Zinn (1982). MBSR involved a 10 week

course in which chronic pain patients were taught three mindfulness meditation practices: sweeping, or mentally scanning the body, mindful breathing, and yoga; patients were also instructed to bring awareness to the breath and to observe any sensation or emotion without judgment or evaluation (Kabat-Zinn 1982). Kabat-Zinn found that patients' subjective pain rating index scores decreased considerably from premeditation training (M=17.5) to postmeditation training (M=7.9). Since the advent of this therapy, others have used the model of MBSR and the benefits of mindfulness to bring this concept into areas that it may have not been seen before. Places such as the prison system, juvenile detention facilities, substance abuse treatment centers, and homeless shelters are now employing the concept of mindfulness meditation with successful results (Parks 2006). Parks and colleagues (2006) trained substance dependent inmates in a ten day Vipassana meditation course and charted their progress at three and six months follow up. The inmates who completed the ten day meditation workshop reported significantly less substance abuse than their peers who had not received the meditation instruction. Success across Axis I disorders, chronic illness, substance use disorders, and a myriad of others has been shown through the use of mindfulness training and therapies such as ACT and DBT. These therapies, though formed of the foundations of MBSR, take a turn in their structure and focus more on the ability to recognize and accept the stream of thoughts occurring at any given moment than practicing meditation. This creates an interesting divergence from the philosophical roots of mindfulness as a Buddhist construct and enters its conceptualization as a therapeutic technique into the realm of science.

A good portion of mindfulness research is focused on training and assessment of the success of mindfulness in either relieving or decreasing psychological symptoms. This research is focused around an individual's ability to attend to the present moment without judgment or

evaluation and how this level of attention affects a variety of tasks such as the Attentional Blink test, autobiographical memory, and word production (Wenk-Sormaz 2005; Anderson 2007; Williams et al. 2000). Research has also focused around the role of mindfulness and its role in decreasing anxiety in stressful situations (Kabat-Zinn). Previous research on mindfulness and emotionally provoking stimuli or tasks has suggested that in fact, those trained in mindfulness meditation typically respond with less reactivity and more emotional stability. Kabat-Zinn uses this focus in his MBSR training during which individuals practice meditation skills as a form of stress reduction which alters brain waves in such a way to reflect better handling of negative emotions under stressful situations (2004). Many of the individuals Kabat-Zinn works with suffer from chronic pain and/or life threatening disorders, and his work with them has shown to reduce pain levels as well as the anxiety surrounding the perceived pain. Ortner, Kilner, & Zelazo (2007) conducted a study in which they presented participants with varying degrees of meditation experience with unpleasant pictures and then asked them to perform an attentional task. They found that participants who had been practicing meditation for longer periods of time showed less interference from the emotional stimuli, suggesting some ability to detach from or compartmentalize the emotional reactivity to the suggestive stimuli. What is it about mindfulness or the practice of meditation that allows individuals to detach from emotionally provoking stimuli in such a way that it does not affect their level of attention to external stimuli?

Attention and Mindfulness

While little knowledge exists around the cognitive processes that occur during the process of mindfulness, it has been suggested that mindfulness training may teach people to lessen their emotional reactivity to negative stimuli (Ortner 2007). As Kabat-Zinn has shown, mindfulness training is effective in reducing effects of generalized anxiety disorder and panic

disorder, as well as every day symptoms of anxiety and depression. Numerous studies have shown that anxiety provoking situations typically result in selective attention to emotionally threatening information; yet, when combined with mindfulness training, participants are typically less emotionally reactive and perform better on attention tasks such as the Emotional Stroop and Attentional Blink (Wenk-Sormaz 2005, Slagter 2007). The findings across the board are in favor of mindfulness training enhancing attentional control with participants showing significant increase in their ability to selectively attend to specific stimuli and be less affected by emotionally charged stimuli. For example, Ortner, Kilner, and Zelazo (2007) found that those with meditation experience were able to disengage their attention from unpleasant stimuli more rapidly than those without meditation experience and therefore showed less interference on a cognitive task in which they were to respond to high or low tones. Their findings suggest that those individuals higher in mindfulness may not necessarily show less reaction to negative stimuli, but are more equipped to disengage from such stimuli to attend to the task at hand. Similarly, MacLeod, Matthews, and Tata (1986) found that high levels of anxiety lead to focused attention on emotionally threatening words. The combination of these findings suggest that while the exact cognitive processes involved in mindfulness are not clear, what is clear is that "being mindful" leads to greater attentional capability and lessened emotional reactivity.

What is it about the four factors within the KIMS that fit the concept of mindfulness so well? As Siegel (2007) suggests:

> These facets involve more than the immersion of oneself in sensation devoid of executive prefrontal functions alone. The essential capacities to monitor ones own intentional states and the focus of awareness onto itself are central features of mindful practice. These prefrontal abilities, combined with the additional

> frontal use of linguistic centers to describe internal experience as one observes ongoing states, are fundamental to mindful awareness. In these ways, mindfulness is clearly an integrated state of mental processing that involves a wide range of attentional, emotion regulating, conceptual and observational processes that are harnessed in a flexible and adaptive manner. (p.261)

It is the combination of these varying states of mental processing that lead to further questions about what mindfulness is and how it may be related to attentional tasks. Baer suggests that mindfulness may result in better self-awareness and attention to cognitive, emotional, and sensational cues, which may then lead to a more skillful response in attending to such cues. As others have suggested, "mindfulness practice may function as an exposure procedure in which sustained observation of aversive thoughts and feelings leads to reduced emotional reactivity to these stimuli and reduced escape and avoidance (Kabat-Zinn 1982, Linehan 1993)." Thus, the practice of "being mindful" may in itself lead to more emotional awareness and less reactivity in emotionally provoking situations.

Mindfulness and Individual Differences

It has been suggested that most people are probably capable of being mindful, but the degree to which their ability exists may vary over time and across individuals (Kabat-Zinn 2003, Brown & Ryan 2003). While previous research has focused on the effects of mindfulness training on a variety of tasks, there is no research to date that assesses baseline levels of mindfulness and its effect on attention or distraction. Is it possible that mindfulness, outside of a state that one may acquire, may also be considered a trait showing considerable difference across individuals? Ortner, Kilner, and Zelazo (2007) suggest that mindfulness may actually be represented by both state and trait aspects such that "an individual may display varying degrees

of mindfulness at different points in time" depending on the task or stimuli they are presented with. Sternberg (2000), in trying to determine how to categorize mindfulness looked at the possibility of defining the concept as either a cognitive ability, a cognitive style, or a personality trait. He concluded that it is most closely linked to a cognitive style. If this is in fact the conclusion, it begs the question of how cognitive styles respond and react to different emotional stimuli and how mindfulness may be affected.

Kabat-Zinn (1982) and Linehan (1993) suggest that mindfulness practice may function as an exposure technique such that continued observation of negative or unpleasant thoughts will lead to less emotional reactivity over time and therefore a decrease in escape and avoidance behaviors. Thus as one is exposed to and becomes more familiar with their own cognitive patterns and learns to view them as passing thoughts, they in turn become less affected by the changing tides which leads to a less reactionary state in their external environment. Several researchers have suggested that "mindfulness is a naturally occurring characteristic that is likely to show meaningful variation even in populations without meditation experience," yet no research exists to discern these individual differences and what they mean (Brown & Ryan 2003; Kabat-Zinn 2003). If individuals are in fact varied in their level of mindfulness and how they attend day to day to environmental stimuli, would it not be advantageous to gain an understanding of how these individual differences relate to not only attentional abilities, but higher order functioning (executive cognitive functioning) as well?

Mindfulness in the Stressed System: Anxiety and Attentional Blink

While research has shown that mindfulness training is effective for individuals suffering from anxiety and/or stress, the day to day functioning of a stressed system has not been assessed to determine if there is in fact a more inherent tendency of mindfulness in some and how they

may react to stressful situations and distraction on an attentional task in this state. Previous research has suggested the link between mindfulness and anxiety is such that those trained in mindfulness techniques are less reactive to anxiety and typically perform better on attentional tasks. Jefferies, Smilek, Eich and Enns (2008) conducted a study in which participants were placed in one of four mood induction groups, either happy, sad, anxious, or calm and then asked to perform on an attentional blink task. They found that participants in the anxiety group had the lowest level of performance on the attentional blink task where the second target in a stream of stimuli was identified less in this condition than any of the other conditions. While research by Raymond, Shapiro, and Arnell (1992) has shown that identification of a second target may typically be hindered by up to 700 ms. more recent research has suggested that this deficit may actually be closer to 500 ms. (Slagter et al. 2007). In their study, Slagter and colleagues (2007) compared a practitioner group trained for 3 months in intensive meditation to a novice group of individuals who received one hour of meditation and the suggestion to meditate for 20 minutes per day. Before and after meditation training participants in both groups performed an attentional blink task and between group comparisons were made. The findings were that those in the intensive meditation group allocated less resources to the first target resulting in less attentional blink over time. What is especially interesting about these findings is that participants were not engaged in meditation during the attentional blink task which Davidson and Lutz (2008) suggest may indicate a long term effect of meditation such that it lessens participants tendency to "get stuck" on a target or stimulus. What it may also suggest is that those who are naturally higher in mindfulness may respond in a similar manner.

As of yet, all the previous research has focused on emotional regulation rather than emotional activation. While studies have shown that those high in anxiety typically perform

poorly on attentional tasks, and that those trained in mindfulness may learn to become less reactive to emotional stimuli, no studies have combined these findings to determine if anxiety activation with those who have a tendency toward mindfulness may result in less attentional blink. Typically, researchers have not focused on individual differences in mindfulness; therefore, the current study sought to differentiate individual differences of mindfulness in the population and how these differences would affect performance on an attentional blink task in either a high anxiety or no anxiety group. The current hypothesis tested whether participants in the anxiety induction group who scored higher on the KIMS would produce a smaller attentional blink compared to those who scored lower on the KIMS or those in the control group. The prediction was that individuals in the anxiety group that scored higher in mindfulness would perform better on the attentional blink task, suggesting that mindfulness exists as a trait and enables individuals to allocate resources to the specific task at hand rather than becoming wrapped up in the emotionally provoking stimuli.

Methods

Participants

Participants consisted of 60 individuals from the undergraduate psychology research pool at a southeastern university. Participants ages ranged from 18-45 (M=21.32, SD =5.54). Participants may or may not have previously been exposed to some form of mindfulness training and were assessed for this as part of the demographics. All participants were compensated with course credit.

Measures

Demographics Questionnaire. This form requested participants' age, gender, ethnicity, completed schooling, and whether or not they have previously been exposed to or participated in any activity in which they found themselves "getting in the zone." If participants answered yes, they were then instructed to rate their experience on a five point Likert-scale ranging from *none* to *a lot*.

NEO Five Factor Inventory (Costa & McCrae 1992). The NEO is a 60 item self-report measure that assesses the domains of the five-factor model of personality. Previous research has suggested a link between openness and internal awareness of emotional and cognitive function, so this measure was selected to decipher individual differences that may exist between mindfulness and personality.

Kentucky Inventory of Mindfulness Skills (Baer et al. 2004). The KIMS is a 39 item self-report measure used to assess the multifaceted domains of mindfulness. The scale assesses four main factors of the individual: ability to observe, describe, act with awareness, and accept without judgment. This scale was developed in order to assess how mindfulness may correlate with a variety of psychological constructs.

SCL-90 (Derogatis 1977). The SCL-90 is a symptom checklist comprised of 90 items that is used to assess a broad range of symptoms from mild loss of well-being to severe clinical distress. This measure is attuned to a variety of psychological constructs and is a good inventory to use to assess a wide variety of distress states the individual may be experiencing.

State-Trait Anxiety Inventory. (Spielberger 1970). The State-Trait Anxiety Inventory is a self-report scale measuring two separate components, state anxiety and trait anxiety. *State anxiety* refers to a transitory emotional state characterized by subjective feelings of tension that

may vary in intensity over time. *Trait anxiety* refers to a relatively stable disposition to respond to stress with anxiety and a tendency to perceive a wider range of situations as threatening.

Attentional Blink Task (Slagter et al. 2007). Participants were presented stimuli at the center of a computer screen. Each trial began with a fixation cross followed by a rapid serial stream of letters with two numbers imbedded within the stream. Each letter was randomly drawn and presented for 67-ms. followed by a 34-ms. blank. The task consisted of three sessions of 48 trials.

Neurocognitive Battery (Peterson et al. 1999). The Neurocognitive Battery is a computerized neuropsychological test battery that assesses executive function, impulsivity, personality, planning and organizational behavior, and memory.

Procedure

Participants were first given a consent form to sign stating they agreed to participate in the study and that they understood the procedure and their anonymity within the study. Participants were instructed that the current study sought to asses a link between thinking styles and cognitive processing. They were then handed a packet of questionnaires that included a demographics sheet, the KIMS, NEO-FFI, SCL-90-R, and State Anxiety scale. Individuals were asked to answer all questions to the best of their ability and as honestly as possible. Once the packet was completed, participants completed the a digit span test and then were randomly assigned to either the anxiety induction or control group and informed that they were to begin the assessment of their thinking styles. Participants in the anxiety induction group were instructed to use the next five minutes to prepare a three minute speech on something they like and dislike about their body while standing directly in front of a video camera. The script and technique modeled Phillips and Giancola's (2008) anxiety induction which has proven significant results.

Those in the control group were asked to wait five minutes before beginning the next task. Once the five minutes had passed, the participant was instructed to begin the second portion of the task (Note: the participants in the anxiety induction group did not actually have to give the speech).

The participants were then directed to a computer where they completed an attentional blink task consisting of three sets of 48 trials each (Colzato et al. 2008). They were presented with a set of instructions on the computer screen and then instructed to start the actual trial when ready. Participants were informed that there could be one or two numbers in the letter stream and were asked to report these numbers by typing them in order on a keyboard. Participants were instructed to guess T2 if they believed it had been presented and were not entirely sure about what number it was. If they felt that no T2 target was present, they were instructed to enter zero for the second number. Once the attentional blink task was completed, participants were then instructed to complete the Neurocognitive Battery. Once this was completed participants were asked to complete the state anxiety assessment again, and those in the experimental condition were also asked to complete an assessment of what effect the thought of having to do a speech affected their ability to perform on the tasks.

Once participants completed the entire study, they were debriefed on the experiment they completed and the deception was broken for those in the anxiety condition.

Results

Manipulation Check

A manipulation check to test the integrity of the anxiety induction was performed using a Univariate Analysis of Covariance where the fixed factor was induction group, the dependent

variable was the score from the second administration of the state anxiety measure and the covariate was the score from the first administration. Results revealed a significant effect of group on post-induction anxiety ($F(1,57) = 5.04$, $p < .05$) suggesting that the anxiety induction was effective in increasing state anxiety levels immediately after the induction.

In order to examine the relation between the predictor variables and the outcome, Pearson's Bivariate Correlations were conducted by group. The result show a number of relationships between attentional blink scores and KIMS scores, as well as attentional blink scores and psychopathology. As shown in Table 1, the KIMS scale of Observe was correlated to a number of accuracy variables in the control condition at Acc1Lag5, Acc1Lag8, Acc2Lag3, and Acc2Lag8, where Acc1 represents number of times target one was correctly identified and Acc2 represents number of times target two was correctly identified when target one was correct. The Global Severity Index, Anxiety, and Interpersonal scales on the SCL-90 were correlated to a number of accuracy variables in the control condition at Acc1Lag3, Acc1Lag5, and Acc1Lag8, while the Depression scale was correlated with accuracy variables in the control condition at Acc1Lag3 and Acc1Lag8 as shown in Table 1. Because the pattern of correlations did not show relationship between the variables that were part of the hypotheses, we did not conduct the planned regression analyses.

Table 1

Pearson's Correlation Matrix for Control Condition

	Ac1Lg1	Ac1Lg3	Ac1Lg5	Ac1Lg8	Ac2Lg1	Ac2Lg3	Ac2Lg5	Ac2Lg8
KIMS								
Observe	-.295	-.295	-.454**	-.478*	-.162	-.377*	-.334	-.419*
Describe	-.103	-.056	-.152	.006	-.138	-.089	.001	-.035
Act w/Awareness	.163	.288	.101	.174	.113	-.020	-.175	-.117
Accept	-.128	.143	-.041	.139	.099	-.135	-.147	-.092
Anxiety								
Pre	-.084	.011	.080	-.170	-.112	.205	.116	.094
Post	-.216	-.086	.037	-.176	-.176	.144	.216	.218
Final	-.242	-.099	-.098	-.237	-.127	.290	.179	.164
Psychopathology								
Global Severity	-.040	-.614**	-.523**	-.582**	-.152	.185	-.294	-.152
Anxiety	-.069	-.509**	-.373*	-.568**	-.113	-.220	-.283	-.126
Interpersonal	-.125	-.567**	-.585**	-.548**	-.241	-.170	-.251	-.176
Depression	-.044	-.474**	-.337	-.511**	-.129	-.152	-.166	-.116

** Correlation significant at the 0.01 level (2-tailed), * Correlation significant at the 0.05 level (2-tailed).
KIMS=Kentucky Inventory of Mindfulness Scale, Psychopathology=SCL90,
Acc1Lag1=accuracy for target 1 at a space of 1 distractor, Acc1Lag3=accuracy for target 1 at a space of 2 distractors, Acc1Lag5=accuracy for target 1 at a space of 4 distractors, Acc1Lag8=accuracy for target 1 at a space of 7 distractors.
Acc2Lag1=T2 accuracy when T1 was correct presented immediately after, Acc2Lag3=T2 accuracy when T1 was correct at a space of 2 distracters, Acc2Lag5= T2 accuracy when T1 was accurate at a space of 4 distracters, Acc2Lag8=T2 accuracy when T1 was accurate at a space of 7 distracters.

Table 2

Pearson's Correlation Matrix for Experimental Condition

	Ac1Lg1	Ac1Lg3	Ac1Lg5	Ac1Lg8	Ac2Lg1	Ac2Lg3	Ac2Lg5	Ac2Lg8
KIMS								
Observe	.080	.131	.228	.143	.179	.135	-.053	-.089
Describe	.056	-.057	.161	.245	.307	.215	.017	.057
Act w/ Awareness	.025	-.236	-.079	-.080	-.300	-.110	-.128	-.255
Accept	.189	-.057	-.036	-.065	.106	-.186	-.023	.094
Anxiety								
Pre	-.012	.324	.249	.156	.128	.324	.194	.202
Post	-.085	.203	.157	-.006	.070	.218	.086	-.002
Final	.055	.163	.183	.047	.212	.160	.161	.087
Psychopathology								
Global Severity	.056	.334	.244	.072	.080	.211	.180	.164
Anxiety	.184	.098	.117	-.082	.131	.020	.221	.208
Interpersonal	-.090	.125	.060	-.032	-.096	.153	.084	.028
Depression	-.169	.219	.067	.065	-.125	.094	.019	.107

KIMS=Kentucky Inventory of Mindfulness Scale, Psychopathology=SCL90
Acc1Lag1=accuracy for T1 with T2 presented immediately after, Acc1Lag3=accuracy for T1 at a space of 2 distracters, Acc1Lag5=accuracy for T1 at a space of 4 distractors, Acc1Lag8=accuracy for T1 at a space of 7 distracters.
Acc2Lag1=accuracy for T2 when T1 was correct presented immediately after, Acc2Lag3=T2 accuracy when T1 was correct at a space of 2 distracters, Acc2Lag5= T2 accuracy when T1 was accurate at a space of 4 distracters, Acc2Lag8=T2 accuracy when T1 was accurate at a space of 7 distracters.

Discussion

Previous research has suggested that mindfulness is linked to better performance under conditions which invoke anxiety, as well as less interference in attention tasks such as the Attentional Blink. The current study sought to link these two factors in a way previously unexplored by assessing mindfulness at baseline levels without any form of training. The findings suggest that while the anxiety induction was effective in increasing levels of anxiety, the effect did not translate to performance on the attentional blink task. Mindfulness as measured by the KIMS was mostly unrelated to performance as well. Interestingly, all significant correlations found lie strictly in the control condition which conflicts with the proposed hypothesis that individuals scoring higher mindfulness would perform better on the attentional blink task. Furthermore, the only KIMS scale that produced significant correlations at any level of the attentional blink task was the KIMS scale of observe. This same pattern appeared within the control condition when the GSI (Global Severity Index), the IPS (Interpersonal scale), the ANX (Anxiety scale), and the DEP (Depression scale) were correlated with attentional blink scores. Although no conclusive evidence may be drawn from this pattern, it may be noteworthy that this effect only exists at Time 1 of the attentional blink task and not at Time 2. In sum, the hypothesis that a relationship between mindfulness and attentional blink would first, exist and second, manifest more strongly under conditions of anxiety was not supported. In fact, it appears that anxiety may have erased any relationship between KIMS scores and performance on the attentional blink task.

While this study used previously validated measures to determine mindfulness, to induce anxiety, and to assess the ability to attend to rapid streaming stimuli, it is unique in that the combination of these factors had not previously been assessed. The significant findings on only

the KIMS scale of observe is surprising when reviewing the development of the scale and Baer et al.'s (2004) finding that acting with awareness should be the scale most closely related to attentional blink scores. It appears that the KIMS scales tend to focus on more physiological aspects of mindfulness such that the focus is aimed at more sensorial experience than higher order cognitive functioning. If this is the case, it may be that while the KIMS is measuring one aspect of mindfulness, the higher order cognitive functions that the attentional blink task taps into are not reflected in this assessment. As Siegel (2007) has previously suggested, the ability to monitor internal states (KIMS observe scale) plus the ability to describe (KIMS describe scale) are fundamental to awareness. This suggests that the observe scale may not be sufficient to tap into mindfulness on its own and Baer (2004) has suggested that it is the direct combination of the four scales that lead to the most holistic interpretation of mindfulness as a construct. This may be further challenged by the Anderson et al. (2007) study in which they attempted to find a link between mindfulness training and attention and found no conclusive results negating previous findings which have suggested this link does exist. From this they proposed that mindfulness may be more closely associated with changes in the quality of awareness of present moment experience than basic attentional abilities suggesting that the scales of the KIMS may not be sufficient to match the breadth of the attentional blink task.

Though the KIMS appeared to be the most advantageous scale to use due to its multi-dimensional assessment ability, in hindsight, using a scale that was more akin to present moment awareness and attention may have produced more significant results in relation to the experimental group. Similarly, the fact that no mindfulness or meditation training existed in this study left the door open as to whether or not there would be a strong enough representation of mindfulness in the population, and what that may mean. While previous studies have shown

mixed results regarding mindfulness in the form of meditation training and performance on attention tasks, consistent results continue to show up between T1 and T2 regarding the effects of training. Since the concept of mindfulness has appeared on the forefront of Psychology's radar it has been a challenge to decipher and understand this intangible construct in a way that is acceptable to all parties. While the current scales tap into a number of sensory skills, it appears that measuring or understanding mindfulness as a higher order function has yet to be addressed. Furthermore, as Posner and Rothbart have suggested, it may be the practice of mindfulness in the form of meditation or other modalities that allows one to strengthen the networks that have been built around the trait of mindfulness. This being said, it may be the case that while trait mindfulness does exist in the population, this level of mindfulness is not strong enough to show an effect in the attentional blink task under the anxiety induction condition. It may be that only repeated use of these networks allows for the lessening effect in the anxiety condition.

Furthermore, the limitations in this study may have led to the current findings. The most pressing limitation is that of power. Although the results indicate that the manipulation worked and accuracy scores on the attentional blink both at T1 and T2 followed a consistent pattern with that of Colzato et al.'s (2008) study it may be that the small sample size in this study kept us from finding significant results. It may also be that other mindfulness scales are more related to accuracy scores on the attentional blink task, but due to the small number of participants, these scores were not tapped. This finding may also translate to the SCL-90 results that were found only in the control group.

The results of the SCL-90 scales at Time 1 reflect what has previously been found in the literature regarding attention, anxiety, and depression. Both of these scales at Time 1 show a significant effect with Lag time, such that accuracy decreases the higher the ANX and DEP

scale. As Arend and Botella (2002) have suggested, a number of studies have demonstrated that those with higher trait anxiety tend to be more affected by emotionally charged stimuli thus resulting in distraction from the task at hand. One explanation for the findings in this study in only the control condition is that the trait level of anxiety and depression that exist in the participants is not equivalent to the state level that was induced by the anxiety induction. Since this finding does not translate into the anxiety group, it may be advantageous to compare the SCL-90's interpretation of anxiety and the scaled items that relate to this scale with the Giancola induction to determine if we are in fact measuring two different areas, or perceptions of anxiety. This suggests a possible limitation in the conceptualization of anxiety in the study which would warrant further assessment.

While the current study did not produce significant results in the direction we had hypothesized, utilizing mindfulness training with the anxiety induction may prove to be more fruitful. Specifically, since previous research has shown a decreased reactivity to emotionally provoking stimuli after mindfulness meditation training, those findings should translate to the anxiety induction used. This coupled with a larger sample size may produce results more reflective of the belief that individuals showing higher levels of mindfulness will be less affected by the anxiety induction and therefore more attentive to the attentional blink task.

References

Anderson, N., Lau, M., Segal, Z. & Bishop, S. (2007). Mindfulness based stress reduction and attentional control. *Clinical Psychology and Psychotherapy, 14,* 449-463.

Baer, R., Smith, G., & Allen, K. (2004). Assessment of mindfulness by self-report: The Kentucky inventory of mindfulness skills. *Assessment, 11,* 191-206.

Bishop, S., Lau, M., Shapiro, S., Carlson, L., Anderson, N., Carmody, J., et al. (2004). Mindfulness: a proposed operational definition. *Clinical Psychology: Science and Practice, 11,* 230-241.

Breslin, F., Zack, M, & McMain, S. (2002). An information-processing analysis of mindfulness: implications for relapse prevention in the treatment of substance abuse. *Clinical Psychology: Science and Practice, 9,* 275-298.

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

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

Colzato, L., Slagter, H., Spape, M., & Hommel, B. (2008). Blinks of the eye predict blinks of the mind. *Neuropsychologia, 46,* 3179-3183.

Davidson, R. & Lutz, A. (2008). Buddha's brain: neuroplasticity and meditation. *IEEE Signal Processing Magazine,* 172-176.

Derogatis, L. & Fitzpatrick, M. (2004). The SCL-90-R, the brief symptom inventory (BSI) and the BSI-18. In M. Maruish (Ed) The use of psychological testing for treatment planning and outcomes assessment (pp 1-41). Mawah, NJ: Lawrence

Erlbaum Associates.

Hayes, S., Strosahl, K. & Wilson, K. (1999). *Acceptance and commitment therapy.* New York: Guilford.

Hayes, S. & Wilson, K. (2003). Mindfulness: method and process. *Clinical Psychology: Science and Practice, 10,* 161-165.

Hanh, T. (1998). *The heart of the Buddha's teaching*. New York: Broadway Books.

Jefferies, L., Smilek, D., Eich, E., & Enns, J. (2008). Emotional valence and arousal interact in attentional control. *Psychological Science, 19,* 290-295.

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

Kabat-Zinn (2003). Mindfulness-based interventions in context: past, present, and future. *Clinical Psychology: Science and Practice, 10,* 144-156.

Lezak, M. (1982). The problem of assessing executive function. *International Journal of Psychiatry, 17,* 281-297.

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

MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95,* 15-20.

Marlatt, G. & Kristeller, J. (1999). Mindfulness and meditation. In W.R. Miller (Ed.), *Integrating spirituality into treatment (67-84).* Washington, D.C.: American Psychological Association.

Ortner, C., Kilner, S. & Zelazo, P. (2007). Mindfulness meditation and reduced emotional

interference. *Motivation Emotion, 31,* 271-283.

Phillips, J. & Giancola, P. (2008). Experimentally induced anxiety attenuates alcohol related aggression in men. *Experimental and Clinical Psychopharmacology, 16,* 43-56.

Posner, M. & Rothbart, M. (2007). Research on attention networks as a model for the Integration of psychological science. *Annual Review of Psychology, 58,* 1-23.

Raymond, J., Shapiro, K., & Arnell, K. (1992). Temporary suppression of visual processing in an RSVP task: an attentional blink? *Journal of Experimental Psychology: Human Perception and Performance, 18,* 849-860.

Siegel, D. (2007). Mindfulness training and neural integration: differentiation of distinct streams of awareness and the cultivation of well-being. *Social Cognitive and Affective Neuroscience, 2,* 259-263.

Slagter, H., Lutz, A., Greischar, L., Francis, A., Nieuwenhuis, S., Davis, J., & Davidson, R. (2007). Mental training affects distribution of limited brain resources. *PLoS Biology, 5,* 1228-1235.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. *Manual for the State-Trait Anxiety Inventory.* Palo Alto, Calif.: Consulting Psychologists Press, 1970.