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Philadelphia College of Osteopathic Medicine

Department of Psychology

AVAILABILITY FOR LEARNING:

EFFECTS OF MINDFULNESS MEDITATION ON STUDENT COGNITIVE ABILITIES

By Alexander Harne

Submitted in Partial Fulfillment of the Requirements of the Degree of

Doctor of Psychology

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COLLEGE OF
OSTEOPATHIC

DEPARTMENT OF PSYCHOLOGY

DISSERTATION APPROVAL

This is to certify that the thesis presented to us by Alex Harne
on the 4th day of April, 2017, in partial fulfillment of the requirements for the
degree of Doctor of Psychology, has been examined and is acceptable in
both scholarship and literary quality.

COMMITTEE MEMBERS' SIGNATURES

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Abstract

Teachers are regularly expected to teach more information with fewer resources and less instructional time. Often, young students attending class may not be available for learning. In order to maximize learning, teachers must prepare the mental states of their students. This study sought to determine if correlations existed between the recurrent practice of mindfulness meditation and the strengthening of various cognitive skills and attitudes towards learning. The most significant findings found an overall increase in the attention, working memory, executive functions, and receptivity towards learning as perceived by the teacher and students. Students with the lowest levels of cognitive skills and receptiveness were often the individuals to benefit most significantly from the mindfulness meditation program.

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Chapter 1: Introduction

Statement of Problem

An individual's ability to learn on any given day may fluctuate (Wolf, 2009; Zoladz et al., 2012). Executive functions, working memory, and an ability to sustain focus have been shown to have an impact on students' abilities to learn within the classroom (Kuyken et al. 2013; Mendelson et al., 2010). How receptive to the process of learning and how engaged a student becomes in the task of learning may also affect the ease with which an individual takes in, processes, and stores new information. Such factors must be controlled for in order to maximize student learning within the classroom.

Purpose and Significance of the Study

This study sought to determine if a correlation existed between recurrent mindfulness meditation training in young students and an increase in those students' attention, working memories, and executive functions. Mindfulness meditation training has been shown to improve emotional processing and regulation, executive functions, and working memory (Tang, Hölzel, & Posner, 2015; Hölzel et al., 2011; Short, Mazmanian, Oinonen, & Mushquash, 2016; Chambers, Chuen Yee Lo, & Allen, 2008). Structural changes have been found in the neural circuitry of individuals who practice mindfulness in a recurrent manner, even if for only ten minutes a day (Tang, Hölzel, & Posner, 2015; Weare, 2013; Malinowski, Moore, Mead & Gruber, 2015; Davidson et al., 2013; Davidson 2004; Lazar et al., 2005). The disposition of an individual practicing mindfulness is one of openness and attentiveness, qualities that may also overlap with an individual being more available to participate in the learning process.

Studying the effects of mindfulness meditation training on student cognitive abilities and dispositions is still in its infancy. Although mindfulness studies have seen a steady increase in recent years, much of the current research has been conducted on adults. When studies on

children are conducted, student learning is rarely a factor. Additionally, the mindfulness training programs used on elementary age children often miss the mark in one of two ways: (1) the program may be adapted from an adult program, but still relies too heavily on conceptualization above the developmental age of the child or (2) the program loses focus on the philosophical elements core to mindfulness meditation training. The program examined by this study was designed with these potential flaws in mind. Additionally, this program emphasized the importance of mindfulness training for the teacher. In turn, the teacher was able to teach and reteach these same concepts to her students throughout the day, increasing the dispositional mindfulness of her classroom students when they were not actively engaged in mindfulness meditation.

The Research Questions and Hypotheses

“Does training both students and their teacher in mindfulness meditation increase the students’ cognitive abilities?” was the primary research question of this study. This question was separated into three questions related to three core areas of cognitive ability: (1) attention (2) executive functions, and (3) working memory. The researcher asked if mindfulness training correlated with any change respective to these core components. It was hypothesized that an increase in cognitive abilities would be shown at the conclusion of the program. Additionally, it was hypothesized that these changes would continue to be elicited six weeks after the conclusion of the program.

“Does mindfulness meditation training increase students’ dispositional receptivity towards school and classroom instruction?” was an additional research question. It was hypothesized that increased receptivity would be correlated with the conclusion of the

mindfulness program and that these changes would be sustained six weeks after the conclusion of the program.

Assumptions and Limitation of the Study

This study assumed that the population of second grade students, whose data were made available for analysis, was a representative sample of elementary age school children. This study also assumed that the classroom teacher was open and willing to participate in the mindfulness program and followed the program with fidelity.

Operational Definitions of the Study

Attention is defined as the ability to sustain focus on a particular stimulus and to block out unwanted stimuli. Executive functions were defined as those sets of higher functioning cognitive abilities responsible for initiating, inhibiting, stopping, and shifting activity. Working memory was defined as the mental ability to store or manipulate information in a manner necessary to complete a task. Receptivity is characterized as a mental attitude of acceptance and openness towards the activity of learning and toward the instruction of the teacher. Engagement is the active process of participating in learning; it requires more conscious effort on the part of the individual than the mental state of receptivity. Mindfulness is broadly defined as a state of awareness of the present moment, characterized by clarity, grounding, and an open acceptance of the present (Gallant, 2016; Kabat-Zinn, 1996; Kabat-Zinn, 2004). Within this study, mindfulness is discussed in two forms: (1) mindfulness meditation and (2) dispositional mindfulness. The former refers to the formal practice of mindfulness during prescribed periods of sitting meditation during which the individual draws his or her attention to the present moment in a manner consistent with the definition of mindfulness. The latter refers to a state of being that is persistent beyond specific periods of meditation and is pervasive throughout the individual's

moment to moment experiences throughout his or her day. Both mindfulness meditation and dispositional mindfulness are expressions of the broader concept of mindfulness.

Chapter 2: Review of Literature

The Origins of Mindfulness

Mindfulness, as it exists presently in the West, is an adaptation or secularization of Buddhist teachings (Teasdale & Chaskalson, 2011). As such, the interpretations of these teachings are, at times, easily misrepresented or misinterpreted. In an effort to make what is to some, a religious principle, more palatable for a wider audience, the religious trappings of mindfulness are scrubbed away; at times, this scrubbing has been so significant that it results in the distortion of mindfulness practices. What typically results is a new-age, feel-good philosophy grounded in self-help. This has damaged mindfulness' reputation as a practice, causing some to consider it a bizarre form of pseudo-mysticism. Organizations, such as Kabat-Zin's Mindfulness Based Stress Reduction (MBSR) clinic, that have successfully translated a religious practice into a therapeutic one, were able to handle a major world religion with enough respect and grace to keep its core elements intact.

To avoid distortion, mindfulness must be understood through its historical practice within the Buddhist faith. In order to adapt the practice to be relevant within a western framework, one must recognize that mindfulness has been practiced for thousands of years. Although a novel concept to some, there is nothing new about it. Over the course of millennia, the practice has crystalized into what it has become today; to change its most salient features suddenly, in order to fit the needs of another culture is to risk losing its effectiveness (Bodhi, 2011). Even with this healthy respect for its origins, Buddhism itself is not entirely unified on how mindfulness should be practiced; this is similar to other religions whose various sects have interpreted their own practices differently from the original practice. Within the United States, mindfulness practices typically stem from one of two distinct sects of Buddhism, Zen and Vipassanā.

Vipassanā, a branch of Theravāda Buddhism, tends to focus on insight awareness (Rinpoche & Johnson, 2004). The practitioner engages in meditative techniques, such as a focus on the breath, thoughts, feelings, and actions, in order to deliver some insight into the nature of reality. These forms of practice are traditionally associated with westernized mindfulness (McMahan, 2008). A significant difference between the practice of Vipassanā and Western mindfulness occurs when the motives for practicing diverge. Within Vipassanā, and properly implemented mindfulness programs, the practitioner is encouraged to engage with his or her suffering rather than attempt to escape it. Westernized practices that emphasize a striving for relief from suffering, be it physical pain or mental anxiety, have poorly translated meditative practices into less effective therapeutic practices. As opposed to avoidance, Vipassanā's mindfulness practice asks that the practitioner engage with the uncomfortable.

Zen Buddhism, which is one of the schools of Mahāyāna Buddhism, emphasizes aiming and sustaining focus on the present moment (Kapleau, 1989). Although Zen does not disregard the possibility of the realization of insights, it considers such insights as a bonus of meditation rather than a primary focus. Zen Buddhists may practice focusing on breath awareness or simply the act of sitting. Practitioners may also sustain their focus on a kōan, roughly translated as a “public case”, wherein the individual attempts to exhaust his or her focus on a seemingly illogical statement (Loori, 2006). In this respect, Zen Buddhism treats the sustaining of focus as a muscle that can be exercised and strengthened. Through extended practice, the individual's strengthened focus gives rise to stronger meditative practices, ergo, a more potent mindfulness. Additionally, someone practicing Zen may engage in kinhin, or walking meditation. During kinhin, the individual focuses on his or her steps, maintaining present awareness on the act of walking. Kinhin is typically used to breakup long periods of sitting meditation. Rather than a

break, however, *kinhin* is considered simply to exercise another type of focus on present awareness, similar to how individuals at a gym go from exercising one muscle group to another.

Interestingly, both *Vipassanā* and Zen may participate in similar practices, such as a focus on breath awareness, yet intend to achieve different results. Although the intentions for results differ, there are key similarities that are often lost on non-Buddhist practitioners. Both schools, including Buddhism as a whole, do not try to avoid suffering or to escape from pain. This is easily misunderstood because one of the core elements of Buddhist practices is to identify the nature of suffering (Marsella, 1998). However, identifying the nature of something is vastly different from avoiding or ignoring it. These meditative practices teach the practitioner to engage with his or her pain through mental effort, focusing on each moment as if it were the only moment. If the alleviation of pain occurs, that is fine, but it is not considered the goal. If pain or anxiety disappears, it may be said that it was simply an illusion, a mental apparition, which was created due to a lack of awareness. If anything, these schools emphasize the plasticity of focus, its ability to be developed over time, and the clarity that may arise from sustained awareness.

Both schools of Buddhism are deceptively simple. Focusing on one's breath is not complicated. In its simplicity of approach towards mindfulness meditation, someone seeking to secularize the practices may find it easy to add qualities that do exist, in effect, complicating something as simple as breathing. In reality, it is the sparsity of directives and the emphasis on simple tenets that have allowed both Zen and *Vipassanā* practices to endure and remain effective.

The Secularization and Spread of Mindfulness

When one considers the nature of mindfulness in its Buddhist origins, it may seem counterintuitive to apply it within a clinical setting. The natural question that arises should be, "If mindfulness is not about gaining or avoiding, how does it affect change for those that need

change?” This is an excellent question because it goes beyond the simplistic understanding of mindfulness as a skills-acquisition program.

Mindfulness Based Stress Reduction (MBSR) was one of the first clinical applications to use mindfulness effectively in a manner that was true to its religious and philosophical origins.

Teasdale and Chaskalson (2012) state:

Most of the recent, more systematic evidence that mindfulness, in the shape of MBSR, ‘works’ has also come from studies in which the instructors have worked within an understanding of mindfulness related, in one way or another, to the framework the Buddha proposed. (p. 101)

John Kabat-Zin designed MBSR in response to the suffering he witnessed while working within a clinical and medical setting (Horstman, 2010). Kabat-Zinn had studied Buddhist teachings by Thich Naht Hanh and Zen Master Seung Sahn. Thich Naht Hanh combined a variety of traditional Zen teachings along with insights from Theravada Buddhism, promoting a broader philosophical foundation for Buddhist meditation (Williams, 1989). In effect, Thich Naht Hanh was perfectly poised from an Eastern perspective to begin sharing his religious philosophy with Western minds. Although Kabat-Zinn was trained in Buddhist philosophy, he does not proclaim to be a Buddhist; rather, he considers himself foremost a scientist, teacher, and writer (Wilson, 2014).

Although Kabat-Zinn successfully translated Buddhist mindfulness practices into a secular medical model, concerns arise regarding the possible appropriation of a religion. Wilson (2014), who is a practicing Buddhist, states that he is unsure whether or not such broad applications of Buddhism, with non-Buddhists teaching Buddhist principles to other non-Buddhists, is a victory for Buddhism or is its death. According to Wilson (2014), there is

significant debate within the Buddhist community regarding what secularized mindfulness training means for them. In one respect, it shows the strength of its teachings and scientifically purports to reveal its successes. In another sense, however, this medical and psychological model makes an incision into a religion and extracts its core. Buddhism recognizes that it has undergone many changes and transformations throughout its long history; clinging to the past and fearing the future goes against Buddhist philosophy. Regardless, Western practitioners are responsible for understanding the nature of mindfulness, including its rich history, and recognizing that it holds significance to a broader religious community.

A Dialogue between East and West

As Buddhist practitioners notice a sustained and growing interest in mindfulness, discussions have continually been held to clarify and qualify its practice (Williams & Kabat-Zin, 2011). His High Holiness, the Dalai Lama, leading monk of Tibetan Buddhism, frequently engages in such dialogues. Rather than oppose Buddhism's study by non-Buddhists, the Dalai Lama (2007) has stated, "If scientific analysis were conclusively to demonstrate certain claims of Buddhism to be false, then we must accept the findings of science and abandon those claims." This level of openness towards correction of one's faith is in a way unprecedented. This attitude, which is shared by many, has opened the door for scientists to explore tenets of a major religion in an ethical manner. This willingness to learn from new perspectives has made the scientific study of mindfulness popular within the field of cognitive science (Cooperrider, 2009).

Initially, the openness for a change in one's perspective seemed one-sided. The result was that Western psychology integrated Buddhist practices into itself, cherry picking what should stay and what should go, and then modifying the practices (Marsella, 1998). As an extended dialogue continued, it has moved into what Walsh and Shapiro (2006) refer to as an integrative

stage in which, “the process of mutual enrichment, both theoretical and therapeutic, becomes increasingly systematic” (p. 228).

This systematic manner of investigation has resulted in an increased number of large conferences and gatherings between minds of various disciplines. This structured format of dialogue promotes a level of equality. Doctors, scientists, and Buddhist scholars can sit as equals, open to learning from one another. This allows a more integral stage of dialogue to occur wherein the participants enrich one another, leading towards a more comprehensive and holistic understanding of the others’ practices (Masuchika, 1997).

In order for effective dialogue to take place, a common language needed to be used. Key to this issue of language was how to describe words that were originally written and understood in Pāli, a language that was comprehended in India, having evolved in that country and then translated into a plethora of other languages through Southeast Asia, China, and Japan. From the original Pāli, the word *sati* is translated as ‘*mindfulness*’ (Bodhi, 2011). Without studying the etymology or hermeneutics of *sati*, the English word ‘mindfulness’ begins to ascribe its own cultural-linguistic history to the concept. Bhikku Bodhi (2011) states, “The word ‘mindfulness’ is itself so vague and elastic that it serves almost as a cipher into which we can read virtually anything we want” (p. 22).

The term *sati* is no less vague. In India, apart from Buddhism, it is translated as ‘memory’. Bodhi (2011) indicates it would be a mistake to read too much into this because, “The Buddha assigned the word a new meaning consonant with his own system of psychology and meditation” (p. 22). Prior to the existence of the word mindfulness, Rhy Davids, an English Pāli-language scholar stated:

Sati is literally 'memory' but is used with reference to the constantly repeated phrase 'mindful and thoughtful' (*sato sampajāno*); and means that activity of mind and constant presence of mind which is one of the duties most frequently inculcated on the good Buddhist. (Davids, Müller, & Oldenberg, 1969, p.145)

In an effort to clarify *sati*, not in English, but in Pāli, the word *upatthana* is increasingly used among contemporaries (Bodhi, 2011). *Upatthana* means 'setting up, establishing,' which Bodhi (2011) affirms is precisely what mindfulness is meant to do. To engage in mindfulness is to prepare oneself, or to establish a foundation for the mind to operate. In effect, mindfulness is not an end product, but rather it is a preparation for something else. This returns mindfulness to the notion that it is not an escape from pain or the cessation of mental activity, but it is the conscious effort of the individual to prepare him or herself for what is to come, or more appropriately phrased, what is already present, but left unaware. This preparation requires the individual to put aside judgements (preconceived notions) and ready him or herself to take in the environment, his or her thoughts, and feelings in an open and caring manner. In effect, mindfulness need not only occur during meditation, which is the act of training one's mental faculties towards a fuller mindfulness, but it is a process to be engaged in moment by moment, day by day.

There is no one word for 'meditation' in Pāli. Frequently used, however, is the word *bhavana*, roughly translated as "development through mental training" (Kabat-Zinn, 2004, p. 81). It is important to note that *bhavana* is not the same as *sati* or *upatthana*; meditation is not mindfulness and mindfulness does not have to exist solely within meditation. If mindfulness is preparing one's mind to engage in a receptive awareness, than meditation is a way of training in advance. In this respect, meditation is not dissimilar to an athlete training for a sporting event.

Although an individual might be able to practice mindfulness without meditation, meditation is one of the few processes that may strengthen one's daily mindfulness.

Even when a common language can be understood and spoken together, there is no conclusion to a dialogue between two cultures that seek to understand one another. In order for such a dialogue to take place, there must be the recognition that there are inexhaustible discussions on what mindfulness is and how it is to be carried out. Bhikku Bodhi (2011), although receptive to a Western adaptation of mindfulness, provides Buddhists with words of caution regarding the cross-pollination of Eastern philosophy with Western scientific practices:

At the same time, I also believe that it is our responsibility, as heirs of the Dhamma, to remind such experimenters that they have entered a sanctuary deemed sacred by Buddhists. Thus, respectful towards their sources, they should pursue their investigations with humility and gratitude. They should recognize that the Dhamma bids everyone come and take what they need; however, they should also recognize they are drawing from an ancient well of sacred wisdom that has nourished countless spirits through the centuries and whose waters still retain their potency for those who drink from them today.

Mindfulness' Impact on Cognitive Functions and Emotion Processing

As a mental activity, mindfulness studies tend to focus almost exclusively on their correlations with various forms of cognition and emotion processing. Significant works tend to focus on mindfulness' correlations with metacognition, emotional regulation, executive functions, working memory, and attention. Often, these terms overlap, at times lacking the necessary clarity of definition both in the cognitive term and in the nature of mindfulness. Through reducing terms to their barest forms, simplistic conclusions are drawn about their

supposed mutual connections. To avoid a similar discussion, it is important to distinguish these terms from the effects of mindfulness practices.

Metacognition and Meta-awareness

Metacognition is often referred to as “thinking about thinking” (Flavell, 1979, p. 906). Flavell (1979) conceptualized metacognition with four classes of phenomena that are core to his model of cognitive monitoring. These included metacognitive knowledge, metacognitive experiences, goals, and actions. Flavell’s (1979) metacognitive knowledge “is that segment of your stored world knowledge that has to do with their diverse cognitive tasks, goals, actions and experiences” (p. 906). In effect, metacognitive knowledge directly relates with Flavell’s other proposed phenomena. Metacognitive experiences are the conscious, affective experiences that operate alongside cognitions. The goals’ phenomena are related to specific objects, mental or physical, related to an intellectual enterprise. Last, actions, which include both cognitions and behaviors, are used to accomplish goals. Within each of these four phenomena, awareness is required; ergo, one might conceptualize Flavell’s cognitive monitoring model as ‘awareness of knowledge’, ‘awareness of experiences’, ‘awareness of goals’, and ‘awareness of actions’. Thinking about thinking then becomes being aware about one’s awareness; this is referred to as meta-awareness (Zedelius, Broadway, & Schooler, 2015).

The antithesis of metacognition or meta-awareness is often considered mind-wandering (Zedelius, Broadway, & School, 2015). It makes logical sense that the opposite of meta-awareness would be the absence of control over where the mind goes. Zedelius, Broadway, & School (2015) performed a study wherein participants were told to read a passage, believing that they would be monitored, through physiological signs, whether or not their minds wandered. Participants were unaware that the researchers’ physiological monitoring was a “bogus pipeline”

designed to promote increased honesty in the participants' self-reports regarding mind-wandering. The researchers found that meta-awareness could be increased simply through effort from the individual.

Mindfulness training is not dissimilar to the act of putting forth effort to remain aware as was done in Zedelius, Broadway, & School's (2015) study. Similarities between metacognition-meta-awareness and mindfulness may include an emphasis on maintaining conscious thoughts on one's cognitions, actions, and affective states. Additionally, both metacognition and mindfulness emphasize the fact that sustained awareness requires effort from the individual; it is not a passive task. Although similarities abound, there are some distinct qualitative differences that are often overlooked. Mindfulness is more than 'bare awareness'. Mindfulness requires an attitude of openness and acceptance. Whereas enhanced metacognition leads to increased clarity regarding an individual's actions and thoughts, mindfulness encourages a level of receptivity that is not necessarily a characteristic of metacognition. Mindfulness may increase metacognition, but metacognition may not necessarily increase mindfulness.

Emotional Processing and Regulation

Many different approaches have been used to investigate the effects that mindfulness meditation has on the processing of emotions (Tang, Hölzel, & Posner, 2015; Hölzel et al., 2011; Jain et al. 2007). These studies correlate the recurrent practice of mindfulness meditation with a reduction in emotional distress and an increase in affect regulation (Ding, Tang, Tang, & Posner, 2014). Due to the multidimensional nature of mindfulness and the various ways in which a person's emotional states may be affected, it is worth identifying how specific mechanisms of mindfulness impact major areas of emotional dysfunction.

Impacts of mindfulness on depression. An inability to regulate one's emotions effectively is core to many mental health disorders (Greenberg & Pyszczynski, 1986; Belzung, Willner, & Philippot, 2015). Often, affective disorders are then accompanied by increased negative thoughts regarding the self (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). If mindfulness were only 'bare awareness' or the act of observing oneself, it might very much resemble forms of rumination. Nolen-Hoeksema, Wisco, & Lyubomirsky (2008) state, "rumination maintains and exacerbates depression by enhancing negative thinking, impairing problem solving, interfering with instrumental behavior, and eroding social support" (p.401). One might erroneously conclude that the difference between mindfulness and rumination is in the accuracy of one's self-reflection. However, depressed individuals are not necessarily inaccurate when they state they feel alone, neither do they lack insight or awareness into the intensity of their feelings. On the contrary, depressed individuals may be acutely aware of their cognitions, feelings, and behaviors.

Rather than mindfulness only increasing one's awareness to an event, such as depressed feelings, it encourages the practitioner to alter his or her relationship to the experience (Carmody, Baer, Lykins, & Olendzki, 2009). In turn, this may lead to a greater regulation of one's emotions. Mindfulness does not ask that an individual stop feeling depressed; rather, it asks that an individual, in mindfully processing his or her depression, cease to ascribe 'rightness' or 'wrongness' to the experience. A key mechanism to eliminating these judgements is self-compassion. When engaging with the self in what Daniel Siegal (2007) might refer to as 'heartfulness', the self ceases to be the problem. Mindfulness is not about dismissing negative emotions so much as it is about engaging with them in a friendly and compassionate manner.

As one's ability to engage in mindfulness increases, depressive symptoms decrease (Sugiura & Sugiura, 2014). The mechanisms enabling this correlation are not entirely clear. As was already discussed, certain elements of mindfulness, such as awareness, may not relate to the improved mental health of an individual. Petrocchi & Ottaviani (2015) performed a study in an effort to elucidate narrow elements of mindfulness that may explain the relationship between mindfulness applications and improved mental wellbeing. The Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) was used to monitor specific facets of mindfulness whose strength correlated with improved mental health. The five facets explored by the FFMQ include: (1) observe, (2) describe, (3) act with awareness, (4) nonreactivity and (5) nonjudge. Scores on the FFMQ were compared with scores derived from the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) and the Rumination Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991). Surprisingly, of all the five facets of mindfulness, that of nonjudge was the only one to successfully predict depression. Essentially, it was the level of nonjudgmental self-compassion that one was capable of exerting that best predicted a reduction in depressive symptoms and rumination.

Although the FFMQ is widely used to assess mindfulness qualities in individuals, there are limitations in attempting to quantify something as inherently qualitative as mindfulness practices. Additionally, although there are certainly distinct characteristics of mindfulness, the borders between the characteristics are not as clear. The concept of nonjudge does not exist alone, but rather is contingent upon the other facets of mindfulness. It is uncertain how an individual could express nonjudge without already possessing certain levels of the other four facets (i.e. observe, describe, act with awareness, and nonreactivity). If one were to attempt to extract nonjudge from a holistic practice of mindfulness, and then implement nonjudge into a

therapeutic practice, it is unclear how beneficial this would be to the individual. It is more plausible that the aspect of nonjudge, although representing the most salient feature of mindfulness in ameliorating depressive symptoms, must exist within a framework of awareness and receptivity.

Impacts of mindfulness on anxiety. In addition to alleviating depressive symptoms, mindfulness practices also have been shown to reduce anxiety (Vollestad, Sivertsen, & Nielsen, 2011; Baer, Carmody, & Hunsinger, 2012; Hoge et al., 2013). The act of increasing awareness, however, shows a limited effect on reducing worry and anxious thoughts; rather, it is the act of ‘decentering’ that elicits the clearest decline in anxiety (Hoge et al., 2015). Decentering is the act of observing elements of the mind, such as thoughts and feelings (Teasdale et al. 2002). Hoge et al. (2015) states, “Decentering promotes disengagement from internal experiences (i.e., an intense emotion, its corresponding motivational impetus, and associated maladaptive self-referential processing) in favor of adopting a more distanced perspective” (p. 229). Although Petrocchi & Ottaviani’s (2015) study found ‘observation’ to have a limited impact on depression, Hoge et al. (2015) found the quality of observation to be central to the alleviation of anxiety. This suggests that the holistic practice of mindfulness is required to treat individuals with multiple sources of mental stress. For the anxious individual, mentally distancing oneself from the mental item producing worry significantly alleviated unwanted symptoms.

It is important to note that decentering is not the same as distancing. When Hoge et al. (2015) refer to a “distanced perspective”, they are not suggesting that the individual disengage and avoid. What is suggested, however, is that the individual detach him or herself from the mental item producing anxiety rather than remain enmeshed with it. Decentering is like holding

an item in the palm of one's hand, examining it closely. It is not holding an item with the goal of throwing it away.

As stated previously regarding self-compassion and the treatment of depression, a single narrow quality of mindfulness cannot be extracted from a holistic practice of mindfulness and still remain an effective treatment. It is unlikely that the singular act of decentering or observing what makes an individual anxious would make a permanent or lasting change to the individual's mental state, or would produce a framework of behavior for the individual to maintain easily. Rather, it is critical that the decentering occur within a particular framework; one that promotes other aspects of mindfulness.

Executive Functions

Executive functions are not a unitary trait or construct; rather, they are a multidimensional "team of conductors of mental abilities" that direct and control various aspects of the mind (McCloskey, 2006, p. 8). Executive functions are required for higher order thinking, directing ones thoughts, emotional regulation, and cuing various mental abilities; they are responsible for sustained conscious attention and goal-directed behavior (Anderson, 2002; Miller & Cohen, 2001). When someone is engaged in mindfulness meditation, he or she is utilizing sets of executive functions to engage in conscious awareness; mindfulness requires the cuing of various cognitive abilities, thus executive functions are crucial to engaging in such activities effectively.

Executive functions involve a complex set of cortical-subcortical neural circuitries, but are primarily associated with the prefrontal cortex (PFC). The PFC is one of the last regions of the brain to develop fully; therefore, it is more malleable and apt to change based on environmental stimuli (Treadway & Lazar, 2010). Individuals that regularly practice tasks

requiring executive functions show an increase in their overall abilities to generalize these executive functions towards other similarly related tasks (Strobach, Salminen, Karbach, & Schubert, 2014; Zinke, Einert, Pfennig, & Kliegel, 2012). Because executive functions are capable of improvement through training, one might naturally consider mindfulness meditation as a potential method for strengthening executive functions. Short, Mazmanian, Oinonen, and Mushquash (2016) found that individuals who are dispositionally mindful, and who act with awareness in a non-judgmental manner, exhibit an increased ability to self-regulate, inhibit responses, and shift from one activity to another. These individuals acted with greater intentionality. Moore and Malinowski (2009) determined that individuals who regularly practiced mindfulness meditation possessed an increased ability to inhibit behavioral responses, compared with non-meditators. Many similar studies reproduce these results; however, these studies do not show that mindfulness causes an increase in executive capacities, only that certain executive capacities and mindfulness are correlated. It is just as possible that individuals with highly developed executive capacities are more likely to present as dispositionally mindful.

Although studies correlating mindfulness meditation and well-developed executive functions exist, there are fewer studies that show how non-meditators who begin practicing mindfulness meditation may increase their executive functions over time. Even fewer studies consider the multifaceted nature of executive functions in regard to mindfulness meditation; often what is considered is whether or not executive functions are increased overall, treating executive functions as a single unitary construct. Because the concept of mindfulness is equally multifaceted, it would be difficult to design such a study wherein various components of mindfulness are shown to affect particular elements of executive functions as individuals move from being non-meditators to experienced meditators.

Gallant (2016) recognized this difficulty and performed a literature study, hypothesizing that (1) sustaining attention, (2) directing the mind, (3) withdrawing attention from distractors and (4) eliciting nonjudgmental appraisal of the distractor would be linked to improvement in sub-domains of executive functions. Gallant (2016) used Miyake et al.'s (2000) three-factor model as a theoretical framework; this framework included the following executive concepts: (1) inhibition, (2) updating, and (3) shifting. Inhibition was defined as the active suppression of stimuli that are irrelevant to the current goal. Updating referred to monitoring information held in working memory relevant to the current task. Shifting was identified as switching attention between multiple areas of focus. The researcher found that through mindfulness meditation, individuals would regularly strengthen their inhibitions. Some of the studies that Gallant (2016) reviewed indicated varying results regarding the significant increases either in shifting or in updating. It was concluded that rather than mindfulness meditation having a global impact on executive functions, it was more likely that mindfulness meditation impacted specific areas of executive functions to varying degrees. This conclusion is not surprising, considering the many different facets that compose both executive functions and mindfulness. Further research is required to identify the specific mechanisms of mindfulness meditation and their potentially corresponding impacts to narrow executive functions.

Working Memory

Working memory is a process wherein information is held in mind long enough to manipulate or associate it towards a given task (Dehn, 2008). Due the conscious and effortful nature required of effectively using one's working memory, many have hypothesized that mindfulness meditation may enhance it; numerous studies have shown significant correlations in the mindfulness meditation of adults and increased working memory capacity (Chambers, Chuen

Yee Lo, & Allen, 2008; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010; Mrazek, Franklin, Phillips, Baird, & Schooler, 2013). Mindfulness meditation has also been shown to improve the working memory capacity of adolescents (Quach, Mano, & Alexander, 2016).

Quach et al. (2016) produced a unique study, assigning 198 adolescents to three separate groups: (1) practicing mindfulness meditation, (2) participating in hatha yoga, and (3) control group. This study was particularly interesting because it included an additional unfamiliar activity, such as hatha yoga, to attempt to control for any novelty or placebo effect that mindfulness meditation may naturally produce within non-meditators. After multiple weeks in each group, Quach et al. (2016) found that only the participants who performed mindfulness meditation exhibited significant changes in working memory capacity. The researchers concluded, “These results are consistent with the notion that the practice of meditation-which requires sustained attention while simultaneously redirecting attention back to the current experience – is closely related to the function of working memory” (Quach et al., 2016, p. 493).

Although it is interesting to consider how practicing mindfulness meditation may result in increased working memory, there may be alternative reasons for such an increase. It is well documented that in order for an individual to access his or her working memory, each must first have the capacity to sustain his or her focus (Awh & Jonides, 2001; Katus & Müller, 2016). Although working memory and attention are associated closely, they are quite separate constructs. Considering this important delineation, it is possible that mindfulness meditation may simply increase the efficiency of neural circuitry associated with sustaining focus on various stimuli (e.g. physical objects, mental items, cognitions, emotions, etc.). By increasing one’s attention, it may appear that one’s working memory is improved, but the individual has simply increased his or her access to an already well-formed working memory.

Attention

Attention is not a unitary action; rather, it is a process during which information is selected for increased conscious processing and other information is not (Ward, 2006). Multiple models for attention have been proposed. A model commonly used throughout mindfulness research proposes three distinct neural networks: (1) the orienting network, (2) the alerting network, and (3) executive attention (Peterson & Posner, 1990). The orienting network helps an individual to identify important sensory information. The alerting network is concerned with arousal and vigilance, or the degree to which an individual is able to sustain his or her focus. Executive attention involves the individual's conscious effort to attend to one item and to ignore another. The best example of the use of executive attention is the Stroop (1935) task, which requires an individual to read a color-word and to ignore the conflicting color in which the word is written. During periods of mindfulness meditation, the individual must orient his or her attention, sustain it for an extended period of time, and block out interference from competing stimuli. The problem with this model for attention regarding its application to the majority of mindfulness practices is not in its conceptualization of attention, but in its overly simplistic conceptualization of mindfulness meditation; often these studies tend to conceptualize mindfulness meditation as a time during which the individual is meant only to sustain his or her focus, disregarding the broader aspect of mindfulness previously discussed (Sanger & Dorjee, 2015).

An early neuropsychological model for attention, useful in this current discussion of mindfulness and attention was proposed by Luria (1973), suggesting there are two systems of attention: the reflexive attentional system (RAS) that responds to environmental stimuli and the volitional attentional system (VAS) that consciously interprets the environmental stimuli. The

RAS does not require effort; rather, it occurs in a non-conscious manner, with elements of physical stimuli or mental items arising to one's attention. The VAS is a more specifically directed or willful form of attention. Koziol and Budding (2009) indicate that various forms of attention occur due to the activation of distinct neural networks. Attention to stimuli, whether volitionally (VAS) or non-volitionally (RAS) requires communication between subcortical and cortical regions of the brain; the frontostriatal path is most closely associated with the neural circuitry required for attention. Once the frontal lobes and striatum begin to form a feedback loop, the stimuli are brought to one's conscious attention (Koziol and Budding, 2009). When the process is more volitional or intentional, it is considered to have occurred through 'top-down' processes during which the individual selects what to attend to. When thoughts, feelings, and sensations arise seemingly from nowhere and take up the conscious attention of the individual, this is considered 'bottom-up'.

Mindfulness meditation has a place for both states of attention, both volitional and non-volitional. Some forms of mindfulness meditation focus more closely on directed attention, such as those practices derived from Zen Buddhism. Other forms encourage an openness to allow sensations, thoughts, and emotions to arise naturally, neither attempting to push them away nor attempting to hold on to them; this practice is most commonly associated with Vipassanā. Although Vipassanā forms of meditation make room for non-volitional mental items to arise to one's conscious attention, the meditator is, of course, expected to sustain focus towards those elements which have non-volitionally appeared in one's consciousness (Siegal, 2007).

During mindfulness meditation, one typically begins by attending closely to one's breath or physical body (Kabat-Zin, 1996). For those beginning meditation for the first time, this might be the only exercise that occurs until the meditator has gained sufficient skill in paying attention

(Kapleau, 1989). This effortful form of meditation is significantly more volitional. As one's ability to sustain focus increases, the meditator may begin to open him or herself towards attitudes, thoughts, and emotions. It would be a mistake to suggest that the meditator ceases to attend volitionally; rather the meditator must volitionally attend to the act of breathing, the act of receptivity, and the perception of newly arisen mental items. Attention is split, yet unified under the multifaceted umbrella of mindfulness meditation.

Dispositional mindfulness, or the type of mindfulness with which one moves throughout the day, requires an attentiveness to each moment as it passes by (Siegal, 2007). If one is driving, the attention is drawn to the act of driving. If one is having a conversation, the attention is drawn to the act of holding a conversation. Daydreaming can even be done in a mindful manner if the individual is compassionately attentive to the act of daydreaming, receiving it as its own temporary mental state and recognizing it for what it is. In this sense, dispositional mindfulness is fairly permissive, as long as the individual is nonjudgmentally attending to the awareness of whatever is occurring.

More experienced meditators may begin to wonder if they should be attending to everything in the present moment. Both Buddhist monks and neuroscientists agree that this would be an impossible task (Kapleau, 1989, Kabat-Zin, 2004). By its very nature, attention requires a level of selectivity. The goal is not to attend to all things, but to attend to those that exist within the present moment. Of course, a significant number of elements capable of being focused upon may exist within the present moment. This recognition alone indicates the practitioner's increased level of mindful awareness. Because mindfulness does not stop with awareness, the practitioner must be open and receptive to his or her limits of attending to the moment, accepting the idea that a mindful disposition is itself a state of being whose strength of

practice varies from moment to moment. Through extended practice, both during meditation sessions and in one's dispositional states, mindfulness has been shown to increase one's ability to perceive events and sustain focus (Thomas and Atkinson, 2016; Felver et al. 2014; Tang et. al 2007).

Neurological Impacts of Mindfulness Meditation

Because mindfulness has been shown to impact various areas of cognitive functioning, there has been a significant increase in the number of studies investigating changes in the neural circuitry of mindfulness practitioners (Tang, Hölzel, & Posner, 2015; Weare, 2013; Malinowski, Moore, Mead & Gruber, 2015; Davidson et al., 2013; Davidson 2004; Lazar et al., 2005). Studies have documented notable brain changes in beginning meditators, advanced meditators, healthy individuals, and those requiring mental health therapy (Lutz, Slager, Dunne, & Davidson, 2008; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010; Tang et al., 2007). It is important to note that meditation and brain changes are correlative and not necessarily causal; it is possible that there are pre-existing differences in brain functioning that those willing to engage in meditation possess over those less willing to engage in meditation (Tang et al., 2015; Davidson, 2010). Additionally, even though a number of longitudinal studies involving beginners show changes in brain functioning, it is difficult to determine if these brain changes are the result of meditative practice or simply from the learning of a new skill (Tang et al., 2015). Last, one may speculate about the variability in neurological plasticity among individuals; that is, that certain individuals who are neurobiologically predisposed towards greater plasticity are equally predisposed towards mindfulness practices.

Despite the cautious restraint that researchers must maintain when interpreting potential brain changes associated with mindfulness meditation, the alterations of neural circuitry are not

insignificant. Numerous locations throughout both cortical and subcortical regions undergo changes after recurrent mindfulness meditation sessions (Hölzel et al. 2008; Lazar et al. 2005; Vestergaard-Poulsen et al., 2009). Of primary interest, changes most frequently occur along the frontostriatal neural circuitry (Malinowski, Moore, Mead, & Gruber, 2015, Davidson et al., 2003, Lazar et al., 2005).

Although positive effects are clearly documented, mindfulness requires regular and recurrent practice for a sustained effect (Weare, 2013). Malinowski et al. (2015) performed 64-channel electroencephalographies on participants, 55 to 75 years of age, who engaged in eight weeks of mindful breath awareness training.

The results show that engaging in just over 10 minutes of mindfulness practice five times per week resulted in significant improvements in behavioral (response latency) and electrophysiological (N2 event-related potential) measures related to general task performance. Analyses of the underlying cortical sources (Variable Resolution Electromagnetic Tomography, VARETA) indicate that this N2-related effect is primarily associated with changes in the right angular gyrus and other areas of the dorsal attention network. (Malinowski et al., 2015, p.12)

It was concluded that the mindfulness meditation, for older adults, correlated with increased attention, and this could be viewed as a possible strategy for counteracting cognitive decline associated with aging. More importantly, Malinowski et al. showed that participants did not require extensive periods of mindfulness meditation for benefits to appear on a scan; 10 minutes a day for five days a week did not appear to be an excessively demanding request for the participants.

Davidson et al. (2003) were among the first researchers to evaluate, thoroughly, the neurological impacts of mindfulness meditation training. Their team implemented a similar 8-week training program in mindfulness meditation, to be used within the work environment. The researchers measured electrical activity in the brain for their pre-post tests, and then measured it again four months after the program.

We report for the first time significant increases in left-sided anterior activation, a pattern previously associated with positive affect, in the meditators compared with the nonmeditators. We also found significant increases in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group. Finally, the magnitude of increase in left-sided activation predicted the magnitude of antibody titer. (Davidson et al., 2003, p. 564)

These results were particularly interesting because they suggest that mindfulness meditation's impact on emotional well-being could also have a correlated effect on the overall physical health and well-being of the practitioner. In a follow up review, Davidson (2004) discussed the literature involving the circuitry of emotion, emphasizing the prefrontal cortex (PFC) and amygdala. Results of a meta-analysis indicated that individual difference in the activation of the PFC and amygdala were correlated with "behavioral and biological constituents of affective style and emotion regulation" (Davidson, 2004, p. 1407). Because mindfulness meditation had already been shown to produce unique changes in the PFC, it was again proposed that this circuitry could be shaped by an individual's practice, thereby correlating with an increase in positive affect.

In a similar study, Lazar et al. (2005) studied twenty participants who had incorporated regular meditation into their daily routines. Lazar was careful to state that these individuals were

Western practitioners, not monks, whose meditation routine was just one component of their lives. Participants had a shared average of 7.1 to 9.1 years of meditation, practicing 4.0 to 6.2 hours per week. Cortical thickness was measured from two magnetization-prepared, rapid gradient echo (MPRAGE) structural images. Lazar et al.'s (2005) data indicated that the frequent and regular practice of meditation "is associated with increased thickness in a subset of cortical regions related to somatosensory, auditory, visual, and interoceptive processing" (p. 1895). The researchers determined that meditators had a significantly thicker cortex in the right middle and superior frontal sulci, left superior temporal gyrus, and right anterior insula. The right anterior insula is typically associated with body awareness (Critchley, Wiens, Rotshtein, Öhman, & Dolan, 2004).

It is not surprising that mindfulness impacts numerous brain regions. As one considers the extraordinary interconnectedness of the brain in conjunction with the numerous tasks that mindfulness meditation comprises, changes would be expected to occur across many different neural pathways. Further research is still required to determine if these brain changes are primarily the result of mindfulness meditation and not other pre-existing conditions or co-existing life changes.

Applications of Mindfulness in Therapeutic Settings

Programs for Adults

Mindfulness Based Stress Reduction (MBSR). Mindfulness-Based Stress Reduction (MBSR) was developed by Kabat-Zinn at the University of Massachusetts Medical Center in the late 1970s in an effort to alleviate the physical and emotional suffering of his patients (Kabat-Zinn, 1996). MBSR is a structured group program designed to instruct patients on mindfulness; the program also uses yoga, controlled breathing, and multiple forms of meditation (Kabat-Zinn,

1996; Lenze et al, 2014). MBSR is commonly used to reduce recurring physical pain, but does so by reducing the psychological trauma that accompanies such pain (Kabat-Zinn et al., 1992; Miller, Fletcher, & Kabat-Zinn, 1998, Deyo et al., 2009). Similar to other forms of mindfulness, MBSR's focus is not to teach patients to ignore the pain or to pretend that the pain is less significant than it actually is; on the contrary, the patients are taught how to engage with the pain. An apt metaphor might be how one handles a hot pan from the oven. It would do an individual very little good to pretend the pan was not hot and to grip it without a strategy. The mindfulness components of MBSR act as the thick cloth pan-holder, providing the individual with a strategy to interact with the object, while providing some distance from that which causes pain. Similarly, MBSR instructs patients on how to hold their pain properly, examining it completely and in a manner that is open to its existence and accepting of its consequences. This is not to suggest that its existence is beneficial or that the consequences are not painful, but rather this is simply to allow the patient to let go of the fact that the pain should not exist, a sentiment often turned inward towards the patient's self (Kabat-Zinn, 1996, Kabat-Zinn, 1998).

In Miller et al.'s (1998) study, it was found that brief, but intense, forms of mindfulness training, specifically conducted through MBSR, resulted in long-term generalizable benefits. These benefits included significantly maintained reductions in anxiety and depression associated with persistent physical pain. Additionally, there was a sustained reduction both in the severity and in the number of panic attacks previously associated with the pain. Patients felt more secure with their pain and more willing to participate in major life events.

In a time when the prescription of pain medication has never been higher (Westergaard, Hansen, Glümer, & Jensen, 2015), mindfulness training serves as an additional method for treating physical pain and its psychological impact (Miller et al., 1998). The precise mechanisms

for the reduction in pain continue to be elucidated. It is possible that the regulation and direction of one's attention guides one's perception, appraisal, and insight, thus altering how one copes with the present stimulus (Schwartz, 1989). In turn, the physical pain ceases to be a source of anxiety and ceases to cause the same levels of anxiety significant enough to induce panic. It has also been theorized that mindfulness training's approach to the present moment may cut off the cyclical thought process associated with a fight or flight response (Miller et al., 1998; Kabat-Zinn, 1996).

Mindfulness Based Cognitive Therapy (MBCT). Mindfulness Based Cognitive Therapy (MBCT) was designed to prevent the relapse of Major Depressive Disorder (MDD) (Segal, Williams, & Teasdale, 2002; Michalak, Schultze, Heidenreich, & Schramm, 2015). Similar in many respects to MBSR in terms of its eight-week intensive structure, MBCT diverges as it specifically targets signs and symptoms of MDD. MBCT attempts to bridge a gap between mindfulness training and cognitive therapy. Mindfulness training and cognitive therapy, although similar in some respects, diverge in their approaches to treatment. "Mindfulness shares with cognitive therapy the perspective that perception and thought drive emotion and behavior and that if one changes one's relationship to thought, one can change deeply ingrained self-destructive or maladaptive patterns of behavior" (Miller et al., 1998, p. 50). However, although cognitive therapy seeks to substitute a maladaptive thought for a more beneficial one, MBCT seeks to alter the relationship to that thought (Michalak, Schultze, Heidenreich, & Schramm, 2015). Patients are taught that thoughts are events that occur in the mind and do not necessarily reflect reality (Teasedale, Moore, Hayhurst, Pope, Williams, & Segal, 2002). MBCT increases one's self-compassion towards these thoughts, increasing the patient's ability to relate to oneself with kindness (Neff, 2003, Kuyken et al., 2010; Michalak, Schultze, Heidenreich, & Schramm,

2015). Melyani et al. (2015) have gone so far to say that MBCT is more effective than Cognitive Behavioral Therapy (CBT) in reducing recurrent depressive states, attributing this effect to an increase in self-compassion and a decrease in cognitive reactivity. Further cross-sectional and longitudinal studies will be required to make any definitive remarks comparing MBCT and CBT.

Programs for Children

Mindfulness programs for children are becoming more ubiquitous; however, much of the research regarding the efficacy of such programs is still in its infancy. The purpose of these programs range from increasing emotional control (Maloney, Lawlor, Schonert-Reichl, & Whitehead, 2016), inhibiting behavioral responses (Flook, Goldberg, Pinger, & Davidson, 2015), improving social relationships (Coholic, Oystriick, Posteraro, & Lougheed, 2016) to paying closer attention (Thomas & Atkinson, 2016). Although many of these programs report success, there are few follow up studies to confirm whether or not a program performs as it is purported to. Additionally, less focus is given to the philosophy of mindfulness and more focus is given to the production of a behavior. It is this emphasis of production, or of doing, and an under-emphasis of “being” that begins to show how mindfulness programs become increasingly westernized. In an interview, Zen Master Thich Nhat Hanh stated the following:

There are two things: to be and to do. Don't think too much about to do – to be is first. To be peace. To be joy. To be happiness. And then to do joy, to do happiness – on the basis of being. So first you have to focus on the practice of being. Being fresh. Being peaceful. Being attentive. Being generous. Being compassionate. This is the basic practice. (Miller, 2016, para. 3)

This practice of “being” over “doing” is core to constructing a mindfulness program that is successful for children. Presently, mindfulness programs for children are structured to be

delivered either by the parent or by the school. Many of these programs appear in book form, and a great deal of success is reported by the users; however, there have been a limited number studies and follow up studies to reproduce and document successes.

Parent training. *Sitting Still like a Frog: Mindfulness Exercises for Kids (and their Parents)* (2013), by Eline Snel, indicates directly in the title of the book that mindfulness training is not only for children, but also for the adults that care for them. Similar to Thich Nhat Hann's emphasis of "being" over "doing", Snel asks parents to be active participants in being, or in exuding, this mindfulness for their children, modeling how the practice should occur, both during meditation and dispositionally throughout the day. Effectively, the book begins by clearly defining mindfulness, followed by how to parent mindfully, before any exercises for children are ever mentioned. By creating this structure, the book prepares the administrator of the program, in this case, the parent, to engage the audience effectively, in this case, the child, both with information and with proper example.

Snel goes on to use language that is accessible to a child, such as discussing emotions in the context of a storm or how to pay attention to your surroundings like a frog. Additionally, Snel avoids an emphasis on optimism, which is actually asking an individual to skew reality for the sake of positive thinking, and maintains the course of training the child to open him or herself to what is occurring around him or her, engaging in self-compassion, and providing exercises to increase attentiveness.

Mindful parenting results in a decrease in anxious thoughts, depressive symptoms, and parental stress (Corthorn & Milicic, 2016), which may naturally translate to better mental health outcomes for their child (Loon, Ven, Doesum, Hosman, & Witteman, 2015), even when their child is not participating in mindfulness training. Additionally, mindful parenting shows an

increase in parental self-compassion; the parents become less judgmental regarding their own perceived parental inadequacies, resulting in a more stable view of the self and even a more positive outlook on parenting in general (Gouveia, Carona, Canavarro, & Moreira, 2016).

Although it is becoming better documented that children receive similar benefits from mindfulness programs (Maloney et al., 2016; Coholic, et al., 2016, Flook et al., 2015), there is no known study, to date, that indicates the impact that mindful parenting may have over the mindfulness training of a child. It is likely that both the parent's disposition and the child's participation in the training have a mutually beneficial interaction. The exact strength of this interaction is currently unknown.

Although dispositional mindfulness in parents is linked to a reduced risk of internalizing and externalizing problems for their respective children (Parent, McKee, Rough, & Forehand, 2016), it cannot be said that mindfulness alone has caused such an effect. It is possible that parents who are more naturally prone to dispositional mindfulness are equally less prone to have genetic mental health issues passed along to their children. There are some studies that have attempted to control for mental health issues in the parents and have found a positive impact on the children when the parent undergoes mindfulness training (Bögels, 2015; Lippold, Duncan, Coatsworth, Nix, & Greenberg, 2015)

Mindful parenting is similar to dispositional mindfulness in many respects, but accounts for the "intrapersonal processes specific to parenting" (Lippold et al., 2015, p. 1664). Duncan, Coatsworth, and Greenberg (2009) proposed five main dimensions to mindful parenting. The first dimension requires the parent to listen to the child with full attention. This allows the parent to discern correctly the behavioral cues and accurately perceive verbal communication. Second, the parent is to engage in nonjudgmental acceptance of both of themselves and of the child. This

allows for a balance between child-oriented and parent-oriented relationship goals, an appreciation of the child, and a sense of parenting self-efficacy. Third, the parent is to engage in emotional awareness of the self and of the child. This helps the parent to engage responsively to the child and reduce diminishing the validity of the child's experiences. Fourth, the parent is to attempt to practice self-regulation during the act of parenting. The parent assesses the context of the situation in accordance with personal goals and values, decreasing the dependence on the child's emotion and lessening the impact that negative affect may have on the parent-child relationship. Last, the parent is to engage in compassion for the self and the child. This helps to increase affection for the parent-child relationship and fosters a forgiving view of one's own parenting efforts, reducing self-blame when the parenting goals are perceived as not having been met. Duncan et al.'s (2015) model is meant to increase parent-child affection, increase the efficacy of child management practices and at the same time foster positive outcomes and reduce conduct problems. Duncan et al.'s (2015) model is highly product oriented and goal driven; however, the foundation of this model is on what Thich Nhat Hann might call the "act of being then doing."

Programs for Schools. Research has not yet shown a relationship between the personal mindfulness practices of teachers and the academic products or the behavioral traits of their students. Although there is some debate regarding the importance of teachers becoming practitioners of mindfulness (Thomas & Atkinson, 2016), traditional mindfulness practices would suggest that if mindfulness is to be incorporated into the classroom, some effort would be required on the part of the teacher to become at-least quasi-fluent in its practice. Certainly, the importance and impact of parental mindfulness on children would suggest that the mindfulness of teachers may have some effect on the mindfulness of students. There is less debate regarding

the efficacy of group instructed mindfulness activities as long as there is some degree of individual support; this is evidenced by the success of various MBSR and MBCT programs (Kabat-Zinn, 1996, Teasedale et al. 2002).

Mindfulness programs have been shown to impact students positively, correlating with a reduction in stress and mental health issues (Kuyken et al., 2013; Harnett & Dawe, 2012). Additionally, mindfulness programs result in increased school engagement (Burke, 2010). Such programs have been particularly effective in schools supporting student populations who are socioeconomically disadvantaged (Costello & Lawler 2014). Mendelson et al. (2010) found that a six-week mindfulness intervention program resulted in improvements in emotional self-regulation among 97 urban fourth and fifth graders. This program involved nine lessons on mindfulness, delivered by teachers over four weeks, and included ten minutes of home practice a day. Black and Fernando (2013) implemented a five-week mindfulness-based curriculum for 409 children (83% enrolled in a California free lunch program and 95.7% ethnic minority) between kindergarten and sixth grade. Researchers found improved attention, self-control, participation in activities, and caring for others, lasting up to 7 weeks post-intervention. Studies that show that a positive impact on vulnerable student populations offer a cost effective way of managing more systemic problems impacting student success.

Despite the growing body of literature regarding the efficacy of mindfulness programs on the mental health of students, there is a surprising gap regarding the effect that mindfulness training may have on the academic development of students. Although correlations have been shown to exist between emotional regulation and positive academic outcomes, further research must be conducted to see if the mental benefits of mindfulness translate to increased learning.

Survey Measures

Because this study relied on the shelf data provided by a school, it was important to determine how the school selected its tools for measurement. The school's categories of interest included (1) attention, (2) working memory, (3) executive functions, and (4) receptivity. Each category was allotted four questions and each question was responded to via a Likert scale, with four possible responses. The questions for attention were modeled after similar questions on the Conners-3, a scale used to clinically assess attention in children. Questions regarding working memory were modeled on those used on the Behavior Rating Inventor of Executive Function (BRIEF). Although the BRIEF is primarily a clinical tool used to measure the executive functions of individuals, it is one of the few widely used clinical measures that incorporate questions dedicated to rating an individual's working memory capacity. The school's survey regarding executive functions was modeled on the McCloskey Executive Functions Scale (MEFS). The MEFS provides its user with ratings of specific executive functions based on a comprehensive, theoretical model of executive functions. Last, the school's survey modeled questions regarding receptivity on the Behavior Assessment System for Children – Third Edition (BASC-3). Although the BASC-3 provides comprehensive screening measures for multiple internalizing and externalizing disorders, it also provides users with the ability to rate an individual's attitude towards school and teachers. Questions relating to attitude towards school and teachers were adapted to construct the receptivity scale.

In addition, a Mindfulness Meditation Knowledge Quiz was developed by the school to ensure concepts of mindfulness meditation were developed and understood by the students as the program progressed. The quiz consisted of seven questions centered on the major topics addressed by the mindfulness meditation program.

Chapter 3: Methods

This study was designed to discern if a correlation exists between the implementation of a mindfulness meditation training program and improvements in attention, working memory, executive functions, and receptivity. Pre-test and post-test data were collected to see if there was a correlation. In addition, students were monitored to document their active engagement in the meditation practices. Students were also assessed regarding their knowledge of mindfulness meditation.

Source of Data

Shelf data were collected from a mindfulness program conducted with a second grade classroom of an urban school. Approximately 77% of students within the school identify as Caucasian; 13% identify as African American; less than 4% identify as Hispanic, and less than 3% identify as Asian. The teacher served both as participant and as informant; she engaged in the mindfulness lessons with her students, reinforced concepts of mindfulness throughout the program, but also informed the school through the completion of survey data. In addition, each student completed self-reports regarding his or her own perceived developments of attention, working memory, executive functions, and receptivity.

Instrumentation

Survey data were completed by the teacher and students and submitted to the school (see Appendixes A, B, and C). The surveys were administered prior to the implementation of the mindfulness meditation program, immediately after the program, and once again six weeks after the conclusion of the program. Participation data were collected once a week to document student engagement in the mindfulness meditation exercises.

Procedures Used to Generate the Shelf Data

A regular education class elected to trial a school's mindfulness meditation program titled *Mindfulness Training for Young Children in School* (MT-YCS). After reviewing the literature, it was found that numerous mindfulness programs exist for adults; however, fewer brief, yet structured, mindfulness programs exist specifically for young children in a classroom setting. During the development phase of the MT-YCS program, literature regarding mindfulness training was reviewed. This literature revealed two patterns related to program success. First, the more clearly a program adhered to the basic precepts of mindfulness meditation, the more effective the program proved to be. Second, programs for adults needed to be adapted for children in order for children to see any correlating benefits. For these reasons, Thich Nhat Hann's (2012) *A Handful of Quiet: Happiness in Four Pebbles* was consulted for inspiration. Thich Nhat Hann is a well-regarded Zen Buddhist monk who played an instrumental role in Kabat-Zinn's earlier adaptations of mindfulness into secular settings (Hastman, 2010). In his book, Thich Nhat Hann highlighted four core elements of mindfulness for children to practice: (1) breathing, (2) groundedness, (3) stillness, and (4) seeing the world as constantly new. Thich Nhat Hann also suggested that young children may benefit from physical representations of certain core qualities of mindfulness; these physical symbols are meant to serve as a reminder to engage in the attitude or activity that each represents.

MT-YCS was designed as a six-week training program for students in elementary school and kindergarten. The program was not designed to create experts in mindfulness, but rather to provide young students a firm foundation on which to practice. As such, the program was also designed to educate teachers regarding principles of mindfulness, including how to practice with the children not only during meditation, but also during daily classroom activities. Teachers were

encouraged to become both practitioners of mindfulness as well as guides for their students. The complete schedule and structure of the MT-YCS activities is provided in Appendix D. Its basic structure consists of six sessions of instruction both for the teacher and for students regarding mindfulness. During each of the six sessions, mindfulness meditation is practiced after instruction. Students and teachers participate in 10 minutes of mindfulness meditation, Monday through Friday, between the transition from morning homeroom and instruction. The program as described here was implemented with the teacher and students of the second grade classroom.

Data Analysis

Data were compiled by assigning a point value to the survey responses: “Never”=0, “Sometimes”=1, “Often”=2, “Almost Always”=3. Data from each survey were converted, assigning each student a score for pre-test, post-test, and six weeks post-intervention. An analysis of variance (ANOVA) was conducted; the results of each survey were to determine if a significant change had occurred. Post hoc testing was performed to determine if students had received any benefit at the conclusion of the intervention and if any of these benefits had residual effects.

Chapter 4: Results

Overview

Results were gathered through multiple measures to answer the research questions. Two factors were important in determining the efficacy of the MT-YCS program in teaching mindfulness meditation skills: (1) the gain of mindfulness meditation knowledge, and (2) the level of participation within the program. Only after these factors presented as satisfactory could it be appropriate to evaluate the efficacy of the MT-YCS program and its potential influence on attention, working memory, executive functions, and receptiveness towards the learning environment.

Knowledge of Mindfulness

Students were provided with the Mindfulness Meditation Knowledge Quiz (Appendix C) prior to the implementation of the mindfulness meditation program to assess if students possessed any prior knowledge of mindfulness meditation. Students received the identical assessment after the program was completed. Table 1 indicates the degree of change in the percentage of correct responses for individual students.

Table 1

Percent Correct in Knowledge of Mindfulness Meditation Quiz

Student	Pretest Percent	Posttest Percent	Difference
Student A	71.43%	71.43%	0.00%
Student B	100.00%	85.71%	-14.29%
Student C	71.43%	100.00%	28.57%
Student D	57.14%	71.43%	14.29%
Student E	42.86%	100.00%	57.14%
Student F	100.00%	100.00%	0.00%
Student G	57.14%	100.00%	42.86%
Student H	42.86%	85.71%	42.86%
Student I	14.29%	57.14%	42.86%
Student J	42.86%	85.71%	42.86%
Student K	42.86%	100.00%	57.14%
Student L	28.57%	100.00%	71.43%
Student M	42.86%	85.71%	42.86%
Student N	57.14%	85.71%	28.57%
Student O	42.86%	85.71%	42.86%

All but two of the students increased their scores on the Mindfulness of Knowledge Quiz and one student's score decreased. The two students with no increase appeared to possess mastery of the concepts prior to the administration of the program. For a large majority of the students, the program significantly increased content knowledge of mindfulness meditation

between the pretest ($M = 3.80$, $SE = .43$) and the posttest ($M = 6.13$, $SE = .24$), $t(14) = -5.391$, $p = .000$, $r = -0.66$. The size of the difference, or the effect size, was large ($d = 1.744$).

Program Participation

All students participated for the duration of the program, Monday through Friday, for six weeks. There were no extraordinary or recurrent school attendance issues during this time. All students attended the weekly sessions dedicated to instructing students in a new element of mindfulness meditation; each received guided practice of new concepts prior to practicing these concepts as part of the morning routine throughout the week.

In addition to strong attendance within the program, it was important to note to what degree students were able to maintain the mindfulness meditation practice during a single session. Table 2 shows the duration or amount of time during which students were able to maintain their mindfulness meditation before losing focus or effort during the mindfulness sessions of the six-week program.

Table 2

Amount of Time that Students Could Maintain Mindfulness Meditation

Date Average	Number of Students to last Specific Time Durations								
	1 Min	2 Min	3 Min	4 Min	5 Min	6 Min	7 Min	8 Min	Average
10/7/2016	4	6	5						2.07 min
10/14/2016	2	2	2	9					3.20 min
10/21/2016	3	2	3	5	2				3.07 min
10/28/2016	2	1	1	11					3.40 min
11/4/2016	2	2	1	0	1	1	8		5.07 min
11/11/2016	0	2	2	1	1	9			4.87 min

Results indicate that as the program progressed, students' stamina for sustaining meditation increased over time. Various students appeared to reach a ceiling for sustaining focus and effort during meditation early on, never exceeding one to two minutes. The majority of students, however, continued to progress incrementally as the weeks of practice continued.

Teacher Perceptions of Cognitive Abilities and Receptivity

It is important to note that the data depicted are not of cognitive growth, but of a teacher's perception of cognitive growth among her students. Although the literature indicates such cognitive gains are plausible after the implementation of mindfulness meditation programs, it was not plausible to assess the cognitive abilities of all of the students directly. As indicated in Appendix A, 12 points are the maximum score a student can earn via the rating scale.

Teacher Perceptions of Student Attention.

Table 3

Teacher Perceptions of Student Attention

Student	Pretest Attention	Posttest Attention	Difference
Student A	9	12	3
Student B	9	12	3
Student C	11	12	1
Student D	9	11	2
Student E	10	10	0
Student F	1	7	6
Student G	4	7	3
Student H	8	10	2
Student I	4	10	6
Student J	4	7	3
Student K	2	5	3
Student L	6	11	5
Student M	5	9	4
Student N	8	10	2
Student O	1	6	5

The teacher's perceptions of students' attention grew an average of 3.20 points or by 26.67%. Perceptions of student attention prior to the program ($M = 6.07$, $SE = .85$), compared with perceptions of attention immediately following the program increased significantly with a large effect ($M = 9.27$, $SE = .60$), $t(14) = -7.122$, $p = .000$, $r = -0.49$, $d = 1.117$). The most

significant gains in attention occurred in children who previously were perceived as having significantly less attention than their peers.

Teacher Perceptions of Student Working Memory.

Table 4

Teacher Perceptions of Student Working Memory

Student	Pretest Working Memory	Posttest Working Memory	Difference
Student A	7	9	2
Student B	7	9	2
Student C	9	9	0
Student D	7	9	2
Student E	7	9	2
Student F	6	5	-1
Student G	7	8	1
Student H	7	9	2
Student I	5	9	4
Student J	5	7	2
Student K	3	5	2
Student L	8	9	1
Student M	6	7	1
Student N	8	9	1
Student O	4	6	2

Teacher perceptions of student working memory grew an average of 1.53 points or by 12.78%. Perceptions of student working memory prior to the program ($M = 6.40, SE = .41$),

compared with perceptions of working memory immediately following the program increased significantly with a large effect ($M = 7.93$, $SE = .40$), $t(14) = -5.277$, $p = .000$, $r = -0.44$, $d = 0.980$). Students who were perceived as having high levels of working memory prior to the mindfulness meditation program did not see as many gains as their peers who were perceived as having lower levels of working memory.

Teacher Perceptions of Student Executive Functions.

Table 5

Teacher Perceptions of Student Executive Functions

Student	Pretest Executive Functions	Posttest Executive Functions	Difference
Student A	10	12	2
Student B	7	11	4
Student C	12	12	0
Student D	7	12	5
Student E	10	11	1
Student F	3	8	5
Student G	3	10	7
Student H	9	12	3
Student I	8	12	4
Student J	7	11	4
Student K	3	7	4
Student L	8	12	4
Student M	7	10	3
Student N	10	12	2
Student O	5	11	6

Teacher perceptions of student executive functions grew an average of 3.6 points or by 30.00%. Perceptions of student executive functions prior to the program ($M = 7.27, SE = .72$), compared with perceptions of executive functions immediately following the program increased significantly with a large effect ($M = 10.87, SE = .40$), $t(14) = -7.562, p = .000, r = -0.62, d =$

1.595). The greatest perceived gains in executive functions occurred with students who were previously rated as possessing very low levels of executive functions.

Teacher Perceptions of Student Receptivity.

Table 6

Teacher Perceptions of Student Receptivity

Student	Pretest Receptivity	Posttest Receptivity	Difference
Student A	9	12	3
Student B	7	12	5
Student C	11	12	1
Student D	7	12	5
Student E	12	12	0
Student F	6	7	1
Student G	8	12	4
Student H	7	12	5
Student I	8	11	3
Student J	7	11	4
Student K	7	8	1
Student L	9	12	3
Student M	7	12	5
Student N	12	12	0
Student O	8	11	3

Teacher perceptions of student receptivity grew an average of 2.87 points or by 23.89%.

Perceptions of student receptivity prior to the program ($M = 8.33$, $SE = .49$), compared with

perceptions of receptivity immediately following the program increased significantly with a large effect ($M = 11.2$, $SE = .40$), $t(14) = -6.013$, $p = .000$, $r = -0.63$, $d = 1.638$). Students who already possessed very high levels of receptivity towards the teacher and towards the learning environment were less likely to see significant gains. Students who were initially perceived as possessing minimal receptivity achieved the greatest gains.

Student Perceptions of Cognitive Abilities and Receptivity

Data in Tables 7 through 9 reflect how students perceived their own cognitive abilities. Table 10 indicates how students perceived their receptivity towards their teacher and towards the learning environment. It is worth noting that self-reports for young children may not consistently reflect true abilities. However, evaluating students' self-assessments offers insight into their unique perceptions regarding their individual capacities.

Student Perceptions of Attention.

Table 7

Student Perceptions of Attention

Student	Pretest Attention	Posttest Attention	Difference
Student A	11	12	1
Student B	11	10	-1
Student C	12	11	-1
Student D	7	9	2
Student E	7	9	2
Student F	4	7	3
Student G	5	7	2
Student H	8	11	3
Student I	10	10	0
Student J	6	6	0
Student K	3	10	7
Student L	9	12	3
Student M	4	9	5
Student N	6	8	2
Student O	3	7	4

Student perceptions of their attention grew an average of 2.13 points or by 17.78%.

Perceptions of attention prior to the program ($M = 7.07$, $SE = .78$), compared with perceptions of attention immediately following the program increased significantly with a medium effect ($M = 9.20$, $SE = .48$), $t(14) = -3.756$, $p = .002$, $r = -0.39$, $d = 0.848$). The majority of students self-

assessed gains in their ability to attend; students who had previously self-assessed high levels of attention did not report gains, and in some cases, reported slight losses. The loss could be due to the variability inherent in self-reports from young children.

Student Perceptions of Working Memory.

Table 8

Student Perceptions of Working Memory

Student	Pretest Working Memory	Posttest Working Memory	Difference
Student A	11	11	0
Student B	10	9	-1
Student C	11	12	1
Student D	9	11	2
Student E	5	8	3
Student F	8	8	0
Student G	8	10	2
Student H	10	8	-2
Student I	6	9	3
Student J	5	6	1
Student K	5	5	0
Student L	5	10	5
Student M	5	10	5
Student N	10	10	0
Student O	1	8	7

Student perceptions of their working memory grew an average of 1.73 points or by 14.44%. Perceptions of working memory prior to the program ($M = 7.267$, $SE = .76$), compared with perceptions of working memory immediately following the program increased significantly, with a medium effect ($M = 9.00$, $SE = .49$), $t(14) = -2.694$, $p = .017$, $r = -0.33$, $d = 0.702$). Students who rated themselves as having high levels of working memory initially did not see the same level of gains as students who initially rated themselves as having low levels of working memory.

Student Perceptions of Executive Functions.

Table 9

Student Perceptions of Executive Functions

Student	Pretest Executive Functions	Posttest Executive Functions	Difference
Student A	12	11	-1
Student B	11	12	1
Student C	12	12	0
Student D	10	11	1
Student E	7	12	5
Student F	11	8	-3
Student G	7	11	4
Student H	9	11	2
Student I	12	11	-1
Student J	8	8	0
Student K	2	12	10
Student L	10	12	2
Student M	10	10	0
Student N	6	9	3
Student O	5	11	6

Student perceptions of their executive functions grew an average of 1.93 points or by 16.11%. Perceptions of student executive functions prior to the program ($M = 8.80$, $SE = .76$), compared with perceptions of executive functions immediately following the program increased significantly, with a medium effect ($M = 10.73$, $SE = .36$), $t(14) = -2.280$, $p = .000$, $r = -0.39$, d

= 0.843). Students who perceived themselves as possessing very low levels of executive functions perceived the greatest gains.

Student Perceptions of Receptivity.

Table 10

Student Perceptions of Student Receptivity

Student	Pretest Receptivity	Posttest Receptivity	Difference
Student A	11	12	1
Student B	11	10	-1
Student C	12	12	0
Student D	11	12	1
Student E	9	12	3
Student F	10	10	0
Student G	9	11	2
Student H	10	10	0
Student I	10	12	2
Student J	7	8	1
Student K	1	12	11
Student L	9	12	3
Student M	10	12	2
Student N	7	7	0
Student O	12	12	0

Student perceptions of receptivity grew an average of 1.67 points or by 13.89%. Perceptions of receptivity prior to the program ($M = 9.27$, $SE = .71$), compared with perceptions of

receptivity immediately following the program increased significantly, with a medium effect ($M = 10.93$, $SE = .42$), $t(14) = -2.269$, $p = .040$, $r = -0.35$, $d = 0.740$). Many students indicated high levels of receptivity prior to the administration of the program, yet enough change had occurred to show an effect in students' receptiveness towards their teacher and learning environment.

Chapter 5 Discussion

Knowledge of Mindfulness

The implemented six-week program successfully instructed students in mindfulness meditation. The large effect size suggests the program was effective in communicating the essential qualities of mindfulness meditation in a manner that young students can comprehend. This suggests that correlations indicated by the study may have occurred as a result of proper instruction and practice of mindfulness meditation. Additionally, it provides support to the notion that even young school age children can comprehend the more nuanced concepts of mindfulness meditation.

When the data are examined more closely, students with the lowest pretest knowledge of mindfulness meditation elicited the greatest gains. Students who initially knew very little regarding the practice were commensurate with their peers who may have already had some background knowledge. Students who already possessed high levels of background knowledge maintained those levels throughout the program.

The majority of students learned that mindfulness meditation is more than simply “paying attention” or “watching breath”, although those concepts are foundational to the skill. Students learned to evoke specific emotional states, such as feelings of being grounded, calm, and receptive. These states were practiced in relation to the self and others. During meditation, students practiced these states, one at a time, for weeks; all of this occurred while following their breath. Students, as well as their teacher, learned not be too harsh on themselves if they felt they were not “doing it right”, and that when they felt something was wrong, to acknowledge that feeling with elements of groundedness, calmness, and receptivity as best they could. Students

and teacher reported that eliminating the feeling of the meditation being done to perfection made the activity more enjoyable and less stressful.

Participation

The premise of the program was built on the concept that mindfulness meditation is a skill that can be taught to young students. Not only was it shown that knowledge of mindfulness meditation could increase, but participation data showed that the duration in which students engaged in mindfulness meditation increased through recurrent practice. At the beginning of the program, the majority of students could sustain their meditation for approximately two minutes, with none exceeding three minutes. Towards the end of the program the majority of the students could sustain their meditation for six to seven minutes. The teacher reported that she felt that many of the students could have sustained it for longer periods had she allowed it. Some students, however, consistently had difficulty sustaining meditation for longer than one or two minutes; rather than have those students sit on the rug and not participate, she gave those students the option of returning to their seats to complete whatever seat work was left unfinished from the morning routine.

Without prompting for feedback, many of the students made positive statements regarding their morning meditation routine. Some reported practicing the meditation techniques at home after school and on the weekend. As part of their weekly routine, students also engaged in 30 minute didactic sessions each Friday afternoon. Students expressed the fact that they enjoyed this time to be introduced to a new skill that they could practice throughout the next week. The teacher, who also participated in the Friday afternoon practice, stated that she felt she understood what was being taught and could briefly reteach it throughout the following week, reintroducing topics that were previously taught to students.

The teacher thought it was remarkable that ringing a bell in the morning brought all of the students to a stop, followed by the movement to the rug to sit quietly and wait for morning meditation. She stated that after the first week, almost none of the students would need reminders to respond to the bell.

Executive Functions

Significant increases in executive functions were noted by both the teacher and the students. Students appeared to be able to initiate tasks at the appropriate times, inhibit their responses, stop when asked, and shift from one activity to the next. Executive functions grew most significantly in students who initially had the most numerous deficits. The magnitude of the change between pretest and posttest groups suggests recurrent mindfulness meditation in young children correlates with increases in executive functions.

The exact mechanism concerning the reason why such an increase may occur is unknown. It is well known that executive functions are teachable skills, which suggests a level of malleability. It could be that as students practice the skills involved in mindfulness meditation, overlap occurs with various executive functions. During mindfulness meditation, students practice initiating a task and engaging their attention. They practice stopping activities and thoughts to engage or reengage in the act of meditation. Perhaps most significantly, students increase their conscious awareness of themselves and of their relationship to others. Such awareness is often essential for the expression of appropriate executive functions. That such awareness can be practiced through meditation may provide a rationale for a correlating increase in executive functions.

Attention

Attention is a critical component of mindfulness meditation. Sustaining one's focus on the inbreath and outbreath is often the first lesson taught to new practitioners because it is both core to the practice and one of the simplest techniques to learn. As anyone who has practiced attending to his or her breath may say, it is easy to start, but not always easy to sustain. The mind wanders, sometimes for substantial amounts of time, before consciously redirecting back to the inbreath and outbreath. The students learned that even the best meditators get distracted, but what makes them the best is that they recognize their distractions and return their attention to their breathing.

This study found that attention was strengthened significantly, as observed by the students and their teacher. The students indicated increases in paying attention to details, blocking out distractions, concentrating on seat work, and sitting among peers while sustaining their attention on their teacher. The effect size in both student and in teacher observations indicates mindfulness meditation maintains a robust effect on student attention.

It is possible that as students began their day by practicing "paying attention", the neurological pathways for attention were strengthened or at least activated. Participation data suggest that recurrent practices elicited growth in the overall duration of time during which that students were able to sustain their practice. It is possible that such growth was able to generalize to portions of the school day dedicated to more academic work when sustained focus was required.

Working Memory

Teacher and student reports observed growth in working memory; however, such observations should be tempered. Working memory is a complex task involving numerous aspects of executive functions and attention. It is possible that practicing skills such as sustaining

focus and inhibiting distractions would increase an individual's access to his or her working memory. In that sense, working memory has not increased, but rather the cognitive skills that support working memory have increased.

For the purposes of the classroom, however, a teacher may not care whether the working memory has increased or has simply been supported in another manner. What matters to the teacher is that the students have access to their working memory in order to engage in the act of learning in a more productive way.

Receptivity

Receptivity is characterized by an individual's openness and willingness to engage in new and sometimes unexpected things. It is a state that makes uncertainty less worrisome. The unknown is accepted as unknown in a manner that is almost welcoming. Receptivity is also characterized by a particular warmth or friendliness. When practicing this concept, students were asked to recall a camp fire and some of the feelings they may have felt sitting around it with friends and family. As students sat in meditation, they were asked to conjure up those same feelings and to extend them to those that sat around them on the rug, and then even to try to extend that same warmth and friendliness towards themselves. Finally, after they felt this could be sustained, they were asked to apply the same feeling to their inbreath and outbreath.

By practicing receptivity, or openness, students consistently re-engaged in a healthy thought pattern. They were instructed on how to produce such feelings on demand and that such feelings could be applied to just about anything, including the unexpected. Although this is a more difficult aspect of mindfulness meditation, many of the students expressed the fact that it was their favorite.

Students reported higher rates of caring about what was being taught, openness to learning new things, communicating freely with the teacher, and being receptive to corrections when mistakes were made. The teacher also observed significantly higher rates of these qualities in her students.

Limitations

Data were obtained from 15 second grade students and one regular education teacher, which limit the generalizability of the conclusions. Data represented only teacher and student perceptions of the effects of the MT-YCS; effects were not directly assessed by an objective source outside of the classroom. Reliance on self-reports may have increased potential biases; additionally, the school did not collect data on a similar class that did not participate in the mindfulness meditation training to serve as a control group. Future studies may wish to use such a control group to compare and contrast any observed gains.

Clinical Implications

The purpose of school is to learn. Although mindfulness meditation may be a fun or relaxing activity, it should be practiced only if it is shown to aid in the learning process. For this reason, it was important for this study to highlight certain aspects of individual cognitive improvement that may generalize into increased learning. By finding increases in attention, executive functions, access to working memory, and an overall more receptive attitude towards learning, this study adds to the body of research that suggests mindfulness meditation may benefit students, even very young students.

It was also shown that significant portions of classroom time are not needed to see meaningful results. A teacher may be able to implement a mindfulness program as part of the morning routine, provided sufficient training has occurred with the teacher and students.

The structure of the program also appears feasible for recurrent implementation. Six 30 minute didactic sessions are not likely to be taxing on an instructor's schedule; after a teacher has participated in these didactic sessions enough, he or she may be able to run these weekly lessons without assistance, reproducing the same instruction from year to year. After the lessons have been completed and students have been introduced to the facets of mindfulness meditation, they can continue to engage and practice mindfulness as part of their morning routine. The teacher can continue to lengthen or shorten the morning mindfulness sessions as needed.

Teachers are continuously met with new demands to teach students more information in a shorter span of time. By mentally preparing students to learn before each day begins, teachers may find that time spent in active learning is more effective. Additionally, teachers may find that they, too, become more mindful of their students and their lessons, engaging in the act of teaching in a way that elicits the same qualities found in mindfulness practices.

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Appendix A

Teacher Survey

The following form was completed by the teacher to collect pre-test, post-test, and follow-up data regarding the attention, working memory, executive functions, and receptivity of the students.

Teacher Form

Attention

1. Pays attention to details
(N) (S) (O) (A)
2. Can block out distractions
(N) (S) (O) (A)
3. Is able to concentrate on individual seat work
(N) (S) (O) (A)
4. Can sit among peers and continue to listen to instruction from the teacher
(N) (S) (O) (A)

Working Memory

1. Is able to remember multiple steps to complete a task
(N) (S) (O) (A)
2. Does NOT easily forget what he or she was doing
(N) (S) (O) (A)
3. Remembers what was just taught after a few minutes have passed
(N) (S) (O) (A)
4. Is able to hold new academic information in their head to complete a task
(N) (S) (O) (A)

Executive Functions

1. Starts school work at the appropriate time
(N) (S) (O) (A)
2. Is able to wait their turn (Inhibiting)
(N) (S) (O) (A)
3. Stops playing or engaging in a desirable activity when asked to do so
(N) (S) (O) (A)
4. Shifts from one academic activity to the next without difficulty
(N) (S) (O) (A)

Receptivity

1. Cares about what is being taught
(N) (S) (O) (A)
2. Is open to learning about new things
(N) (S) (O) (A)
3. Communicates freely with the teacher
(N) (S) (O) (A)
4. Is open to correction when mistakes are made
(N) (S) (O) (A)

Appendix B

Student Survey

The following form was completed by individual students to collect pre-test, post-test, and follow-up data regarding the attention, working memory, executive functions, and receptivity of the students.

Student Form

Attention

1. I pay attention to details.
(N) (S) (O) (A)
2. I can block out distractions.
(N) (S) (O) (A)
3. I am able to concentrate on individual seat work.
(N) (S) (O) (A)
4. I can sit with friends and continue to listen to what the teacher is saying.
(N) (S) (O) (A)

Working Memory

1. I am able to remember the steps of instructions.
(N) (S) (O) (A)
2. I do NOT easily forget what I was doing.
(N) (S) (O) (A)
3. I can still remember what was taught after a few minutes have passed.
(N) (S) (O) (A)
4. I am able to hold new things I'm learning in my head to finish school work.
(N) (S) (O) (A)

Executive Functions

1. I start my school work when told by my teacher.
(N) (S) (O) (A)
2. I am able to wait my turn.
(N) (S) (O) (A)
3. I stop playing and doing what I want to do when my teacher asks me.
(N) (S) (O) (A)
4. I can change from one school activity to the next without difficulty.
(N) (S) (O) (A)

Receptivity

1. I care about what is being taught.
(N) (S) (O) (A)
2. I am open to learning about new things.
(N) (S) (O) (A)
3. I think it is easy to talk to my teacher.
(N) (S) (O) (A)
4. If I make a mistake, I like when my teacher shows me what I should fix.
(N) (S) (O) (A)

Appendix C

Mindfulness Meditation Knowledge Quiz

The following form was completed by individual students to collect pre-test, post-test, and follow-up data regarding their knowledge of mindfulness meditation concepts discussed within the program.

Mindfulness Meditation Knowledge Quiz

1. When we meditate, we try to...
 - a. Listen to all of our thoughts at the same time
 - b. Pay attention to our breathing
 - c. Walk around
2. When we meditate, we try to...
 - a. Worry if we are doing it right
 - b. Let our mind wander
 - c. Feel solid like a mountain
3. When we meditate, we want to...
 - a. Feel our emotions very strongly
 - b. Calm our emotions to see them clearly
 - c. Think about as many things as we can
4. When we meditate, we...
 - a. Get frustrated when we lose our focus
 - b. Tell ourselves what we have done wrong
 - c. Want to be kind to ourselves
5. When we meditate and thoughts pop into our head...
 - a. We don't like that
 - b. We welcome the thoughts, watch them briefly, then think about our breathing
 - c. We shake our heads until all of the thoughts come out
6. Mindfulness meditation helps us to...
 - a. Be smart
 - b. Be the best
 - c. Pay attention to each moment
7. During meditation, when we pay attention...
 - a. We are friendly towards each moment
 - b. We judge each moment as good and bad
 - c. We get upset if each moment isn't the way we want it to be

Appendix D

Mindfulness Meditation Training for Students

Schedule

- 6 periods of group instruction – 20-minute duration per period
- 30 periods of mindfulness meditation – a maximum of 10 minutes per period

Rationale for the schedule

Mindfulness curriculums for young children should highlight conceptual learning, yet emphasize guided practice. For this reason, more emphasis was placed on guided mindfulness meditation.

Intended Participants

This program is designed for implementation within a school setting. The targeted participants are between kindergarten and fourth grade. The program may be implemented for older school aged children, yet the language used throughout the program may appear developmentally immature with an older audience and should be modified.

Structure

Week 1- Following Breath and Body

CORE Principle: Paying attention; increasing awareness of self.

- Learn how to follow your breathing. What does it feel like? Try counting breaths to 10 when your mind wanders.
- Learning how to watch your body
- Practice guided meditation while watching one's breathing.
- Student Goal: During meditation, practice paying attention and self-awareness of physical things; attempt to recognize when not paying attention and redirect attention in a friendly way.

- Teacher Goal: During classroom instruction, observe your teaching as you would observe your breath during meditation. Ask yourself: How is teaching unfolding moment by moment? Observe these moments in a nonjudgmental and self-compassionate way, just as you would do during meditation.

Week 2- Be a mountain

CORE Principle: Establishing a state of grounded and connectedness.

- Do not replace the lesson from before; this is just building on it.
- Practice guided meditation with a sense of grounding.
- Student Goal: During meditation, continue to follow breathing and body, attempt to do so while feeling grounded, like a mountain.
- Teacher Goal: The teacher is encouraged to observe their sustained attitude during classroom instruction. Is it one that feels unstable and chaotic? Attempt to observe oneself as solid, as firmly planted. Attempt to observe if one's thoughts as grounded in the present moment to moment experiences during teaching. When thoughts appear to be wandering or are in flux, attempt to ground them in the present activity.

Week 3- Be water

CORE Principle: Increasing stillness to enhance clarity. Move from moment to moment in a fluid way.

- Prior practice is built upon. Students are still practicing following their breathing and maintaining a sense of groundedness during meditation.
- Learn the difference between still water and rough water.
- “When the water is choppy, can you see things in it?”
- Flow, like water, from moment to moment
- Practice guided meditation with stillness.
- Student Goal: During meditation, continue to follow breathing; attempt to do so while feeling grounded and still. Redirect attention when it wanders in a friendly way.
- Teacher Goal: The teacher should attempt to observe how she or he reacts to the emotions the students exhibit. Does the teacher absorb and reproduce the same emotions as the students in turmoil? Does the teacher remain still and placid, exuding a calmness that is then taken up by the students?

Week 4- Be a flame

CORE Principle: Increasing compassion towards self and others.

- Same as before, nothing is being replaced, only built upon.
- “Have you ever sat around a camp fire or a fire place? What does it feel like?”

- Learning to be warm, to give light, to be friendly, to yourself and to others.
- Practice guided meditation while feeling friendly towards oneself and others.
- Student Goal: During Meditation, continue to follow breathing, attempt to do so while feeling grounded, still, and warm towards yourself and other. Direct attention in a friendly way when it wanders.
- Teacher Goal: During instruction, the teacher should attempt a two-way trend of compassion, first towards herself or himself, then towards the students. It is very important that the teacher build a foundation of self-compassion first. The teacher's self-compassion may then be reflected as compassion towards her or his students; such compassion might be practiced when students do not understand a concept or when students are not engaging in a task as one would hope.

Week 5 - Cloud watching

CORE Principle: Watch the mind and how it moves. Detach from thoughts without disregarding them.

- Have you ever watched a cloud before?
- What does it do when it moves across the sky? (Changes shape, gets bigger, gets smaller, goes away, maybe another one like it comes back.)
- Thoughts are just like those clouds.
- Practice guided meditation while following one's thoughts.
- Student Goal: Continue to follow breathing, attempt to do so while feeling grounded, still, and warm towards yourself and others. If a thought pops into your head, let yourself look at it like a cloud in the distance; don't get lost in it like a fog. Watch it come, watch it go, with the same grounded, stillness, and warmth you watched your breath with.
- Teacher Goal: Watch one's teaching as one might watch a cloud. How does it move over time? Does it change shape? Is it fluid? How does it change in response to the classroom's atmosphere? These are all questions a teacher may ask.

Week 6 - Review

CORE Principle: Practice, practice, practice.

- Discuss each week's lesson
- Take questions and offer advice