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# Developing Executive Functions through Mindfulness Training in School-Aged Children

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Executive Functions and Mindfulness

Philadelphia College of Osteopathic Medicine

Department of Psychology

DEVELOPING EXECUTIVE FUNCTIONS THROUGH MINDFULNESS TRAINING

IN

SCHOOL-AGED CHILDREN

By Ashley Black Adams

Submitted in Partial Fulfillment of the Requirements of the Degree of

Doctor of Psychology

March 2015

**PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE  
DEPARTMENT OF PSYCHOLOGY**

**Dissertation Approval**

This is to certify that the thesis presented to us by Ashley Adams  
on the 12<sup>th</sup> day of May, 2015, 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.

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**Abstract**

Well-developed executive functions are necessary for successful classroom functioning. Students with executive function deficits can fall behind academically as well as socially and emotionally, relative to their same-aged peers. Effective interventions for developing executive functions within the school environment are essential for addressing this issue. This study examines changes in students' executive functions as a result of their participation in a mindfulness training intervention. Participants included four ten-year-old elementary school boys who took part in a ten-week mindfulness training intervention. The data were generated through pre and post assessments with an executive function teacher rating scale and a Goal-Attainment Scale completed by the participants. Results suggest that all four participants demonstrated self-perceived increases in executive functions as indicated by reaching their self-set goals. Teacher reports indicated an increase in some measured executive function capacities; however, results were not consistent across subjects.

**Keywords:** Executive Functions, Mindfulness, Students

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## **Chapter 1: Introduction**

### **Introduction**

Mindfulness is a topic that is attracting much attention in the field of psychology because of its effectiveness as an intervention strategy for developing a person's cognitive capacities. Mindfulness is currently described as a particular way of paying attention to the present moment, characterized by a receptive and non-judgmental attitude (Kabat-Zinn, 1994). Its roots, which lie in Buddhist philosophy, include practices such as yoga, guided meditation, and progressive muscle relaxation. Neurological processes are implicated in mindfulness training (Chiesa, Serretti & Jakobsen 2013). Results from functional neuro-imaging studies suggest that mindfulness training is associated with 'top-down' emotion regulation in short-term practitioners and 'bottom up' emotion regulation in long-term practitioners. Executive functions reside primarily in the prefrontal cortex or the frontal lobes (Miller & Cummings, 2006), and are therefore implicated in both of these processes. Executive functions are the mechanisms of the brain that are required for a person to process his or her perceptions, emotions, thoughts and actions. They direct various areas of the brain to perform in a purposeful, goal-directed, self-regulated, organized and strategic way (McCloskey, Perkins & Van Divner, 2009). Mindfulness training has been described as an emotion regulation strategy (Brown, Ryan & Creswell, 2007). Mindfulness training is a research-based strategy used for developing neurological processes specifically within the prefrontal cortex and, as a result, is an effective means for developing executive function capacities.

Research has suggested that practicing meditation for extended periods of time or even for short lengths of time can have lasting positive effects on participants' attentional capacities, executive functions, working memory, mood, alertness and levels of anxiety or depression. One benefit of mindfulness training is that it can be an effective intervention that can be delivered in a relatively short period of time. For example, Zeidan, et al. (2010) found that people who practiced mindfulness for only four days improved their moods, verbal fluencies, visual codings and working memories (Zeidan et al., 2010). Another benefit is the positive impact that mindfulness training can have on a person's cognitive capacities. Specifically, research suggests that meditators have more accurate, efficient, and flexible visual attentional processing across diverse tasks as compared with non-meditators (Hodgins & Adair, 2010). Furthermore, a study which investigated the relationship between mindfulness and cognitive flexibility found that meditators scored significantly better on measures of attention and on tasks requiring cognitive flexibility as compared with non-meditators (Moore & Malinowoki, 2009). Finally, mindfulness training can have long lasting results on the cognitive capacities of its practitioners. Research supports the idea that attentional capacities were not only strengthened immediately following meditation practices, but that they also extended to contexts separate from meditation practice over time (Hodgins & Adair, 2010). This suggests that the cognitive capacities strengthened by practicing mindfulness continue to be impacted and strengthened when the person is no longer practicing this meditation.

Mindfulness training is an effective intervention for developing cognitive capacities because it can be practiced for shortened lengths of time; it can also increase multiple cognitive capacities, and it has long-lasting impacts on these capacities.

Executive function capacities are essential for school success. A person can have varied strengths and weaknesses among their executive functions, and these various deficits can result in a myriad of functioning difficulties within the individual. Specifically, executive function capacities are needed for children to be successful in reading, writing and mathematics. Research supports the fact that the development of executive function capacities are positively correlated with increased reading and mathematics performances (Jerma, O., Reynolds, C. & Swanson, L. H., 2012). This suggests that children with strong executive function capacities perform better academically. Furthermore, executive function capacities are essential for emotional regulation. Throughout the school day children are expected to maintain self-regulation skills that allow them to be motivated and ready to learn. Students who have behavioral outbursts typically struggle academically, and because executive function capacities have a negative relationship to emotionally negative/aggressive behaviors, development of executive function capacities is integral for students lacking these skills. Finally, executive function capacities are implicated in a child's ability to bring multiple cognitive capacities online simultaneously. This skill is vital for classroom success because the current Common Core State Standards require children to think abstractly; the goal is to provide children with college readiness skills throughout their school careers. Children need strong executive function capacities to be successful in school because these are essential for academic success, for emotional regulation and for bringing multiple cognitive capacities online simultaneously. Considering the fact that mindfulness training is an emotional regulation strategy that has been shown to improve the development and use of executive functions, it follows that mindfulness training may

have a positive impact on the behavior and academic performances of children with learning and behavior problems.

### **Statement of the Problem**

There is a lack of research on the effects that mindfulness training can have on school-aged children's executive function capacities. Mindfulness meditation was not studied as an intervention for psychological well-being until the late 1970s, as a result of the work of Jon Kabat-Zinn (1982). Kabat-Zinn (1982) used mindfulness training to assist patients dealing with chronic pain. His method is known as Mindfulness-Based Stress Reduction (MBSR). As researchers began to see the benefits of mindfulness training, additional mindfulness-oriented interventions were created; these included Mindfulness-Based Cognitive Therapy (Segal, Williams, & Teasdale, 2002), Dialectical Behavior Therapy (Linehan, 1993) and Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999). Despite the growing research supporting the cognitive benefits that mindfulness training can have on adults, the paucity of scientific studies investigating the benefits that mindfulness training can have on children is surprising.

### **Purpose of the Study**

This study examined the impact of a brief mindfulness-based training program on the classroom functioning and self-perceived goal attainment of four students with learning and behavior problems. It was hypothesized that given the impact that mindfulness training can have on adult's psychological and cognitive well-being, mindfulness training would demonstrate similar benefits for children. Additionally it was

hypothesized that these benefits would carry over to the classroom environment and result in improved classroom functioning.

### **Research Questions**

The specific research questions addressed by this study are:

1. Do student perceptions of progress toward self-selected goals for improved use of executive functions increase during and after the implementation of a 10 week program designed to teach mindfulness practices?
2. Do teacher perceptions of the frequency of occurrence of behaviors indicating the effective use of executive functions reflect an increase in frequency of occurrence after the implementation of a 10 week program designed to teach mindfulness practices?
3. How do changes in student self-ratings compare with changes in teacher ratings?

## **Chapter 2**

### **Review of the Literature**

#### **Introduction**

The review will address the literature on the concepts of executive functions and mindfulness, methods for assessing executive functions and mindfulness, and interventions intended to improve the use of executive functions through the application of mindfulness principles.

#### **Executive Function Capacities**

Executive functions and their role in cognition and cognitive processes is a topic that has gained a great deal of attention in the field of psychology. The definition of executive functions varies greatly in the professional literature. One definition provided by Saltus (2003) refers to executive functions as the “CEO of the brain”. This definition, however, is limited because it suggests that executive functions actually are a unitary trait. Although they can work simultaneously to cue various parts of the brain, it is not appropriate to consider executive functions to be a single entity. Another definition describes executive functions as the ‘S’ factor (Goldberg, 2001). This again suggests that executive functions are a single unit. Furthermore it suggests that a person could have a global executive function deficit, which is not the case; instead, there can be great variability among the multiple executive functions in terms of development, resulting in unique patterns of strengths and weaknesses. For the purposes of this study, executive functions will be defined as the mechanisms of the brain that are required for a person to

process their perceptions, emotions, thoughts and actions. They direct various areas of the brain to perform in a purposeful, goal-directed, self-regulated, organized and strategic manner (McCloskey, Perkins & Van Divner, 2009). Although definitions of executive functions vary, the most comprehensive understanding of executive functions is one that identifies them as multiple capacities within the frontal lobes that cue the processing of perceptions, emotions, thoughts and actions.

Another area of debate in the executive functions literature is the identification of the executive functions themselves. For example, some definitions include Working Memory as an executive function (Dawson & Guare, 2012). Other models argue that working memory is distinctly different from the executive functions used to cue the rest of a neural network within the brain that is used for the efficient use of working memory. Because this paper will be following McCloskey, Perkins and Van Divner's (2009) definition of executive functions, it is also appropriate to include the executive capacities identified by these experts. They identify executive capacities through a Hierarchy Model that places executive functions in tiers based on developmental and neuropsychological indicators (McCloskey, Perkins, and Van Divner, 2009). The tiers include: I. Self-Control: Self Activation, II. Self-Control: Self-Regulation, III. Self-Control, Self-Realization/Self Determination, IV. Self-Generation, and V. Trans-self-Integration. It is indicated that the movement from one tier to another is not contingent on the full development of the neural mechanisms within a tier, but instead it is a fluid progression unique to each individual. An individual can be developing at a higher tier while continuing to develop at a lower tier as well.



In terms of the specific tiers, Self-Activation refers to the person's ability to awaken the executive functions in order to bring them online. Self-Regulation refers to a set of thirty-two executive functions used to direct perceptions, feelings, thoughts and actions throughout each day; they include: Perceive, Focus, Sustain, Energize, Initiate, Inhibit, Stop, Interrupt, Flexible, Shift, Monitor, Modulate, Correct, Balance, Sense Time, Pace, Sequence, Execute Routines, Hold, Manipulate, Store, Retrieve, Anticipate, Gauge, Estimate Time, Analyze, Compare, Generate, Associate, Organize, Plan, and Decide. These executive functions are brought online at various times throughout day to day functioning. Furthermore, more than one function can be activated simultaneously. Self-Realization refers to the individual's ability to be aware of himself/ herself and others, to reflect on the past and to be aware of the various executive capacities he or she is bringing online. Self-Determination refers to the individual's ability to set goals and plan for the future. Self-Generation allows the person to cultivate a philosophy of life as he or she questions his or her existence and purpose. Finally, Trans-Self Integration refers to the individual's ability to experience a unified state of consciousness, or the ability to see beyond the autonomous self (McCloskey, Perkins & Van Divner, 2009). Having a comprehensive understanding of executive capacities and how they are tiered, allows one to understand how developmental variations can occur among individuals.

Executive functions reside primarily in the prefrontal cortex or frontal lobes (Miller & Cummings, 2006). This particular section of the brain is the last part of the brain to mature and continues to develop at least until the age of twenty- five in most typically developing individuals. However, executive functions emerge in a developmental progression and are being used much sooner than the age of twenty- five.

Response Inhibition is argued by some as being the first executive capacity to develop in infancy (Dawson & Guare, 2012). McCloskey posits that rudiments of all 32 self-regulation executive functions emerge within the first year of life. It has been argued that Perceive is the first executive function capacity to develop (McCloskey, Perkins, & Van Divner, 2009), as evidenced by an infant's ability to regulate the visual system. It has been further reasoned that in order for the infant to exert this skill, additional executive function capacities must also be developing, including Focus/Select and Sustain. The rate of development of each specific self-regulation executive function can vary greatly within an individual brain. Additionally, there can be great variation in the rate of development of each executive function from one person to another.

As a result of the variation in the developmental progression of executive functions, a person can have varied strengths and weaknesses among his or her executive function profile. Executive function deficits can result in a myriad of functioning difficulties within the individual. Therefore, people with executive function deficits may present very differently from one to another depending on the specific executive function or functions that are weak.

Additionally, executive functions efficiency can vary across four arenas of involvement that include the intrapersonal, interpersonal, symbol system, and environmental arenas (McCloskey, Perkins, & Van Divner, 2009). Therefore, a person can potentially have well-developed executive functions in one arena, yet simultaneously have an executive function deficit within another arena. This suggests that, depending on the executive function that is maladaptive, a person may present differently from situation to situation. Therefore, it is important to identify specific deficits in functioning

when developing intervention strategies. The more accurate the identification of the executive functions deficit specific to the arena of involvement, the more effective and efficient the intervention strategy can be. This also suggests that intervention strategies targeted at developing some executive functions may not produce changes in functioning within each arena of involvement. As a result, various interventions may need to be put in place in order to provide the person with a comprehensive approach to developing his executive functions. Because executive functions are not a single unit and come on line in various arenas, a person can have deficits in some areas and strengths in others. As a result, it is important to identify specific deficits in order to develop targeted intervention strategies.

As discussed previously, understanding the developmental acquisition of these executive functions and the process by which executive functions are strengthened allows the service provider to identify deficits that a child might have and can lead to the development of a more specific and comprehensive intervention or interventions. Additionally, in recognizing that executive functions can vary, depending on whether they are directing perception, feeling, thought or behavior allows the service provider to better define the deficit. Identifying a deficit in one of these executive functions through an assessment measure would indicate that the child potentially struggles with a behavioral deficit in some capacity. This poses a problem for these individuals because they are expected to perform at a certain level within the school system and, yet, they are incapable of producing work that indicates their abilities. This may result in 'Producing Disabilities' (Denckla, 2007) that do not result from a skill deficit but from an inability by the child to demonstrate what has been learned.

Students with learning disabilities typically demonstrate poor academic performance within the classroom setting. Many of these students have their learning difficulties compounded by the presence of executive functions deficits. Although many of the 32 executive functions may be underdeveloped, the ones most often compromised include: Perceive, Stop, Inhibit, Flexible, Shift, Hold, Anticipate, Plan, Generate, Associate, Pace, Monitor, and Correct (McCloskey, Perkins & Van Divner, 2009).

Perceive refers to a person's ability to cue the use of sensory and perception processes to take information in from the external environment or "inner awareness" in order to tune into perceptions, emotions, thoughts or actions as they are occurring. A deficit in this function would potentially cause the child to misinterpret an environmental or internal cue. Stop is defined as the ability to cue the sudden, immediate discontinuation of perceiving, feeling, thinking or acting. Inhibit cues resistance to urges to perceive, feel, think or act impulsively. This is a deficit commonly seen in children with behavioral disabilities. Flexible cues a recognition of the need to change and Shift cues the transition from one way of perceiving, feeling, thinking, or acting to another, in reaction to what is occurring in the internal or external environments. Hold refers to a person's ability to cue the activation of the necessary cognitive processes required to maintain initially registered information and continues cueing these processes until the information is manipulated, stored or acted on as desired. A deficit in this area would inhibit the child from remembering learned information. Anticipate cues the anticipation of events in the near future, such as the preparing for future classroom assignments and Plan cues the development of a plan to handle these upcoming events. Generate cues the realization that a novel situation is required for a current problem. Children with

executive function deficits in this capacity will have a difficult time reasoning and coming up with solutions to academic problems with which they are presented.

Associate cues the realization that associations need to be made between the current problem situation and past problem situations and cues the resources needed to carry out the required associative problem-solving routines. Underdeveloped problem-solving skills in children will result in a lack of ability to make connections between past events and current events. Pace cues the awareness of, and regulation of, the rate at which perception, emotion, cognition and action are experienced or performed. Monitor cues the activation of appropriate routines for checking the accuracy of perceptions, emotions, thoughts or actions. Finally, correct cues the use of appropriate routines for correcting errors of perception, emotion, thought or action based on feedback from external or internal sources. A deficit in this area inhibits the child from following a previously identified positive routine or response. If the child has a deficit in one or more of these areas, the likelihood of poor academic performance in the classroom is very high.

Executive function deficits can significantly impact classroom performance across all academic areas (Berninger & Richards, 2002). In reading, specifically, the use of well-developed internal executive function cues is essential for reading skills such as decoding, fluency, and comprehension. Some of the executive function capacities necessary in order to be effective at decoding words when reading include Inhibit, Perceive, and Focus/Select (McCloskey, Perkins & Van Divner, 2009). Children with deficits in these areas often present as inconsistent learners who demonstrate the skills one day but not the next. Furthermore, these children inaccurately demonstrate and apply the strategies that they are taught. Children with deficits in the executive function

capacity of Pace typically have a difficult time reading fluently (McCloskey, Perkins & Van Divner, 2009; Berninger & Richards, 2002). This is due to their inability to regulate their reading rates independently; their fluency is often off target and inconsistent. Finally, reading comprehension requires multiple executive function capacities to be cued simultaneously. Classroom performance will be greatly impacted for students with executive function deficits; however, with appropriate and targeted interventions for these deficits, children can become successful.

Another academic area that is impacted by executive function capacity deficits is written expression. As with reading, written expression requires the simultaneous cueing of multiple cognitive processes (Berninger & Richards, 2002; McCloskey, et. al., 2009). To be a successful writer, a student needs to be fluent in handwriting in order to secure the generation of ideas and the sequencing of these ideas into a comprehensive piece. Handwriting at its basic level requires motor skills in order to manipulate the writing utensil appropriately to form legible letters. This skill in itself requires that executive function capacities cue multiple cognitive areas within the brain because motor and visual integration is essential. Idea generation during writing is another skill set that children with deficits in executive function capacities struggle with. Executive function capacities necessary for this skill include Initiate, Gauge, Modulate, Generate, Associate, Plan/Organize, and Retrieve (McCloskey, Perkins & Van Divner, 2009). After children have developed an idea that they would like to write about, they need to be able to sequence the events and put them on paper. This requires that the child activate the Store, Retrieve and Execute cues (McCloskey, Perkins & Van Divner, 2009). Due to the numerous executive function capacities that are necessary to be a successful writer, it is

clear that a deficit in these capacities could inhibit a child from being effective in the classroom.

A final academic area that requires the use of multiple executive function cues is mathematics. Mathematics require a child to have mastery of fine motor skills for writing numbers, the capacity to identify the orthography of the mathematical problems, and to recognize and implement procedural routines proficiently for calculations and problem-solving (Berninger & Richards, 2002; McCloskey, Perkins & Van Divner, 2009). As mentioned previously, handwriting is an essential skill for being successful with mathematics. Additionally, children who misperceive operation signs or have difficulty transposing numbers demonstrate poor Perceive, Inhibit, and Focus/Select cues. In terms of cueing the use of the proper procedures for solving mathematical problems, the executive function capacities necessary for successful written expression are also needed in this area (McCloskey, Perkins & Van Divner, 2009). Therefore, it is likely that a child exhibiting executive function capacity deficits is likely to have difficulty in multiple academic areas in the classroom.

Executive function capacities are essential for school success. A person can have varied strengths and weaknesses among his or her executive functions, and these various deficits can result in a myriad of functioning difficulties within the individual. Specifically, executive functions capacities are needed for children to be successful in reading, writing and mathematics. Research supports the idea that the development of executive function capacities are positively correlated with increased reading and mathematics performance (Jermain, Reynolds & Swanson, 2012). This suggests that children with strong executive function capacities perform better academically.

Furthermore, executive function capacities are essential for emotional regulation. Throughout the school day, children are expected to maintain self-regulation skills that allow them to be motivated and ready to learn. Students who have behavioral outbursts typically struggle academically, and because executive function capacities have a negative relationship to emotionally negative/aggressive behaviors, development of executive function capacities is integral for students lacking these skills. Finally, executive function capacities are implicated in a child's ability to bring multiple cognitive capacities online simultaneously. This skill is vital for classroom success; the current Common Core State Standards require children to think abstractly because the goal is to provide children with college readiness skills throughout their school careers. Children need strong executive function capacities to be successful in school because these are essential for academic success, emotional regulation and for bringing multiple cognitive capacities online simultaneously.

### **Mindfulness**

Mindfulness is a topic that has been gaining attention in the field of psychology because of its effectiveness as an intervention strategy for developing a person's cognitive capacities. Mindfulness is currently described as a particular way of paying attention to the present moment, characterized by a receptive and non-judgmental attitude (Kabat-Zinn, 1994). Its roots lie in Buddhist philosophy and include practices such as yoga, guided meditation, and progressive muscle relaxation. Mindfulness is also described as a mental factor that signifies "presence of mind, attentiveness to the present" (Bodhi, 1993, p. 86); or the mental ability to pay attention to the physical or mental



events that occur in the present moment (Bodhi, 1993). Another description of mindfulness that supplements this relatively constricted description can be found in the Satipatthana Sutta, a text on mindfulness practice with roots in the Buddhist traditions (Thera, 1972). Being mindful has historically referred to an individual's ability to remain in the present moment during each new experience. As one would expect with these definitions, and with the discussion of Trans-Self Generation discussed earlier, executive functions are directly linked to mindfulness practice.

The Satipatthana Sutta outlines four areas of experience in which one can be mindful; these include: body, feeling or sensations, consciousness, and mental objects. Being mindful in these four areas requires unclouded understanding and the ability to recognize and remain in touch with experiences as they arise within these domains (Thera, 1972). Being mindful of our bodies requires one to have a clear understanding of oneself in space. Practicing mindful movements, such as yoga, facilitates this process and clarifies one's understanding because it requires the person to be aware of his or her movements and body positions in space. Being mindful of the body's feelings or sensations is another domain in which one can grow. To be mindful of sensations, one would need to be aware of sounds, sights, smells, touches and tastes as he or she experiences them. This skill can be taught and practiced to make the process less conscious and more automatic. For example, one can practice mindful eating, during which the person will be required to think about and be aware of the tastes and feeling of the food; this would facilitate the skill of being mindful of the body's sense of taste. Consciousness is another domain outlined by the Satipatthana Sutta. Being conscious in itself is not being mindful. An individual can be conscious of his or her surroundings and

know that he or she is there; however, to be mindful of them means to think more deeply about their purposes and how they can impact one's existence. Finally, being mindful of mental objects requires a person to think and analyze thoughts as they arise within the mind. Being mindful is a skill that can be taught through various techniques, requiring practice across different domains.

Many executive function capacities are connected to mindfulness training. More specifically, research has suggested that practicing meditation for extended periods of time and even for shortened lengths of time can have lasting positive effects on participants' attentional capacities, memories, moods, alertness and levels of anxiety or depression. One benefit of mindfulness training is that it can be an effective intervention after practicing for shortened lengths of time. This is supported in a study that reported that people who practiced mindfulness for only four days improved their moods, verbal fluencies, visual coding and working memories (Ziedan, Johnson, Diamond, David & Goolkasian, 2010). Another benefit is the positive impact that mindfulness training can have on a person's cognitive capacities. Specifically, research suggests that meditators have more accurate, efficient, and flexible visual attentional processing across diverse tasks, as compared with non-meditators (Hodgins & Adair, 2010). Furthermore, a study which investigated the relationship between mindfulness and cognitive flexibility found that meditators scored significantly better on measures of attention and tasks requiring cognitive flexibility, as compared with non-meditators (Moore & Malinowoki, 2009). Finally, mindfulness training can have long lasting results on the cognitive capacities of its practitioners. Research supports the fact that attentional capacities were not only strengthened immediately following meditation practices, but they also extended to

contexts separate from meditation practice over time (Hodgins & Adair, 2010). This suggests that the cognitive capacities strengthened by practicing mindfulness continue to be impacted and strengthened when the person is no longer practicing. Mindfulness training is an effective intervention for developing cognitive capacities due to the fact that it can be practiced for shortened lengths of time; it can increase multiple cognitive capacities, and it has long-lasting impacts on these capacities.

Meditators performed significantly better than non-meditators on all tasks of attention, suggesting that mindfulness is linked to improvements of attentional functions. It has also been argued that regaining or increasing attentional control is possible through the practice of mindfulness (Hodgins & Adair, 2010). Executive function capacities such as Focus/Select, Sustain, and Inhibit would be implicated in tasks requiring attention. In order to maintain attention to a task, Focus/Select, it is imperative that the person cue the direction of his or her attention to a specific, identified target and ignore less relevant information because the target is presented to him or her. Additionally, once a target is identified, and the person determines that attention to this target is necessary, the person must sustain the engagement of the processes involved in perceiving, feeling, thinking or acting. Finally, as other stimuli enter into awareness, the person must be capable of cueing the processes that resist urges to perceive, feel, think or act in order to maintain his or her attention to task. Therefore, attentional processes require that multiple executive function capacities be on line simultaneously, and as mentioned previously, mindfulness training can facilitate the development of these capacities.

In addition to developing attentional capacities, mindfulness training also increases cognitive flexibility (Moore & Malinowski, 2009). Cognitive flexibility refers

to a person's ability to selectively alter how he or she conceptualizes information as it is presented (Scott, 1962). Cognitive flexibility, like attention, is imperative in a learning environment. Flexible/Shift, Perceive, and Manipulate would include a few of the executive function capacities necessary for cognitive flexibility. Specifically, Flexible/Shift would be essential for the individual to cue a change in focus or alter perceptions, emotions, thoughts or actions as new information is presented. Additionally, Perceive is required for cognitive flexibility because a person must initially identify the fact that there is sensory information that needs to be processed before thinking can be altered. Finally, the ability to cue cognitive processes in order to manipulate information as it presents itself within the environment is a capacity necessary for altering conceptualizations. As with attentional processes, cognitive flexibility requires multiple executive function capacities to be brought online concurrently. Furthermore, these skills can be strengthened through mindfulness training.

Aside from the behavioral improvements seen with mindfulness training, studies have also reported that parts of the brain are impacted as a result of training. Specifically, it has been argued that gray matter density increases as a result of mindfulness practice (Holzel, et al., 2011). Grey matter processes sensory information and transmits this information to the Central Nervous System in order to facilitate a response. Therefore, increasing grey matter in the brain would result in more efficient processing of information, which would allow for more efficient response patterns. Furthermore, consistent use of these processes would result in strong connections that would further facilitate efficient and automatic processing. The regions of the brain that saw an increase in gray matter concentration as a result of practicing mindfulness included areas

that are implicated in learning, memory, and emotion regulation (Holzel, et al., 2011). As discussed previously, all of these skill sets require the use of multiple executive functions. Additionally, these skills are necessary for academic success, which would suggest that practicing mindfulness would improve classroom performance. These results suggest that neuroplasticity, or a change in the functioning and structure of the brain, can therefore be made through mindfulness practice.

As discussed previously, mindfulness requires both attentional control and open awareness; both of these skills activate specific areas of the brain. One area of the brain that is activated during mindfulness practice includes the dorsolateral prefrontal cortex, which is linked to executive decision making and attention (Baer, 2010). Additionally, mindfulness practice activates the anterior subdivision of the cingulate cortex (Paus, 2001). This region of the brain integrates attention, motivation and motor control, suggesting that activation of this area would develop these processes. The anterior insula is a third region of the brain that is activated during mindfulness practice (Lutz, Slagter, Dunne & Davidson, 2008). This region of the brain is responsible for processing sensations experienced by the body and by attentional capacities. Using mindfulness to strengthen these regions of the brain would support the person's ability to activate these structures efficiently, which would in turn increase executive decision making, attentional processes, the integration of attention, motivation, motor control and the processing of sensations.

Mindfulness training can have long-lasting, beneficial changes on the brain regions discussed previously. Studies have shown that different parts of the brain are activated when a person is learning a novel task, as compared with a time when he or she

is completing a task that has been previously taught (Maguire, Gadian, & Johnsrude, 2000); this suggests that neuroplasticity is possible. Furthermore, changes in the brain as a result of this practice can take effect in a small period of time (Baer, 2010). These changes, therefore, have long-lasting, positive effects on individual functioning and can happen in relatively short periods of time. One of these positive effects includes the slowed degeneration of neural tissue as a result of the aging process. This results in an increased amount of grey matter and better sustained cognitive processes for mindfulness practitioners as they age (Baer, 2010). Practicing mindfulness training results in positive changes to structural components of the brain, resulting in long-lasting beneficial cognitive effects.

### **Mindfulness Training and Children**

Mindfulness meditation was not studied as an intervention for psychological well-being until the late 1970s; this was a result of the work of Jon Kabat-Zinn (1982). Kabat-Zinn (1982) used mindfulness training to assist patients dealing with chronic pain; it was known as Mindfulness-Based Stress Reduction (MBSR). As researchers began to see the benefits of mindfulness training additional mindfulness-oriented interventions were created; these included Mindfulness-Based Cognitive Therapy (Segal, Williams, & Teasdale, 2002), Dialectical Behavior Therapy (Linehan, 1993) and Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999). All of these interventions have been successful in treating patients with mental health deficits. Considering the growing research supporting the cognitive benefits that mindfulness training can have on adults,

the paucity of scientific studies investigating the benefits mindfulness training can have on children is surprising.

Although research is sparse on the effects of mindfulness training on children (Grossman, Niemann, Schmidt & Walach, 2004), a few studies have discussed how this intervention could be beneficial for this population. Research does support the fact that teaching mindfulness to inexperienced individuals, such as children, can result in positive, beneficial effects (Davis & Hayes, 2011). Specifically, Brown, Ryan and Creswell (2007) have identified three benefits to mindfulness practice; these include emotional regulation, behavioral well-being and social interactions. All of these domains are within the scope of educational psychology. Additionally, mindfulness training has been used to treat behaviors such as obsessive compulsive disorder (Patel, Carmody & Simpson, 2007) and substance and alcohol abuse (Witkiewitz, Marlatt & Walker, 2005). These studies suggest that teaching mindfulness allows the person to regain control over his or her impulsive behaviors and become better equipped to self-regulate these maladaptive behaviors. These results would support the notion that mindfulness-based training could support children with behavioral disorders and other academic deficits.

Although the research on mindfulness training on children is limited, some studies on this topic have been done. Semple Lee, Rosa & Miller (2010) have identified a reduction in anxiety of children between the ages of nine and thirteen who participated in mindfulness training. Zylowska (2008) found that mindfulness training had beneficial effects on children who have a diagnosis of Attention Deficit Hyperactivity Disorder. Mindfulness training benefits have also been seen in studies focusing on students with Asperger's Syndrome (Singh et al., 2011). These results support the fact that

mindfulness training can be beneficial for children from a variety of backgrounds; they also suggest that traditional mindfulness practice done with adults needs to be modified for children in terms of the approach and the time allotted to the practice. Additional research needs to be completed to determine the effects mindfulness training can have on children (Burke, 2010).

Other studies that looked at the mindfulness training and children have identified mindfulness training as an effective intervention for various school-based problems. It has been found to be an effective method for helping children to reduce feelings of anxiety (Semple, Reid, & Miller, 2005). Mindfulness training utilizing skills such as breathing, walking and sensory exercises was created to assist students with decreasing feelings of anxiety. Results suggested that the children had a positive reaction to participating in the program and improved in at least one area including: academic functioning, internalizing problems, or externalizing problems. Another study sought to determine whether or not mindfulness training could increase attention (Semple, 2005). This was done through a program called Mindfulness-Based Cognitive Therapy for Children (MBCT-C). The results suggested that participation in the program decreased a student's attention problems. As a result, Mindfulness-Based Cognitive Behavior for Children (MBCT-C) was used to as an intervention for internalizing and externalizing behaviors in children (Lee, Semple, Rosa & Miller, 2008). This intervention was in place for twelve weeks and focused on participants between the ages of nine and twelve. As a result of participation, parents reported reduced internalizing and externalizing problems. Reduced feelings of anxiety and increased levels of attention are essential skills for



effective classroom functioning. Without these skills children are not available to learn, and as a result, may not perform in the classroom at a developmentally appropriate level.

Other studies discovered that mindfulness training was an efficient approach for helping children cope with bullying (McCloy, 2004). In fact, a mindfulness program was developed specifically to assist children who had been victims to bullying (McCloy, 2004). The program used 'mindful thinking' in order to teach students how to take on another person's perspective and to facilitate appropriate reactions in bullying situations. These studies, although not exclusively looking at executive functions, do suggest that the mindfulness training can enhance these cognitive capacities as they teach children self-regulation and self-awareness skills in order to cope with various problems they can encounter within the schools.

Mindfulness training has also been an effective intervention for children who demonstrate aggressive type behaviors (Singh, et al., 2007). Specifically, this study taught children appropriate mindfulness techniques to implement during times that cause them to become aggressive. The results suggested that the children were effectively capable of using the strategies that they were taught which led to a reduction in aggressive behaviors. Furthermore, they were capable of implementing these strategies even after the intervention was no longer being implemented. This suggests that mindfulness training would be an effective intervention for students who struggle with modulating their behavior. Helping them to become more aware of their bodies' reactions to frustration and stress and providing them with skills they can use to decrease these feelings, could be done effectively through mindfulness training. Furthermore, the

underlying skills needed for the children to become practiced at these skills would require the development of executive functions.

One study conducted by Flook et al. (2010) specifically looked at the effects that mindfulness training had on a child's executive function capacities. Mindful awareness practice was a program implemented over eight weeks, in two thirty minute sessions on sixty-four second and third grade students. Students' executive function capacities were rated by parents and teachers before participation in the program and after participation. Results suggested that children's behavioral regulation, meta-cognition and executive control increased as a result of participation in the program, as compared with a control group. This research is a direct support in favor of the benefits of mindfulness training on the development of executive function capacities in children. Furthermore, it provides a framework indicating how such a program should be implemented.

### **Executive Function Capacities and Children**

Intervention strategies aimed at developing executive function capacities depend on a comprehensive approach to targeting the problem. Three key questions have been identified in determining specific executive function deficits (McCloskey, Perkins & Van Divner, 2009). First, it is important to identify whether the deficit that the child is experiencing is due to a lack of use or whether it is a manifestation of brain dysfunction. Children with executive function deficits typically present with 'producing disabilities', discussed previously; these result in an inconsistent demonstration of knowledge. A second question identified is: Are the neural networks associated with the child's specific executive function deficits fixedly damaged, or is the deficit the result of under usage? If

the student is presenting with a deficit in functioning due to a lack of use of these neuronal networks, it is plausible to suggest that proper intervention could strengthen these networks and develop functional capacities. The last question identified by McCloskey, Perkins and Van Divner (2009) is to consider whether the deficit is a manifestation of improper usage of already developed neuronal networks or whether it stems from the underdevelopment of these networks due to a delay in the natural progression of the individual. The answer to this question would help to guide the individual further in developing a targeted intervention strategy; however, a student with deficits due to misuse of neuronal networks would benefit from some behavioral modification strategies; a child with the latter concern would require more lengthy intervention and support.

Another key concept when developing executive functions is the idea that the goal is to assist the child with external control and to develop simultaneously, his or her ability to establish control internally (McCloskey, Perkins, Van Divner, 2009). This would suggest that the interventionist must initially model appropriate external cues to teach the student how to make use, efficiently of his or her executive functions. Using a scaffolded approach to learning, the interventionist could slowly begin to minimize the external cues provided and support the child as this becomes a more independent process. Mindfulness training requires the child to participate in various activities designed to increase focus and awareness. As the child learns this skill within the intervention environment under the guidance of the trainer, it would be appropriate to facilitate the generalized use of these strategies and to foster the independent use of these strategies by the trainee in order to maintain the goal of the intervention as outlined previously.

Although there is limited research on mindfulness and children, there is more research to support the development of executive function capacities in children. One approach to developing executive function capacities, specifically in children with ADHD, is the if-then plan (Gawrilow, Gollwitzer & Oettingen, 2011). This plan requires the child to set goals, using the if-then vocabulary. The study found that children without ADHD made fewer perseverative errors and were therefore better at shifting their attention to various stimuli. Children with ADHD that implemented an if-then plan, as compared with those setting only a goal intention, performed better on tasks requiring executive function capacities. More specifically, children with ADHD increased their working memories and their abilities to inhibit their responses to reactions using the if-then plan. Interventions focused on developing executive functions in children as young as five and six have also found positive results. Cognitive flexibility, working memory and interference control are indicators of school readiness and academic success. Targeted intervention strategies have proved successful in developing these cognitive components (Rothlisberger, Neuenschwander, Cimeli, Michel & Roebbers, 2012). This information supports neuroplasticity and also the fact that executive function capacities can be strengthened through targeted interventions. Interestingly, the approaches to develop executive function capacities are similar to those aiming to teach mindfulness. Therefore, it could be argued that children within this population would benefit from such training in an effort to develop executive functions.

### **Assessments of Mindfulness Awareness**

There are currently three self-report scales designed to measure mindfulness awareness; they include: the State-MAAS (Brown & Ryan, 2003), the Toronto Mindfulness Scale (Lau et al., 2006), and the State Mindfulness Scale (Tanay & Berstien, 2013). The State-MAAS is a five-item scale designed to measure mindful attention and awareness as they are currently experienced within daily life. The State-MAAS items are rated on a 7-point Likert-type scale and refer to a recent, brief period of time (the previous day or hour) or to the present moment. The Toronto Mindfulness Scale includes 13 items, rated on a 5-point Likert-type scale, which represent two separate factors, labeled *Curiosity* and *Decentering*. The SMS or State Mindfulness Scale is based on traditional Buddhist history relative to a conceptual model of mindfulness (Bodhi, 1993). These scales are used in an effort to determine how effective mindfulness training and knowledge of mindfulness is on a variety of concepts as discussed earlier.

### **Assessments of Executive Function**

Executive function assessments have been centered primarily on the Symbol System arena (McCloskey, Perkins & Van Divner, 2009). As a result, identification of generalizable strengths and weaknesses among the child's executive function profile is limited and not always appropriate. Assessments of executive function capacities include: the NEPSY (Korkman, Kirk, & Kemp, 2007), the Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993), the Delis-Kaplan Executive Functions Scale (Delis, Kaplan, & Kramer, 2001), the Rey Complex Figure (Meyers & Meyers, 1995) and the Behavior Rating Inventory of Executive Function (Gioia et al., 2000).

Another limit to these assessments is that the results are not directly related to academic skill development (McCloskey, Perkins, & Van Divner, 2009). This poses a problem for the development of intervention strategies; the results of these evaluations are not necessarily a direct link to student abilities because they are restricted to one arena of executive function. Furthermore, within the school system an intervention focused on developing executive function capacities would not be appropriately measured by these assessments.

A multi-faceted approach to assessing executive functions is necessary in order to develop a comprehensive picture of a child's executive function profile. In order to do this, McCloskey, Perkins and Van Divner (2009) suggest following four questions when assessing this area. The first requires the examiner to identify the executive functions of the child that provide strengths. This allows the examiner to develop intervention strategies that will pull on the skills that are more highly developed in order to facilitate the development of the less established functions. The second question requires the examiner to identify the child's executive function deficits or weaknesses. Identifying these deficits allows the examiner to create targeted interventions for developing these areas. A third question specifically addresses the steps that examiner needs to take in order to develop the less advanced executive function capacities. Once again, the more specific the examiner is in identifying the strengths and weaknesses of the child, the more highly targeted and effective the interventions can be. The final question to ask when assessing executive functions concerns the person or persons who would be responsible for implementing and monitoring the interventions. In order to systematically identify executive function strengths and weaknesses, assessment procedures need to include

these four questions that have been outlined. By following these questions the examiner is able to remain focused on the child's complete executive function profile, allowing for more closely targeted and efficient intervention strategies.

When assessing executive functions it is also important for the examiner to keep in mind the arenas of involvement, as well as the domains of functioning in which they are assessing the child (McCloskey, Perkins & Van Divner, 2009). Therefore, a multi-faceted approach that includes multiple methods of assessment is essential. These methods can either directly or indirectly engage the executive functions being assessed through formal and informal assessment processes. Indirect informal methods include interviews with parents and teachers and a review of student records. These methods allow the examiner to get a comprehensive picture of the child's full executive functions. Indirect formal methods include behavior rating scales that can be completed by the parent, teacher or child. The Behavior Rating Inventory of Executive Functions (Gioia, et al., 2000) is an example of such a behavior scale. Direct, informal measures of assessment include an interview with the child, behavioral observations, process-oriented interpretations of standardized assessments and work samples. These approaches allow the examiner to have direct contact and interactions with the child, which is important for hypothesis development. Finally, direct, formal methods include standardized methods of assessment that compare a child's performance on the assessment battery with that of his same aged peers. There are multiple examples of these assessments, which were discussed previously; these include: the NEPSY (Korkman, Kirk, & Kemp, 2007), the Wisconsin Card Sorting Test (Heaton et al., 1993), and the Delis-Kaplan Executive Functions Scale (Delis, Kaplan, & Kramer, 2001). When assessing executive functions,

the most comprehensive approach to take would be one that employs a multi-faceted approach enlisting various methods.

### **Current Mindfulness Curriculums**

Although research is limited in terms of the benefits of mindfulness training on children, there are curricula designed to teach mindfulness to school-aged children. The Hawn Foundation & Scholastic created the MindUp Curriculum which is a classroom based curriculum focused on developing mindfulness in students and their teachers. The program teaches children about brain functioning and incorporates mindfulness skills into the school day. This program consists of fifteen lessons designed to increase awareness, strengthen cognitive skills and promote social-emotional well-being. Teachers are provided with interactive lessons, as well as information on brain-based research delineating the structural implications on the brain for the activities suggested. This program highlights the ‘Core Practice’, or deep belly breathing, which educators are encouraged to incorporate throughout the school day to assist children in re-centering themselves. This strategy is only one that is suggested requiring focused, sustained attention and practice. The program teaches students about concepts such as neuroplasticity and encourages students to think of the brain as a muscle that can become stronger as with other muscles in the body-through exercise and practice. This program inspires educators to incorporate mindfulness training in the school through Tier One, or whole group, instruction.



**Summary**

Mindfulness based training is an effective means for facilitating cognitive structural changes. Specifically, mindfulness training has impacted grey matter development (Holzel, et al., 2011) and has increased cognitive flexibility (Moore & Malinowski, 2009); it also engages the dorsolateral prefrontal cortex, which is linked to executive decision making and attention (Baer, 2010), and activates the anterior subdivision of the cingulate cortex (Paus, 2001), which is a region of the brain that integrates attention, motivation and motor control. All of these findings suggest that mindfulness can lead to neuroplasticity and therefore create long-term positive changes in brain structure and functioning. Furthermore, because these areas of the brain are also related to executive functions, it is likely that the activation of these brain regions through mindfulness training will result in the development of these functions. Because executive functions are essential for academic success, an intervention using mindfulness training could arguably increase a student's academic performance as well. A mindfulness based program can increase executive functions because it targets multiple circuits in the brain that house these functions. Furthermore, this type of intervention can lead to academic success as a result of increased executive functions.

The development of a mindfulness-based curriculum that can be implemented in the schools for a targeted population as an intervention for developing executive function capacities would be beneficial. As discussed previously, mindfulness training can have positive results in a relatively short period of time. The rigor of the curriculum requires teachers to move at a fast pace, covering a lot of material in a short period of time. For this reason, it is not acceptable to remove children from their classrooms for extended

amounts of time for interventions because they miss too much valuable instruction time. Therefore, a program designed to offer meaningful and effective intervention that can be implemented in a short amount of time would be essential for the schools. Additionally, mindfulness interventions have proved to have long-lasting results, making this type of intervention phenomenal for the school setting. Children can be provided with short-term targeted intervention strategies that will improve their cognitive functioning for a long period of time. Finally, mindfulness based instruction targeted at improving executive functions can result in increased academic success. As discussed previously, executive function capacities are essential for academic skills such as reading, writing and mathematics. Therefore, increasing executive function capacities in school-aged children would support them academically within the classroom. A mindfulness-based intervention program targeted at developing executive function capacities is perfect for the school setting because the program can be offered in brief amounts of time, have long-lasting cognitive benefits and improve classroom functioning.

## **Chapter 3**

### **Methods**

This study will examine the pre and post data collected during the implementation of a mindfulness program for young children. The research design of this study employed a single case study design with multiple participants.

#### **Source of Data**

The source of data was shelf data from a group intervention conducted at a public elementary school located in central New Jersey. The intervention included four students. The data gathered for each student were analyzed for this study. For the purposes of this study, the data that had been collected during the mindfulness program intervention were obtained from school records during the 2013-2014 school year.

#### **Data**

The data used for this study included teacher ratings from a pre and post intervention program concerning the frequency of behaviors indicative of executive functions use. The rating scale was developed specifically for use with the mindfulness program intervention. The rating scale was completed by each student's classroom teacher both pre-intervention and post-intervention. Additionally, each student completed self-ratings three times throughout the intervention to self-monitor their perceived progress towards the expectations they had set for themselves at the onset of the intervention.

### **Characteristics of the Students Who Completed the Training Program**

The students that participated in the mindfulness study were four males between the ages of ten and eleven who were attending an elementary school in a suburban school district in central New Jersey. All four students were recruited from the three fifth grade classes within this school. In order to identify the target population (which composed the intervention group), the fifth grade teachers rated all of the students within their classrooms, using a screening rating scale.

### **Mindfulness Program Used to Produce the Archived Data**

The *Developing Executive Function Capacities through Mindfulness Training Curriculum* (Appendix A) is composed of twenty sessions implemented over the course of ten weeks. The program integrates psychoeducational and cognitive behavioral strategies throughout its implementation. The sessions were highly structured and designed to build upon previously learned concepts and strategies. The environment was controlled and consistently set for each session. This included bean bag chairs for students to sit in during discussions and meditations, a lavender scent sprayed in the room prior to the sessions and dimmed lights. These strategies enhanced relaxation (Koulivand, Ghadiri & Gorji, 2013; Davis, 2015). The structure of the sessions included a beginning breathing exercise called ‘Take Five’, during which the students sat quietly in their designated bean bag chairs. For ‘Take Five’, the students followed the facilitator’s lead with a three count in-take breath followed by a five count exhale. This was done five times. Following the breathing exercise, students participated in a five

minute mindful movement exercise, consisting of various yoga movements. Participants were then led in a five minute guided meditation exercise. These exercises were followed up with a discussion about the various parts of the brain that were implicated in the exercises that the students had just completed. Most of these discussions were adapted from the MindUp Curriculum. These discussions often built upon information that was discussed from previous sessions. Following the discussion, the students engaged in an activity that was designed to facilitate the participants' understanding of the concepts that were being discussed in that session. Participants then engaged in an interactive activity in which the group added the 'tools' or techniques learned, to their mindfulness toolbox posted on the wall as a visual reminder of the strategies they had learned. Finally, the group closed with 'Take Five'. The format of the group follows:

#### SCHEDULE:

- 10 Weeks
- 20 Sessions
- 30 minutes/session
- Weekly individual 'check-ins' to assess progress-discuss journals and goals

#### STRUCTURE

- Begin with breathing/centering exercise (2 minutes)
- Mindful Movements (5 minutes)
- Guided Meditations
- Brain Talk-Adapted from MindUp Curriculum (10 minutes)
- Mindful Activity (10 minutes)
- Add to our Brain Training Poster (2 Minutes)
- Close with breathing/centering exercise (2 minutes)

Session	Goal
<b>Day 1</b>	Introduce the Program-Explain what the group is about-helping students control their minds and bodies through awareness. We are going to learn ways to exercise our brains-the more we exercise it the stronger, smarter and more confident it will become (create a poster on which we can write down strategies as we learn them; they will help us to exercise our brains).
<b>Day 2</b>	Help Children identify three key parts of the brain involved in thinking and learning.
<b>Day 3</b>	Discuss Mindful verses Un-Mindful Thoughts and Actions.
<b>Day 4</b>	Discuss Mindful verses Un-Mindful Thoughts and Actions.
<b>Day 5</b>	Teach students that our emotions shape our behavior and learning.
<b>Day 6</b>	Teach students the MindUP Core Practice-breathing exercise to cue our brains to relax and focus-I can take control of myself.
<b>Day 7</b>	Students learn how to train their attention to the most pertinent information in the room.
<b>Day 8</b>	Teach students the MindUP Core Practice-breathing exercise to cue our brains to relax and focus-I can take control of myself.
<b>Day 9</b>	Teach students how to increase dopamine levels in their brains.
<b>Day 10</b>	Teach students that our emotions shape our behavior and learning.
<b>Day 11</b>	Teach students self-regulation skills through breathing.
<b>Day 12</b>	Help children to think positively-Practice makes Permanent.
<b>Day 13</b>	Help students to use happy memories to increase optimistic thinking.
<b>Day 14</b>	Help students to be thankful.
<b>Day 15</b>	Help students to identify how important being kind is.
<b>Day 16</b>	Help students to identify how important being kind is.
<b>Day 17</b>	Teach students self-regulation skills through breathing.
<b>Day 18</b>	Help students to develop targeted EF capacity. Create/Implement Act of Kindness for school.
<b>Day 19</b>	Help students to develop targeted EF capacity. Create/Implement Act of Kindness for school.
<b>Day 20</b>	Closing Exercises

Four students were identified as participants in the program after being randomly selected from this pool of participants. Upon selection to participate in the program, a consent form, informing parents of the intentions of the program was sent home. After consent was received, the teachers completed the executive function rating scale for all four students participating in the study. Additionally, at the conclusion of the introductory session the students identified three goals that they were hoping to reach by the conclusion of the program. The students in the intervention group then participated in a ten-week mindfulness program in which they were introduced to and practiced different exercises including yoga, progressive muscle relaxation, education on brain anatomy, and guided meditation. The program consisted of twenty sessions that lasted for thirty minutes for each session.

After the study concluded (ten weeks after initial rating scale completion), the executive function rating scale was disseminated to the classroom teacher to complete. The pre- and post-intervention rating scales were scored, and the data were placed in an excel file for access at a later time.

### **Measures Used in the Mindfulness Program Study**

After the students were selected for participation in the program, and consent was received from the students' parents, the teachers completed a pre-intervention rating scale for each participant. The pre-intervention rating scale was a 10-item measure designed to assess teachers' perceptions of the frequency of occurrence of behaviors indicative of the students' use of executive function capacities in the classroom environment.

Specifically, the targeted executive functions included: Focus Attention, Sustain

Attention, Initiate, Pause and Continue, Modulate, Monitor, Gauge and Analyze.

Question wording is shown in the following table:

	1	2	3	4	5
Is actively engaged in task.					
Follows multi-step directions.					
Completes class assignments.					
Maintains a level of attention to task that enables proper participation/completion of task.					
Is able to work through minor distractions.					
Thinks before he/she says something or acts.					
Generates multiple solutions to problems.					
Can adapt to new situations.					
Is a self-starter.					
Thinks flexibly-can move from one topic to another.					

Each item was rated using the following Likert-type scale: 0-Unable to do this on his own; 1-Can do with direct assistance; 2-Can do only with prompting; 3-Seldom does without a prompt; 4-Frequently does it without a prompt; 5-Always does this independently.

Additionally, at the end of session 1, each student identified the three executive function goals that he wanted to reach by the culmination of the program after having been introduced to the purpose and goals of the program. Each student rated his self-perceived progress towards these goals after one month of intervention, two months of intervention and post intervention. Students rated themselves on a 5-point Likert scale ranging from -2 (much less than expected outcome) to 2 (Much greater than expected outcome) on each of the three goals. After the students rated themselves, they had the opportunity to check-in with the facilitator to discuss their progress.



**Statistical Analyses to be conducted with the Mindfulness Program Data**

The pre-intervention and post-intervention teacher ratings were tabled for each student and inspected visually to assess the degree of change in teacher perceptions about the frequency of behaviors indicative of the use of specific executive functions.

The students' self-ratings of progress toward their self-established goals were tabled for each student and inspected visually to assess students' perceptions of whether or not they were making progress toward their personal executive function goals.

## Chapter 4

### Results

#### Overview

This chapter presents the results of the data analyses intended to answer the research questions regarding the effectiveness of the intervention program. The primary outcomes were the student self-ratings of attainment of their personal executive function goals and the teacher ratings on the executive functions rating scale. Two participants were present for all twenty sessions; one participant was present for eighteen of the sessions, and one participant was present for seventeen of the sessions. One of the four participants was diagnosed with a brain tumor after the curriculum was completed.

*Research Question 1: Do student perceptions of progress toward self-selected goals for improved use of executive functions increase during and after the implementation of a 10 week program designed to teach mindfulness practices?*

### Donny's Self-Rating Results

Table 4.1 shows the self-rating scores provided by Donny throughout the intervention.

Table 4.1

Donny's Intervention and Post-Intervention Scores on the Self-Rating Scale

Goal	One Month of Intervention	Two Months of Intervention	Post Intervention
1	-1	0	2
2	-1	0	1
3	-1	1	0

Based on self-report responses, Donny had reportedly made progress towards reaching his first goal of 'focus better' one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as reaching his first goal. At the completion of the program Donny reportedly far exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Donny made progress towards reaching his second goal of 'control emotion' one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as reaching his second goal. At the completion of the program Donny reportedly exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Donny reportedly made progress towards his third goal of 'better at schoolwork and homework' one month into the

program. His response after two months of participation in the program reflects the fact that he had perceived himself as exceeding his expectations for reaching his third goal. At the completion of the program Donny reportedly met his expectations in terms of reaching his goal; this was a slight decrease from his previous report in which he had exceeded his goal.

### **Ronald's GAS Results**

Table 4.2 shows the GAS self-report scores provided by Ronald throughout the intervention.

Table 4.2

Ronald's Intervention and Post-Intervention Scores on the Goal Attainment Scale

Goal	One Month of	Two Months of	
	Intervention	Intervention	Pot Intervention
1	-2	1	2
2	-2	1	2
3	-1	1	2

Based on self-report responses to the GAS, Ronald reportedly had made no progress towards his first goal of 'to not have as much fear' one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as having exceeded the criteria for meeting his first goal. At the completion of the program Ronald reportedly far exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Ronald reportedly was much further away than expected from reaching his second goal of ‘I want to stay on task more’ one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as exceeding the expectations he had set for meeting his second goal. At the completion of the program Ronald reportedly exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Ronald reportedly made progress towards reaching his third goal of ‘to think more easily’ one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as exceeding his expectations for reaching his third goal. At the completion of the program Ronald reportedly met his expectations in terms of reaching his goal.

### **Sam’s GAS Results**

Table 4.3 shows the GAS self-report scores provided by Sam throughout the intervention.

Table 4.3

Sam’s Intervention and Post-Intervention Scores on the Goal Attainment Scale

Goal	One Month of	Two Months of	
	Intervention	Intervention	Pot Intervention
1	-1.5	0	0.5
2	-1	0	0
3	0	0.5	0.5

Based on self-report responses to the GAS, Sam reportedly made some progress towards reaching his first goal of ‘to focus better’ one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as meeting the criteria for meeting his first goal. At the completion of the program Sam reportedly slightly exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Sam reportedly made progress towards reaching his second goal of ‘to control my feelings better’ one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as meeting the expectations he had set for meeting his second goal. At the completion of the program Sam reportedly continued to meet his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Sam reportedly met the criteria for his third goal of ‘to calm my mind better’ one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as slightly exceeding his expectations for reaching his third goal. At the completion of the program Sam continued to slightly exceed the criteria he had set for reaching his goal.

### **Charles’s GAS Results**

Table 4.4 shows the GAS self-report scores provided by Charles throughout the intervention.

Table 4.4

Charles's Intervention and Post-Intervention Scores on the Goal Attainment Scale

Goal	One Month of	Two Months of	
	Intervention	Intervention	Pot Intervention
1	0	1	2
2	0	1	1
3	0	2	2

Based on self-report responses to the GAS, Charles reportedly met the criteria for reaching his first goal of 'increase my ability to focus' one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as slightly exceeding the criteria for meeting his first goal. At the completion of the program Charles continued to report that he slightly exceeded his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Charles reportedly also met his second goal of 'be able to calm down/relax when upset' one month into the program. His response after two months of participation in the program reflects the fact that he had perceived himself as slightly exceeding the expectations he had set for meeting his second goal. At the completion of the program Charles reportedly continued to slightly exceed his expectations in terms of reaching his goal.

Based on self-report responses to the GAS, Charles reportedly met the criteria for reaching his third goal of 'do better on schoolwork' one month into the program. His response after two months of participation in the program reflects the fact that he had

perceived himself as far exceeding his expectations for reaching his third goal. At the completion of the program Charles continued to far exceed the criteria he had set for reaching his goal.

*Research Question 2: Do teacher perceptions of the frequency of occurrence of behaviors indicating the effective use of executive functions reflect an increase in frequency of occurrence after the implementation of a 10 week program designed to teach mindfulness practices?*

### **Donny's Teacher Rating Scale Results**

Table 4.5 shows the Pre-Intervention and Post-Intervention Executive Function Rating scales provided by the participants' classroom teachers.

Table 4.5

Donny's Pre- and Post-Intervention Scores on the Teacher Rating Scale

Item	Pre-Intervention	Post-Intervention
Focuses attention on school tasks	1	3
Focuses attention on own actions	1	1
Sustains attention for school tasks completion	1	1
Starts school work	2	3
Controls emotional reactions well in frustrating situations	1	1
Pauses to listen to what others say during conversations	1	3
Avoids being over/under stimulated by sights, sounds, touches	1	3



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Checks school work to avoid careless errors on tests/work	2	2
Figures out what it takes to keep control in difficult situations	1	1
Examines and analyzes in more detail thoughts and feelings he has about himself or things he has done	1	1

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\*0-Unable to do this on his own; 1-Can do with direct assistance; 2-Can do only with prompting; 3-Seldom does without a prompt; 4-Frequently does it without a prompt; 5-Always does independently

Donny's general education classroom teacher completed the teacher rating scale. Teacher responses to the pre and post rating scales indicated that Donny's teacher's perceptions changed in a positive direction for 4 of the 10 items. On the following three items, Focuses Attention on School Tasks, Pauses to Listen to What Others Say During Conversations and Avoids Being Over/Under Stimulated by Sights, Sounds, Touches, teacher perceptions changed from a 1, 'only does with direct assistance, requires much more than a simple prompt', prior to the intervention, to a 3, 'Seldom does on his own without being prompted, reminded, cued to do so, after he completed the program. For the item, Starts School Work, teacher perceptions changed from a 2, 'does only after being prompted, reminded or cued to do it' to a 3, 'Seldom does on his own without being prompted, reminded, cued to do so'. This level of change suggests that Donny's teacher's perceptions have changed significantly. Prior to the intervention, she perceived that Donny was demonstrating skill deficits reflecting an inability to engage in the desired behaviors reflective of the use of executive skills. In contrast, the teacher's post-intervention ratings indicated that she now perceived Donny to be capable of performing the behaviors (thereby having the executive skills that would enable him to perform

them), but not able to cue himself effectively when to use these executive skills. These ratings thereby reflect a deficit in the use of executive functions to cue the engagement of executive skills in order to exhibit the desired behavior. Donny's teacher now perceives that she usually must provide him with the executive function prompt, but after she does, he is able to engage the executive skills needed to demonstrate the desired behavior.

Thus she perceives Donny as having moved from exhibiting an executive skill deficit to an executive function deficit, which does represent a significant positive change despite the fact that Donny continues to exhibit difficulties with self-managing these behaviors. Teacher perceptions did not change for the other 6 behaviors assessed with the rating scale. For these behaviors, Donny's teacher continues to perceive him as being unable to perform them even when provided with direct assistance.

### **Ronald's Teacher Rating Scale Results**

Table 4.6 shows the Pre-Intervention and Post-Intervention Executive Function Rating scales provided by participant's classroom teachers.

Table 4.6

#### Ronald's Pre- and Post-Intervention Scores on the Teacher Rating Scale

Question	Pre-Intervention	Post-Intervention
Focuses attention on school tasks	0	1
Focuses attention on own actions	5	4
Sustains attention for school tasks completion	0	4
Starts school work	0	4
Controls emotional reactions well in frustrating situations	5	4

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Pauses to listen to what others say during conversations	5	4
Avoids being over/under stimulated by sights, sounds, touches	4	1
Checks school work to avoid careless errors on tests/work	0	0
Figures out what it takes to keep control in difficult situations	5	4
Examines and analyzes in more detail thoughts and feelings he has about himself or things he has done	0	0

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\*0-Unable to do this on his own; 1-Can do with direct assistance; 2-Can do only with prompting; 3-Seldom does without a prompt; 4-Frequently does it without a prompt; 5-Always does independently

Ronald's general education classroom teacher responses to the pre and post rating scales indicated that his teacher's perceptions changed in a positive direction for 3 of the 10 items. On the following two items, Sustains Attention for School Tasks Completion, and Starts School Work, teacher perceptions changed from a 0, 'unable to do this, even when direct assistance is provided', prior to the intervention, to a 4, 'frequently does this on own without prompting', after he completed the program. For the item, Focused Attention on School Tasks, teacher perceptions changed from a 0, 'unable to do this, even when direct assistance is provided' to a 1, 'only does with direct assistance, requires much more than simple prompt'. This level of change suggests that Ronald's teacher's perceptions have changed significantly. Prior to the intervention, she perceived that Ronald was demonstrating skill deficits reflecting an inability to engage in the desired

behaviors reflective of the use of executive skills. In contrast, the teacher's post-intervention ratings indicated that she now perceived Ronald to be capable of performing the behaviors (thereby having the executive skills that would enable him to perform them), and to effectively cue himself when to use these executive skills. These ratings thereby reflect a skill acquisition in the use of executive functions to cue the engagement of executive skills in order to exhibit the desired behavior. Ronald's teacher now perceives that she rarely must provide him the executive function prompt because he is able to engage the executive skills needed to demonstrate the desired behavior. Thus, she perceives Ronald as having moved from exhibiting an executive skill deficit and an executive function deficit to being independent with these skills, which does represent a significant positive change. Teacher perceptions did not change for 2 behaviors assessed with the rating scale. For these behaviors, Ronald's teacher continues to perceive him as being unable to perform them even when provided with direct assistance. Ronald's teacher perceived him as declining on 5 of the items: Focuses Attention on Own Actions, Controls Emotional Reactions Well in Frustrating Situations, Pauses to Listen to What Others Say during Conversations, and Figures out what it takes to Keep Control in Difficult Situations. Although his teacher perceived him as declining in these areas, her ratings changed from 'always or almost always does this on his own, does not need to be prompted to do it' to 'frequently does this on his own without prompting'. This does not suggest that Ronald exhibited an executive function deficit as a result of his participation in the program, because he perceived him as frequently engaging the executive skills needed to demonstrate the desired behavior. Ronald's teacher did perceive him as demonstrating an executive function deficit on the item 'Avoids being Over/Under

Stimulated by Sights, Sounds, Touches’, because her rating pre-intervention suggested that he frequently could do this on his own without prompting, and post-intervention she felt that he could do this only with direct assistance and required much more than a simple prompt.

### **Sam’s Teacher Rating Scale Results**

Table 4.7 shows the Pre-Intervention and Post-Intervention Executive Function Rating scales provided by the participant’s classroom teachers.

Table 4.7

#### Sam’s Pre- and Post-Intervention Scores on the Teacher Rating Scale

Question	Pre-Intervention	Post-Intervention
Focuses attention on school tasks	2	1
Focuses attention on own actions	1	2
Sustains attention for school tasks completion	2	2
Starts school work	2	2
Controls emotional reactions well in frustrating situations	1	2
Pauses to listen to what others say during conversations	2	2
Avoids being over/under stimulated by sights, sounds, touches	3	3
Checks school work to avoid careless errors on tests/work	2	1

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Figures out what it takes to keep control in difficult situations	2	2
Examines and analyzes in more detail thoughts and feelings he has about himself or things he has done	1	1

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\*0-Unable to do this on his own; 1-Can do with direct assistance; 2-Can do only with prompting; 3-Seldom does without a prompt; 4-Frequently does it without a prompt; 5-Always does independently

Sam's general education classroom teacher completed the teacher rating scale. Teacher responses to the pre and post rating scales indicated that Sam's teacher's perceptions changed in a positive direction for 2 of the 10 items. On the following two items, Focuses Attention on Own Actions, and Controls Emotional Reactions Well in Frustrating Situations, teacher perceptions changed from a 1, 'only does with direct assistance, requires much more than a simple prompt', prior to the intervention, to a 2, 'Does this only after being prompted, reminded, cued to do it'. This level of change suggests that Sam's teacher's perceptions have changed significantly. Prior to the intervention, she perceived that Sam was demonstrating skill deficits reflecting an inability to engage in the desired behaviors reflective of the use of executive skills. In contrast, the teacher's post-intervention ratings indicated that she now perceived Sam to be capable of performing the behaviors (thereby having the executive skills that would enable him to perform them), but not able to effectively cue himself when to use these executive skills. These ratings thereby reflect a deficit in the use of executive functions to cue the engagement of executive skills in order to exhibit the desired behavior. Sam's teacher now perceives that she usually must provide him with the executive function

prompt, but after she does this, he is able to engage the executive skills needed to demonstrate the desired behavior. Thus, she perceives Sam as having moved from exhibiting an executive skill deficit to an executive function deficit, which does represent a significant positive change despite the fact that Sam continues to exhibit difficulties with self-managing these behaviors. Teacher perceptions did not change for 6 behaviors assessed with the rating scale. For these behaviors, Sam's teacher continued to perceive him as being unable to perform them even when provided with direct assistance. For 2 of the items, Focuses Attention on School Tasks and Checks School Work to Avoid Careless Errors on Tests/Work, Sam's teacher perceived him as decreasing in his skills. Specifically, she saw him prior to the intervention being able to do these skills only after being prompted, reminded or cued to do it, to post intervention doing the skill only with direct assistance and requiring more than a simple prompt.

### **Charles' Teacher Rating Scale Results**

Table 4.8 shows the Pre-Intervention and Post-Intervention Executive Function Rating scales provided by the participant's classroom teachers.

Table 4.8

#### Charles' Pre- and Post-Intervention Scores on the Teacher Rating Scale

Question	Pre-Intervention	Post-Intervention
Focuses attention on school tasks	3	1
Focuses attention on own actions	4	3
Sustains attention for school tasks completion	3	1
Starts school work	1	1
Controls emotional reactions well in frustrating	5	5

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situations		
Pauses to listen to what others say during conversations	5	5
Avoids being over/under stimulated by sights, sounds, touches	3	1
Checks school work to avoid careless errors on tests/work	1	0
Figures out what it takes to keep control in difficult situations	5	4
Examines and analyzes in more detail, thoughts and feelings he has about himself or things he has done	1	0

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\*0-Unable to do this on his own; 1-Can do with direct assistance; 2-Can do only with prompting; 3-Seldom does without a prompt; 4-Frequently does it without a prompt; 5-Always does independently

Charles' general education classroom teacher completed the teacher rating scale. Teacher responses to the pre and post rating scales indicated that Charles's teacher's perceptions changed in a negative direction for 7 of the 10 items and remained the same on 3 of the 10 items. It is important to note that Charles was diagnosed with a brain tumor shortly after the intervention was completed. Charles's teacher perceived him as losing his executive skills during this intervention.

*Research Question 3: How do changes in student self-ratings compare with changes in teacher ratings?*



### Donny's Rating Scales Comparison

Table 4.9 shows Donny's self-selected goals and his rating changes for these goals, along with his teacher's pre/post ratings for these three goals.

Table 4.9

Comparison of Donny's Pre and Post Intervention Self and Teacher Rating Scores

Student Selected Behavior Goals	Pre-to-Post Self-Ratings	Rating Scale Item	Teacher Pre-to-Post Ratings
Focus Attention	-1 to +2	Item 1	1 to 3
		Item 2	1 to 1
		Item 3	1 to 1
Control Emotions Better	-1 to +1	Item 5	1 to 1
		Item 9	1 to 1
Better at Schoolwork and Homework	-1 to 0	Item 4	2 to 3
		Item 8	2 to 2
Behaviors Not Selected by the Student		Item 6	1 to 3
		Item 7	1 to 3
		Item 10	1 to 1

Donny and his general education classroom teacher completed rating scales.

Their responses to the pre and post rating scales indicated that Donny's and his teacher's perceptions changed in a positive direction for his first goal of 'Focus Attention'.

Specifically, his teacher perceived him as acquiring the executive skill necessary to focus his attention on school tasks. However, she felt he continued to need the external cue to

engage these skills. Although she perceived him as focusing his attention on school tasks better, she did not feel that he could focus his attention on his own actions or sustain his attention to task until its completion any better than he could prior to the intervention. This would suggest that Donny's teacher found that he developed his executive skill of focus within the symbol system arena of involvement; however, she did not see an improvement within the intrapersonal arena of involvement. Additionally, she did not see an improvement in his use of the sustain executive function. Donny perceived himself as far exceeding his expectations in this area. For Donny's second goal, 'Controls Emotions Better', Donny perceived himself as improving; however, his teacher did not see Donny as gaining this skill. Finally, for Donny's third goal, 'Better at School Work and Homework', Donny and his teacher both perceived him as improving. Donny's teacher saw an improvement in his use of the initiate executive function, because she felt he improved in his ability to start his school work. She did not perceive him as improving in his ability to monitor because she felt that he continued to make careless errors on tests/work as he had done prior to the intervention.

### **Ronald's Rating Scales Comparison**

Table 4.10 shows Ronald's self-selected goals and his rating changes for these goals, along with his teacher's pre/post ratings for these three goals.

Table 4.10

Comparison of Ronald's Pre and Post Intervention Self and Teacher Rating Scores

Student Selected Behavior Goals	Pre-to-Post Self-Ratings	Rating Scale Item	Teacher Pre-to-Post Ratings
To Not Have As Much Fear	-2 to +2	Item 7	4 to 1
		Item 9	5 to 4
		Item 10	0 to 0
I Want To Stay On Task More	-2 to +1	Item 1	0 to 1
		Item 3	0 to 4
		Item 8	0 to 0
To Think More Easily	-1 to 2	Item 2	5 to 4
		Item 5	5 to 4
Behaviors Not Selected by the Student		Item 4	0 to 4
		Item 6	5 to 4

Ronald and his general education classroom teacher completed rating scales. Their responses to the pre and post rating scales indicated that Ronald's and his teacher's perceptions were contradicting for his first goal of 'To Have Less Fear'. Specifically, his teacher perceived him as being less able to use the executive functions necessary to regulate his emotions, because she felt he needed an increased number of external cues to engage these skills. In contrast, Ronald perceived himself as far exceeding his expectations in this area. For Ronald's second goal, 'I Want to Stay on Task more', Ronald and his teacher perceived him as improving. His teacher reported that he was

able to sustain his attention on school tasks and was able to maintain his attention until the task was completed. Finally, for Ronald's third goal, 'To Think More Easily', Ronald perceived himself as improving; however, his teacher perceived him as decreasing slightly because she felt he needed rare prompting to cue this skill. His teacher also perceived him as having this skill prior to the intervention; however, Ronald did not.

### **Sam's Rating Scales Comparison**

Table 4.11 shows Sam's self-selected goals and his rating changes for these goals, along with his teacher's pre/post ratings for these three goals.

Table 4.11

Comparison of Sam's Pre and Post Intervention Self and Teacher Rating Scores

Student Selected Behavior Goals	Pre-to-Post Self-Ratings	Rating Scale Item	Teacher Pre-to-Post Ratings
To Focus Better	-1.5 to +0.5	Item 1 Item 2 Item 3	2 to 1 1 to 2 2 to 1
To Control My Feelings Better	-1 to 0	Item 5 Item 9	1 to 2 2 to 2
To Calm My Mind Better	0 to 0.5	Item 6 Item 7 Item 10	2 to 2 3 to 3 1 to 1
Behaviors Not Selected by the Student		Item 4 Item 8	2 to 2 2 to 1

Sam and his general education classroom teacher completed rating scales. Their responses to the pre and post rating scales indicated that Sam's perceptions changed in a positive direction for his first goal of 'To Focus Better'; however, his teacher's perceptions varied from improving to slightly declining. Specifically, his teacher perceived him as acquiring the executive function skill necessary to focus his attention on his own actions. However, she felt he continued to need the external cue to engage these skills. Although she perceived him as focusing his attention on his own actions better, she did not feel that he could focus his attention on school tasks any better. This would suggest that Sam's teacher found that he developed his executive function skill of focus within the intrapersonal arena of involvement; however, she did not see an improvement within the symbol system arena of symbol. Additionally, she did not see an improvement in his use of the sustain executive function, whereas Sam perceived himself as slightly exceeding his expectations in this area. For Sam's second goal, 'To Control My Feelings Better', Sam and his teacher perceived him as improving. Sam's teacher saw an improvement in his use of the monitor executive function, because she felt he had improved in his ability to regulate his emotions during times of frustration. She did not perceive him as improving in his ability to inhibit or modulate because she felt that he continued to be stimulated by the environment and to examine his thoughts and feelings he has about himself as he had done prior to the intervention. Finally, for Sam's third goal 'To Calm My Mind Better', Sam perceived himself as improving; however, his teacher did not see him as gaining this skill.

### Charles' Rating Scales Comparison

Table 4.12 shows Charles' self-selected goals and his rating changes for these goals, along with his teacher's pre/post ratings for these three goals.

Table 4.12

Comparison of Charles' Pre and Post Intervention Self and Teacher Rating Scores

Student Selected Behavior Goals	Pre-to-Post Self-Ratings	Rating Scale Item	Teacher Pre-to-Post Ratings
Increase Ability to Focus	-1.5 to +0.5	Item 1	3 to 1
		Item 2	4 to 3
		Item 3	3 to 1
Be Able to Calm Down and Relax When Upset	-1 to 0	Item 5	5 to 5
		Item 9	5 to 4
Do Better on School Work	0 to 0.5	Item 4	1 to 1
		Item 8	1 to 0
Behaviors Not Selected by the Student		Item 6	5 to 5
		Item 7	3 to 1
		Item 10	1 to 0

Charles and his general education classroom teacher completed rating scales. Their responses to the pre and post rating scales indicated that Charles's perceptions changed in a positive direction for his first goal of, 'Increase Ability to Focus', but his teacher's perceptions indicated a decline in this skill. Specifically, his teacher did not perceive him as acquiring the executive function skill necessary to focus his attention on

his own actions or on school tasks. Additionally, she did not see an improvement in his use of the sustain executive function. Charles perceived himself as slightly exceeding his expectations in this area. For Charles's second goal, 'Be Able to Calm Down and Relax When Upset', Charles perceived himself as improving, but his teacher saw him slightly declining, specifically for the executive function foresee/plan. Charles's teacher did rate him as having this ability prior to the intervention, but Charles did not feel he did.

Finally, for Charles's third goal, 'Do Better on School Work', Charles perceived himself as improving; however, his teacher did not see him as gaining this skill and she saw a decline in his ability to monitor because he made more careless errors in his work.

## Chapter 5: Discussion

### Summary of the Findings

*Research Question 1: Do student perceptions of progress toward self-selected goals for improved use of executive functions increase during and after the implementation of a 10 week program designed to teach mindfulness practices?*

The present findings suggest that participation in a mindfulness program within the general education setting is particularly beneficial for self-perceived improvements in executive functions. The children who participated in the program were eager to come to each session and rarely missed a group. Additionally, the participants quickly learned the structure of the sessions and participated in all tasks asked of them; this was facilitated by the fact that the program was composed of a homogenous group in terms of gender. Students reported meeting and exceeding their self-set goals after only a ten week period, consisting of twenty sessions. Students' goals were centered on their school performances and their abilities to self-monitor their emotions. Therefore, an increased rating on these goals indicated that students felt that they were performing better in school and emotionally as a result of their participation in the program.

*Research Question 2: Do teacher perceptions of the frequency of occurrence of behaviors indicating the effective use of executive functions reflect an increase in frequency of occurrence after the implementation of a 10 week program designed to teach mindfulness practices?*

The teacher rating scales did not indicate a global increase in executive function capacities as a result of student participation in the program. Teacher information



provided prior to the intervention indicated that the participants were among the top ten students with the greatest executive function deficits within their classrooms. Teacher post-test results suggested that the students continued to have various executive skill or executive function deficits. However, an item by item analysis indicated that one or more students were rated as performing higher in areas such as: focuses attention on school tasks, focuses attention on own actions, sustains attention on school tasks, starts school work, controls emotional reactions well in frustrating situations, pauses to listen to what others say during conversations, avoids being and over/under-stimulated by sights, sounds and touches, suggesting that the program did increase student performances. The data also indicated that students' participation in the program resulted in the acquisition of their executive skills and executive functions as a result of the intervention within the previously mentioned, defined areas. Furthermore, the data suggests that students gained different skills as a result of their participation in the intervention and that the skill acquisition varied within the arenas of involvement for each student.

*Research Question 3: How do changes in student self-ratings compare with changes in teacher ratings?*

Overall, students reported more improvements in the use of their executive functions than teachers reported. Teachers did perceive three of the four students as improving in two or more areas as a result of their participation in the program. Analyses of student goals and corresponding items from the Teacher Rating Scale indicated that teachers did see improvements in specific executive functions; however, these improvements varied from student to student and within arenas of involvement. For

items that the teachers indicated had improved, students moved from an executive skills deficit to an executive function deficit. This would suggest that students acquired the executive skills needed to perform certain activities; however, they continued to need external cueing by the classroom teacher concerning the times when they should engage these skills. This would indicate a significant improvement in functioning because students were demonstrating a lack of use of these skills prior to the intervention.

### **Significance of the Findings**

These findings suggest that participants saw an improvement in their own classroom functioning and self-regulation as a result of their participation in the program. All four boys who participated noted that they often used the strategies that were discussed in the group and were able to retain the information they learned during the 'brain talk' sessions. The students identified times throughout the week that they needed to implement some of their newly learned strategies and discussed, in their journals, what they used to overcome these obstacles. They were eager to share their experiences and often coached each other through more difficult situations.

The results also suggest that the *Developing Executive Functions through Mindfulness Training Curriculum* is conducive to implementation within a general education classroom setting. The curriculum was designed so that people with minimal experience using mindfulness training could implement the program. Both co-facilitators held certifications in school psychology and had experience with counseling. One of the facilitators had a doctoral degree in the field of school psychology as well. Feedback from the participants and the co-facilitators of the program suggested that the structure of the sessions was appropriate and they preferred the predictability of it. The facilitators

reported that the structure of the sessions allowed for a seamless transition from the classroom into the counseling room because the students knew what to expect upon entering the door. Due to the fact that this program was implemented in a school, and therefore under extreme time constraints, the highly structured sessions allowed the facilitators to cover all of the content of the session within the thirty minute time block allotted. Furthermore, the facilitators did not recommend changes to the curriculum. The activities were reportedly age-appropriate and interactive. It was reported that the students enjoyed participating in the activities and were engaged throughout the sessions. This is significant, because teachers often reported that the participants were not consistently engaged during classroom lessons. Facilitators reported implementing all sessions without deviation from the curriculum.

An item by item analysis indicated that the program did not have an overall significant impact on student performance; however, the following executive functions were improved as a result of the students' participation in the program: focus attention, sustain, initiate, inhibit, pause/continue, modulate. Furthermore, these results were not consistent among the participants, indicating that each participant may have gained something different from their participation in the study.

### **Impact of the Findings**

Overall, the program seems to be an effective school-based intervention. The fact that this program does not require an extended amount of time to implement and can be done in short, thirty minute sessions, makes it a practical intervention for the school setting. Furthermore, the results indicate that this intervention can be an effective tool for increasing student perception of their executive function capacities. As a result, students

can gain a greater awareness of their own skill sets and learn strategies to use throughout their daily lives in order to allow them to become more successful. The students' eagerness to participate in the program suggested that they looked forward to the break in their daily schedule and enjoyed the activities that were planned for them. Feedback from the participants revealed that they felt calmer and more in control of their emotions upon exiting the session; the teachers supported the student reports. This program was implemented at the end of the school day due to scheduling constraints; however, with this feedback, it would potentially have had a greater impact had it been implemented the first thing in the morning.

### **Limitations**

There are several limitations to this study that are likely to affect the validity of the obtained results. Although the current study found that the participants indicated an ability to reach their self-stated goals, the teacher raters did not find the intervention had the same overall impact on student learning. Investigations of the limitations of the current study included: the lack of a control group, a small sample size, a subjective rating scale and the lack of a longitudinal approach.

### **Study Design**

Although there was an active experimental group, the study was lacking a control group. An active comparison group would have been useful in determining if the students benefited from the skills they had learned through their mindfulness training, in comparison with a group who did not learn the same set of skills. This would have enhanced the study; potentially, it would further support student self-perceived success as

a result of their participation. Additionally, a control group would have allowed for further comparisons among teacher ratings and their perceived student deficits.

### **Sample Size**

This study consisted of a small sample size of four students. As a result, it is not a representative sample of the student population and therefore limits the ability of this study to find results that could be generalized. Furthermore, the sample size did not provide the amount of information needed in order to utilize statistical tests of significant differences between pre and post intervention rating scales.

### **Self-Reported Data**

The students identified by the classroom teachers to participate in this study were chosen from the students identified as having the highest degree of executive function deficit. Therefore, when teachers were asked to reevaluate the students' performances, they continue to be depicted as having the lowest executive function deficits, and therefore the results may have been influenced by this self-reported data. Some biases that can influence self-reported data include: selective memory, telescoping, attribution, and exaggeration. Teacher's memory of student performances over the period in which they participated in the program could have influenced the rating scale. Furthermore, telescoping, or recalling events out of order, may have influenced the student's performance on the rating scales. Specifically, the teachers would recall one event that occurred (i.e. the student is extremely distractible in the classroom) and hold on to that memory as if it had occurred daily or more recently. Additionally, the teacher raters were potentially focused on the participants' negative behaviors, and had difficulty recalling positive things that the students were doing in the classroom, therefore, influencing the

way in which they rated the students at the conclusion of the program. Finally, as the research suggests mindfulness practice often has long-term effects for participants because it changes a person's cognitive structures. A limitation of the research study was that it did not include a longitudinal approach to identifying changes in student performance. Specifically, the study would have been strengthened if the researcher had the opportunity to measure the long-term influence that the study had on the participants.

### **Testing and Statistical Regression**

The single-case design employed a pre/post-test design to determine student and teacher perceptions of executive functions both before and after the intervention. Because the raters were asked to use the same rating scales multiple times throughout the study, their decisions could have been influenced. This would suggest that students' perceived changes in performance may not be a result of the program, but may be a result of taking the same rating scale more than one time. Furthermore, statistical regression is the tendency for the extreme scores to revert toward the mean; the use of multiple raters is supposed to account for this error.

### **External Factors**

Another significant impact on the study included the diagnosis of one of the participants. One of the four participants received a diagnosis of a brain tumor after his participation in the study, which could have impacted his performance and potential gains he could have received as a result of his participation. Furthermore, it was noted that this student did not make any progress in any area that was measured and actually declined in certain areas during the process. This was further supported by the classroom teacher, who indicated that the student's performance throughout the school year continued to

decline and by the end of the year included abnormal behaviors such as excreting in his pants.

### **Instrument and Construct Validity of Measures**

The student and teacher questionnaires used for this study were observation-based and involved student and teacher perceptions of executive function acquisition or development. Therefore, the ratings were subjective in nature. Furthermore, the rating scales are not statistically validated. Therefore, it is possible that the items within the rating scales are not valid measures of the constructs intended to be assessed.

### **Future Directions**

Further investigation of the impact of mindfulness training for the development of executive functions in elementary school aged children would be useful in order to distinguish potential sources of variance. Future research should include an active comparison group that focuses on an activity such as relaxation. Additionally, the measurements should be more objective and perhaps include frequency data that monitors how often a student is displaying a specific behavior. This behavior can be monitored throughout the training to determine if his or her ability to control such behavior increases as a result of his or her participation in the intervention. Finally, future research should include a longitudinal approach to studying the impact that mindfulness-based training can have on executive function capacities. This would be difficult to implement in the school setting with the current research design because students move from grade to grade and teacher to teacher each year, therefore, it would be recommended that data collection include frequency data.

In terms of the implementation of the program, some changes are recommended. First, the program should be run first thing in the morning, because the students often reported that they felt calmer upon exiting the group. This calmness would ideally stay with the students throughout the school day to further facilitate changes in behavior. Second, feedback from teachers should be collected daily. The data collection should be further supported with discussions between the classroom teacher and group facilitator. By collecting data more regularly, the facilitator is better able to monitor student progress and have ongoing conversations with staff regarding student progress. This would also account for many of the previously mentioned limitations of the study such as telescoping. A final change would include having the teachers participate in the first session of the program before the children begin. This would give the facilitator the opportunity to provide the teachers with information regarding the goals of the intervention. Additionally, the facilitator could share the language used in the program and support the teacher with using the same language in the classroom to facilitate generalization of the skills learned.



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## Appendix A

### **DEVELOPING EXECUTIVE FUNCTION CAPACITIES THROUGH MINDFULNESS CURRICULUM**

#### SCHEDULE:

- 10 Weeks
- 20 Sessions
- 30 minutes/session
- Weekly individual 'check-ins' to assess progress-discuss journals, discuss goals and measure sustained attention (hour glass)

#### PARTICIPANTS

- 5<sup>TH</sup> Grade Students
- Identified by classroom teacher through surveys distributed identifying need/deficit
- 10-12 participants

#### EXECUTIVE FUNCTION CAPACITIES BEING ADDRESSED (McCloskey)

- PERCEIVE: cueing awareness of sensations
- INITIATE: cueing initiation of experience of sensations
- MODULATE: curing regulation of the intensity of experiencing sensations
- GAUGE: cueing the capacities needed to experience sensations
- FOCUS/SELECT: cueing attention to the sensations
- SUSTAIN: cueing the sustaining of attention to the sensations
- STOP/INTERRUPT: cueing the stopping of the experiencing of sensations
- INHIBIT: cueing resisting of the urge to immediately experience sensations

#### STRUCTURE

- Begin with breathing/centering exercise (2 minutes)
- Mindful Movements (5 minutes)
- Guided Meditations: Adapted from Sitting Quiet Like a Frog (5 minutes)
- Brain Talk-Adapted from MindUp Curriculum (10 minutes)
- Mindful Activity (10 minutes)
- Add to our Brain Training Poster (2 Minutes)
- Close with breathing/centering exercise (2 minutes)



**DAY ONE**

- Goal: Introduce the Program-Explain what the group is about-helping students control their minds and bodies through awareness. We are going to learn ways to exercise our brains-the more we exercise it the stronger, smarter and more confident it will become (create a poster that we can write down strategies as we learn them that help us to exercise our brains).
  - Objectives
    - Discuss Routine of the Group.
    - Behavioral Expectations of the group: voluntary...
    - Give students journals and have them identify three goals they wish to get from being part of the program. Explain that we will monitor their goals and discuss how they are doing to reach these goals on a weekly basis.
  - Activity
    - What does mindful look like? Use Week Four example in book.
    - Create our Tool Boxes-each student will have their own 'toolbox' that they will add a tool to each session.
- Materials
  - Poster with Routine
  - Poster for Brain Strengthening Ideas-Brain Training
  - Journals
  - Markers, Pens, etc.
  - Art supplies
  - Shoe Boxes for each student

**DAY TWO**

- Goal: Help Children identify three key parts of the brain involved in thinking and learning; and how understanding how feelings arise will assist them in changing what they do in response.
  - Brain Talk:
    - Identify/Define Amygdala, PFC and Hippocampus
      - Prefrontal Cortex is the coach...it directs the players on the field and calls the plays
      - Amygdala is the players...the players express their feelings but must play together and collaborate to follow the play called by the coach
      - Hippocampus is the play...the players can refer to it in order to help them remember what they need to do on the field
    - Discuss student examples of times when their amygdala alerted them to danger and when it made them nervous or worried.

- How did your reaction affect your ability to plan?
    - Review-Have students discuss in pairs the different parts of the brain and explain what each part does.
      - Give examples (you see a dog run out into the street) how does your body react? What are you thinking? How does your body feel?
  - Activity:
    - Have students act out being the three different parts of the brain:
      - Have children line up on one side of the room
      - One student is the PFC, teachers are the amygdala and the rest of the students are little bits of information trying to get to the PFC.
      - Give the little bits of information each a sentence to share with the PFC.
      - Have the Amygdala act as if in “flight”, “freeze” or “mindful” mode in random order. They are to take the ‘bits of information’ to the PFC.
      - Discuss how information is processed differently when it is calm or on alert.
  - Brain Training: (Let’s start building a toolbox of things to do if we get worried and our thoughts get jumbled...our amygdala is acting in flight or freeze mode). Let’s try two activities we can do when we think we might get nervous or worried.
    - Getting Rid of Worries and Clearing Our Minds:
      - Laugh for 15 seconds before starting a challenging task
        - Practice making funny faces or twisting their bodies)
      - Stand and Shake like a wet dog then stop and take three deep breathes.
- Homework:
  - Brain Power Activity Sheet?
  - Journal: Identify times when your brain is working like the shaken bottle...what did you do to calm it?
- Materials
  - Brain Power Activity Sheet
  - Clear Plastic Bottle (filled with water, sand, glitter)-The amygdala on alert mixes up the bottle, using mindfulness helps to calm everything and settle it.
  - Brain Training Poster

**DAY THREE**

- Goal: Discussing Mindful verses Un-Mindful Thoughts and Actions.
  - Brain Talk:
    - Discuss that giving your mind time to process something you hear, see, taste, smell or feel before responding produces mindful thinking.
  - Activity:
    - Listening to Sounds around us...have students write down as many sounds as they can hear after they sit quietly for thirty seconds-discuss
    - Discuss mindful listening-discuss how we can miss a lot of these sounds during the day because our attention is not focused on them. This exercise was to help us to calm our mind and allow us to focus.
  - Brain Training: (Let's add to our toolbox of things to do if we get worried and our thoughts get jumbled...our amygdala is acting in flight or freeze mode).
    - Worried
      - Focus listening to sounds around us.
- Homework:
  - Journal: Identify Mindful role models.
- Materials
  - Brain Training Poster
  - Activity Sheet

**DAY FOUR**

- Goal: Discussing Mindful verses Un-Mindful Thoughts and Actions.
  - Brain Talk:
    - The Amygdala's role in Mindful Awareness:
      - Who can remember what the amygdala does?
      - The amygdala determines emotional responses by classifying incoming sights, sounds, smells and movements as either threatening or pleasurable.
        - If pleasurable it is passed on to the PFC, if threatening our reflexes take over.
        - Discuss 'false alarms' and how this could be detrimental to our functioning...freezing, flight, or fight.
          - This is UN-MINDFUL behavior because our bodies act without thinking about it.
          - We are mindful when we create some time between the sensory input and our reactions! A

response happens after our mind thinks about it.

- “Use your PFC, please!”

- Activity
  - Practice being Mindful: Coloring to Music...stop and start coloring as music is turned on and off.
- Brain Training: (Let’s add to our toolbox of things to do if we get worried and our thoughts get jumbled...our amygdala is acting in flight or freeze mode).
  - Frustrated or Angry
    - Counting to Ten-this gives us time to think more clearly...our brain has time to catch up and act mindfully!
- Homework:
  - Mindful/Not Mindful activity sheet?
- Materials
  - Brain Training Poster
  - Activity Sheet

## **DAY FIVE**

\*Adapted from MindUP

- Goal: Teach students that our emotions shape our behavior and learning.
  - Brain Talk:
    - What part of the brain can be called the “guard dog of our reactions”? The Amygdala! When we feel scared, or threatened, or bullied, or stupid, we act like we are in danger or on alert. When we feel this way, it becomes very difficult for us to engage in mindful behavior because we are not ‘using our PFC’. Our brain is wired to respond first to emotions we are feeling.
    - Did you know we can teach our brains to feel safe? Where do you feel safe? When we feel safe we are better able to think, focus, learn and concentrate. Even better, when we feel safe we make the neural connections in our brains stronger. This allows us to be more mindful of our reactions.
  - Activity:
    - Mindful Senses: Sight, Sound, Taste, Smell-Have students go to different ‘stations’ where they engage their senses in a mindful way.
      - Taste: Raisins, Pretzels, Strawberries: Have students come up with three words that describe each food.
      - Sight: Two pieces of artwork: have students discuss and write down ten words that make the pictures different.

- Sound: Have the students play different instruments and discuss how each makes a different sound. Name two sounds that the instrument makes.
  - Smell: Have students smell different items and write two descriptive words per item.
  - Touch: Have students feel for different objects and identify different textures!
- Brain Training:
  - Using our senses mindfully!
- Homework:
  - Write down any of the activities you use until we meet again that help you to stay calm.
  - During one meal this week, eat mindfully and share your experience.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Materials for mindful tasting, seeing, hearing and smelling

## **DAY SIX**

\*Adapted from MindUP

- Goal: Teach students the MindUP Core Practice-breathing exercise to cue our brains to relax and focus-I can take control of myself.
  - Brain Talk:
    - Neuroplasticity is a new word we will be discussing today. Neuroplasticity refers to our brain's ability to be flexible and grow. Did you know that our brains can become stronger as we learn and practice new things? Just like our muscles grow and get stronger when we exercise. Did you know that we can guide our brains to learn the way we want them to? How do you think we do this? (Discuss). One of the ways we can guide our brains is to practice exercises so that they become a 'habit'. When we practice these exercises, we create and strengthen nerve cell connections by increasing the number and size of the dendrites (show picture) on the neuron. This allows for more efficient (quicker and more accurate) passage of information. This also helps us to make our actions more reflective than reactive. By practicing breathing to reduce anxiety or stress, you will help your body do this more naturally when it has these emotions.
  - Activity:
    - Students act as neurons passing information along to one another. The children's left hands are the dendrites and receive the message; torsos

are the cell body; right arms are message shuttling axons; right hands are the nerve endings and transfer messages to the dendrites of the next neuron. Use one small object (something that is practiced) and one large more awkward object (something new) and time how long the children can pass it along. Discuss which message traveled faster, would the message move more quickly with practice?

- Brain Training: (Let's add to our toolbox of things to do if we get worried and our thoughts get jumbled...our amygdala is acting in flight or freeze mode).
  - Core Practice
- Homework:
  - Journal: Mindful Me Picture
- Materials
  - Brain Training Poster
  - Picture of a Neuron
  - MindUp Book
  - Rain Stick or Chime
  - Small Objects for Breathing

## **DAY SEVEN**

\*Adapted from MindUP

- Goal: Students learn how to train their attention to the most pertinent information in the room.
  - Brain Talk:
    - RAS: Last time we discussed neurons and how our brains grow and get stronger when we practice the exercises in our 'brain toolbox'. There is one network of long nerve pathways that lies in the middle of our brain stem called the reticular activating system, or the RAS. The RAS helps us to regulate our basic body functions, such as keeping us awake or alert. Really, this system can be called our attention-focusing center. The RAS connects our brain stem, which is responsible for our basic body (reflexive) functions, to our PFC, which does what again? Sensory information that we take in (sights, touch, sounds, smells) goes up to the brain through the spinal cord and is filtered through the RAS. The RAS sends the information to the correct place in the conscious brain. Anything that is not important is blocked. At any given point we are taking in millions of bits of information. Right now sitting in this room we are hearing different sounds, seeing things all over the room, feeling warm air. If we are being mindful, we are able to block out all of the other information and only focus on what is important.

- We can strengthen our RAS by practicing our focus on specific sensory stimuli. Think to yourself what sensory information your RAS is letting filter through right now?
  - Activity:
    - Simon, Bop-It, Where's Waldo? (Vision)
    - Listen to music and discuss the different sounds we hear.
  - Brain Training:
    - Mindful Listening...listen to music.
- Homework:
  - Journal: How can mindful seeing/listening help you in the classroom?
  - Write down any of the activities you use until we meet again that help you to stay calm.
- Materials
  - Brain Training Poster
  - Picture of a Neuron
  - MindUp Book
  - Simon/Bop-It/Where's Waldo
  - Music

## **DAY EIGHT**

\*Adapted from MindUP

- Goal: Teach students the MindUP Core Practice-breathing exercise to cue our brains to relax and focus-I can take control of myself.
  - Brain Talk:
    - Focusing on breathing helps us to: slow our heart rate, lower our blood pressure and sharpen our focus. Controlling our breathing helps us to lessen anxiety by overriding the fight, flight or freeze reaction by the amygdala. It gives the PFC the steering wheel. When you are regulating your breathing, you are getting your mind in a state where it can think clearly and plan a response...or act mindfully!
  - Activity:
    - Practice being Mindful: Listening and Breathing
      - Timed Breathing Exercise...use script from book
      - Belly Breathing: Have students put a small object on their belly. Have them watch the object as it rises and falls as they breathe.
- Homework:
  - Write down any of the activities you use until we meet again that help you to stay calm.
- Materials
  - Brain Training Poster

- Picture of a Neuron
- MindUp Book
- Rain Stick or Chime
- Small Objects for Breathing

## **DAY NINE**

\*Adapted from MindUP

- Goal: Teach students how to increase dopamine levels in their brains.
  - Brain Talk:
    - Dopamine is one of four dozen neurotransmitters, or chemicals, in the brain. Dopamine is responsible for producing and regulating positive feelings such as pleasure, hopefulness, optimism and keen interest. When we have enough dopamine in our brains, we feel good about life. Did you know we can actually do things to release dopamine into our brains? We do this by participating in experiences that are pleasurable, doing things that make us happy! Name some things that make you happy (add to the Brain Train toolbox later). Learning is hard when we are feeling negative or hopeless. Dopamine helps us to concentrate, pay attention, remember and keep trying.
  - Activity:
    - Exercise-Just Dance?
  - Brain Training:
    - All activities listed that make us happy!
- Homework:
  - Journal: collage of things that make me happy!
  - Write down any of the activities you use until we meet again that help you to stay calm.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Wii and Game

## **DAY TEN**

\*Adapted from MindUP

- Goal: Teach students that our emotions shape our behavior and learning.
  - Brain Talk:
    - We discussed neurotransmitters last week, and how they are chemicals in our brain that influence our feelings and behaviors. We talked specifically about dopamine and how it is responsible for helping us feel



motivated, happy, and helps us to pay attention and plan. There are two other neurotransmitters that we will discuss. The first is Serotonin. Serotonin helps us to regulate our appetite, sleep, aggression, mood and pain. The second is Norepinephrine which is important for attentiveness, emotions, sleeping and dreaming. The way we think changes as the neurotransmitters in our brains increase or decrease. When we are calm and mindful we are able to train our PFC to take in more information. We are calm when the neurotransmitters in our brains are balanced. We can balance them by doing activities mindfully.

- Activity: (Revisit from Activity on Day 5)
  - Mindful Senses: Sight, Sound, Taste, Smell-Have students go to different 'stations' where they engage their senses in a mindful way.
    - Taste: Raisins, Pretzels, Strawberries: Have students come up with three words that describe each food.
    - Sight: Two pieces of artwork: have students discuss and write down ten words that make the pictures different.
    - Sound: Have the students play different instruments and discuss how each makes a different sound. Name two sounds that the instrument makes.
    - Smell: Have students smell different items and write two descriptive words per item.
    - Touch: Have students feel for different objects and identify different textures!
- Brain Training:
  - Using our senses mindfully!
- Homework:
  - Write down any of the activities you use until we meet again that help you to stay calm.
  - During one meal this week, eat mindfully and share your experience.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Materials for mindful tasting, seeing, hearing and smelling

## **ELEVEN**

\*Adapted from MindUP

- Goal: Teach students self-regulation skills through breathing.
  - Brain Talk:
    - We have talked a lot about neurotransmitters in the brain and how they contribute to our behavior. There is another chemical in our brains

called hormones. When we have either real or perceived threats the adrenal gland in our body releases cortisol. When there are low levels of cortisol in our brains we are alert, however, when we have too much cortisol in our bodies for a long period of time, it can hurt our brains. It makes it difficult for us to think, remember and learn. We can have stress for a number of different reasons. It can be physical, environmental or emotional. Can you give an example of each? (lack of downtime, parental stresses, pressures to achieve, exposure to violence, over-stimulating or noisy environments, families dealing with substance abuse, unrealistic expectations, and poverty). We can lessen our stress levels by regulating our breathing and lowering our heart rates.

- Activity:
  - Monitoring our heart rate: have students measure how many times their heart beats for thirty seconds...have them write it down. Then have students do a quick exercise to increase their heart rate (sun salutation). Have them measure their heart rate again. Have students practice 'Take 5' and have them measure their heart rates a third time. Discuss the changes in their heart rate.
- Brain Training:
  - When we engage in behaviors that we like we relax our amygdala, decrease our cortisol levels, and our neurotransmitters become balanced.
    - Have everyone identify a "brain break" they can use in school or at home!
- Homework:
  - Write down any of the activities you use until we meet again that help you to stay calm.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Stethoscope

## **DAY TWELVE**

\*Adapted from MindUP

- Goal: Help children to think positively-Practice makes Permanent.
  - Brain Talk:
    - Optimism versus pessimism...what does it mean to be an optimist? Who has an example of when they were thinking positively? People who think with more positive thoughts have better physical health, more

school success, better relationships and handle stress better (MindUp, pg. 111). How can we train our brains to think more positively? One way is to use positive self-talk? What is that? Remember when we discussed neuroplasticity? A brain process that makes our brains stronger and better able to think? Using positive self-talk enhances our brains by strengthening the nerve cell connections in our brains (MindUp).

- When we think with a positive attitude, dopamine levels in our brains rise, cortisol levels remain the same and the amygdala is open and sending information to the PFC. By being optimistic we are more mindful.
- When are the times of day that you feel the most stress or anxiety? What things do you say to yourself? What positive things can you say to yourself?
- Activity:
  - Give students scenarios and have them think about and then discuss what automatic thoughts they had (i.e. their friend does not say hi to them in the morning, they earn a bad grade on an assignment, their friend wants to play a different game on the playground, they have a disagreement during a game with a friend, they do not get the lunch they wanted). Have students think about a pessimistic response and an optimistic response to these scenarios.
  - Create Poster: Optimistic Me-taking another person's perspective, replacing a negative thought with a positive one, remember that feelings pass, mindful exercise, play a game, sing a song, make someone laugh.
- Brain Training:
  - Have each student identify how they can develop their targeted EF using an optimistic strategy.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
  - Share a scenario in which you thought optimistically this week.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Optimistic Me poster

## **DAY THIRTEEN**

\*Adapted from MindUP

- Goal: Help students to use happy memories to increase optimistic thinking.
  - Brain Talk:

- We discussed being optimistic last week. We have also discussed the important role of dopamine in our brains. Today we are going to talk about a new strategy that we can use to both help us think optimistically and to release dopamine into our brains. Brain scans show that just thinking about happy experiences activates the same parts of the brain as a pleasurable activity does. Furthermore, when we continuously remember our past successes, we build our confidence and reduce the thoughts of negativity.
- Everyone take a second and complete this sentence..."I can't..." Now I want you to think about an experience you have had that makes this sentence untrue!
- Activity:
  - Today we are going to create a 'mini-movie' in our minds. Everyone take a moment to think of a memory that you have that makes you happy. Some examples may include meeting a new friend, a game you played with a friend, spending time with your family, a funny incident that happened in school/at home, etc. I am going to share with you a happy memory of mine...I want to show you how to enjoy every bit of your memory, so I will close my eyes and create a mini-movie in my mind. Listen to my voice and watch my expression as I recall how the memory went and the details that made it special to me.
  - Now you can each choose a partner, or work on your own, and share a happy memory you have. Make sure to include all of the details that make it so special.
- Brain Training:
  - Put "happy memory" on our chart!
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
  - Share a scenario in which you used your happy memory this week.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Happy Memory

## **DAY FOURTEEN**

\*Adapted from MindUP

- Goal: Help students to be thankful.
  - Brain Talk:
    - Research has shown that when we think about someone or something that we are appreciative of, the body calms itself. Our bodies have an

autonomic nervous system with two branches: the parasympathetic and the sympathetic systems. The sympathetic system causes the body to “fight, flight or freeze” during stress. The parasympathetic nervous system is the counterpart to the sympathetic system. It is responsible for slowing our heartbeat, moves blood from the muscles to the organs, and contracts our pupils. When we feel appreciative, we trigger this calming branch of the ANS. And of course, feeling appreciative affects the neurotransmitters in our brains. Which neurotransmitter do you think would be released? Dopamine!

- Focusing on things that make us grateful is linked to our happiness! The more grateful we are, the happier we are!
- Activity:
  - Let’s take a moment to write in our journals some things that we are thankful for. Try to come up with at least five things that you are grateful for.
  - Now take a moment to think about the last time you said ‘thank you’. Write a thank-you note to a person you are grateful for or to someone who did something that made you grateful. You do not have to give the person this note, but it would be cool if you do!
- Brain Training:
  - Being grateful.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
  - Share a scenario in which you were grateful and said ‘thank-you’ this week. Keep track of the number of times you say thank you this week!
- Materials
  - Brain Training Poster
  - MindUp Book

## **DAY FIFTEEN**

\*Adapted from MindUP

- Goal: Help students to identify how important being kind is.
  - Brain Talk:
    - So what does it mean to be intelligent? Do you know that there are many different types of intelligence? One that we will discuss today is emotional intelligence. As we do acts of kindness we develop our compassion and empathy and more importantly, we learn how our actions and words can impact others. Also, acting in a kind way causes us to release dopamine into our brains, and this makes us feel good!!!
  - Activity:

- Let's take a moment to think about three things you can do to show kindness to others. Write in your journal your three ideas. This week you are going to try to meet this goal.
  - What is something our group can do to show kindness for the school?
- Brain Training:
  - Being kind.
- Homework:
  - Share a scenario in which you were kind to a friend this week!
- Materials
  - Brain Training Poster
  - MindUp Book
  - Ideas for showing kindness to Port Monmouth

## **DAY SIXTEEN**

\*Adapted from MindUP

- Goal: Help students to identify how important being kind is.
  - Brain Talk:
    - Mirror neurons are a kind of brain nerve that helps the brain to imitate (or copy) the actions of another person. The neural pathways associated with emotions such as pain, joy and fear are activated when we see someone's face expressing that emotion. Have you heard of kindness being contagious? Well, this is why! When people work together in a positive way, feelings of kindness, levels of dopamine and opportunities for activating the neural pathways of pleasure and reward multiply.
  - Activity:
    - Now we are going to sit in a circle and give each other a compliment. Think of a meaningful compliment. For example....
    - How did you feel when you gave your friend a compliment? How did it feel when you got a compliment?
  - Brain Training:
    - Being kind.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Ideas for showing kindness to Port Monmouth

**DAY SEVENTEEN**

\*Adapted from MindUP

- Goal: Teach students self-regulation skills through breathing.
  - Brain Talk:
    - We have talked about using our PFC before, which means what? Executive Functions are housed in our PFC...they are multiple (or many) cognitive processes that help us think and act purposefully, strategically, self-regulated, goal-directed and in an organized way. Just like the other parts of our brain, our EFs are affected by our emotions. EFs cue and direct other parts of our brains to respond.
    - There are many different executive function capacities in our frontal lobes. Some of them include Perceive, Modulate, Initiate, Focus/Select, Stop, Sustain, Plan, Organize, Retrieve, Monitor, and Correct. Discuss a definition of each one. Discuss some of the activities that we have done in previous weeks and have the students identify which EF capacities were used for the activity.
  - Activity:
    - Have students identify which EFs are strengths for them and which are weaknesses. Have students identify a goal they want to set for themselves as a result of their participation in the rest of the program. The goal should be developing an identified EF weakness. Explain that we will be discussing their progress towards their goal each week.
    - Coloring to music.
  - Brain Training:
    - Individual: have students identify one way in which they can develop their targeted EF capacity...strategies will be provided for students to practice with...these strategies will be used over the course of the program.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
- Materials
  - Brain Training Poster
  - MindUp Book
  - Strategies for developing EF capacities
  - List of EFs

**DAY EIGHTEEN**

\*Adapted from MindUP

- Goal: Help students to develop targeted EF capacity. Create/Implement Act of Kindness for Port Monmouth
  - On day ten we discussed executive function capacities and their importance in cueing perceptions, thoughts, emotions and actions. Furthermore, you have each set a goal to increase a specific executive function capacity. For the next six days, we will be taking this opportunity during the group to develop this capacity.
  - We will also be taking time to discuss how we are going to show an act of kindness to Port Monmouth. We will take some time each session to work on this idea and discuss how we will implement it.
  - Activity:
    - Work on targeted skill-will be individualized to each student depending on their identified goal.
    - Work on Act of Kindness.
  - Brain Training:
    - Review.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
  - Share a scenario in which you used a Brain Training activity!
- Materials
  - Brain Training Poster
  - MindUp Book

**DAY NINETEEN**

\*Adapted from MindUP

- Goal: Help students to develop targeted EF capacity. Create/Implement Act of Kindness for Port Monmouth
  - On day ten we discussed executive function capacities and their importance in cueing perceptions, thoughts, emotions and actions. Furthermore, you have each set a goal to increase a specific executive function capacity. For the next six days, we will be taking this opportunity during the group to develop this capacity.
  - We will also be taking time to discuss how we are going to show an act of kindness to Port Monmouth. We will take some time each session to work on this idea and discuss how we will implement it.
  - Activity:



- Work on targeted skill-will be individualized to each student depending on their identified goal.
  - Work on Act of Kindness.
- Brain Training:
  - Review.
- Homework:
  - Write down any of the activities you used to develop your targeted EF capacity.
  - Share a scenario in which you used a Brain Training activity!
- Materials
  - Brain Training Poster
  - MindUp Book

## **DAY TWENTY**

- Closing Exercises:
  - Review progress towards each student's goals
  - Graduation Certificate Presentation
  - Closing Exercise
- Materials: Certificates

## Appendix B

### Pre/Post Teacher Assessment

DATE: \_\_\_\_\_

Student: \_\_\_\_\_

For each statement below, think about the student and circle the option, 1 through 5, that best described the student.

- 5**     **AA**     Always or almost always does this on his own. Does not need to be prompted to do it.
- 4**     **F**        Frequently does this on own without prompting
- 3**     **S**        Seldom does this on own without being prompted, reminded, or cued to do so.
- 2**     **AP**       Does this only after being prompted, reminded, or cued to do it.
- 1**     **DA**       Only does with direct assistance. Requires much more than simple prompt.
- 0**     **UA**       Unable to do this, even when direct assistance is provided.

Focuses attention on school tasks	1	2	3	4	5
Focuses attention on own actions	1	2	3	4	5
Sustains attention for school tasks completion	1	2	3	4	5
Starts school work	1	2	3	4	5
Controls emotional reactions well in frustrating situations	1	2	3	4	5
Pauses to listen to what others say during conversations	1	2	3	4	5
Avoids being over/understimulated by sights, sounds, touches	1	2	3	4	5
Checks school work to avoid careless errors on tests/work	1	2	3	4	5
Figures out what it takes to keep control in difficult situations	1	2	3	4	5
Examines and analyzes in more detail thoughts and feelings he has about himself or things he has done	1	2	3	4	5

**Appendix C**

**GOAL ATTAINMENT SCALE**

**STUDENT SELF-ASSESSMENT TOOL**

RATING:

-2: Not even close to meeting my goal!

-1: Not meeting my goal.

0: Met my goal!

1: Met my goal and more!

2: Exceeded my expectations!

GOAL	Rating	Comments