THE IMPACT OF A MINDFULNESS BASED ATTENTIONAL SKILLS TRAINING PROGRAM ON SCHOOL RELATED SELF-REGULATION SKILLS OF ELEMENTARY SCHOOL CHILDREN

A Dissertation

by

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This dissertation meets the standards for scope and quality of
Texas A&M University-Corpus Christi and is hereby approved.

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ABSTRACT

The purpose of this study was to explore the impact of an 8-session mindfulness-based attentional training program (MBAST) with children in third through sixth grade (*n = 24*) in an elementary school setting. The project examined (1) parental reports, (2) student self-perception of self-regulation skills, (3) student understanding of mindfulness skills, and (4) student performance on two standardized measures of attentional self-regulation.

Students participated in groups (*n = 5-7* per classroom) in a series of sessions involving mindfulness based exercises and computer mediated activities (i.e., video games) designed to challenge visual attention, memory, and decision-making in engaging and entertaining motivational contexts. Students completed The Wechsler Intelligence Scale for Children (WISC-III) Coding and Symbol search subtasks at the end of each session. A multivariate analysis of variance repeated measures research design was used to evaluate the impact of training on possible improvements in attentional skills, as assessed by standardized measures of vigilance (speed process and accuracy of responses). The analysis also allowed for the comparison of a pre-program, self and parent reports of self-regulation skills over the eight sessions.

While parent ratings and students' self-reported scores of self-regulation difficulties and mindfulness skills remained stable, the results showed participating students realized a 40-50% increase in their performance on standardized measures of attentional skills.

This study adds to emerging literature on the benefits of mindfulness based and brain training interventions that have been successfully applied to classroom settings. This program explores the benefit of an empirically validated intervention on children's ability to direct and sustain their attention strategically in the context of self-reflection and application to goal

orientated gaming environment. Mindfulness based attention regulation training can be utilized to enhance certain students' capacities in a personal and academic manner.

DEDICATION

I would like to dedicate this dissertation to my family and friends.

To Mãe Mimosa e Pai Guilherme, for all that you do for me. You were the ones to make this possible. For all the times apart, for all the Skype hours, for all the hugs not given because of the distance, for all the moments not present in person but always in heart: I am what I am because of you. Thank you! Obrigada.

To Mano - Israel, you always make me move forward and make me want more. Thank you, Linds Marie, for all the kind words, time, work, and friendship.

To Lorena and Wannigar: You are the best! To Joaninha: Thank you for being my rock, my sky, my everything! Thank you to Nuno for believing in me and for waiting to make this possible. To Carlota and Alexandra: You are my favorite lunatics. Corpus Christi would not have been possible without you. Thank you for keeping me sane. Finally, to Gloria, who always makes me believe that everything is possible; it is just a matter of working for it.

"Sometimes all that we want is a taste, other times there is no such thing as enough."— Meredith Grey

With love,

Martinha

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CHAPTER I: INTRODUCTION

At least 9% of the school-aged children in the United States have been identified with ADHD or a type of attention deficit disorder (Wedge, 2012). One of the main elements for ADHD is the ability to restrain one's behavior and not act on impulse (Barkley, 1997; Brown, 2006). Therefore, teachers and guardians are often concerned with children who are diagnosed as ADHD, due to the lack of their own sense of safety. Children diagnosed with ADHD are also often very active, respond inadequately to others, and tend to misbehave in social contexts.

Problems related to the lack of concentration or excess of distractions may be prejudicial consequences early and in the late stages of a child's development. A young child's attention capacity and short-term memory are both cognitive functions susceptible to internal and external factors (Harvey & Macklem, 2012). Meanwhile, cognitive function is often related to self-regulation and the capacity an individual has to control impulses. Lack of concentration, self-regulation, and ability to maintain focus often leads to learning disabilities that can affect language, reading, writing, spelling, and math. The child or the adolescent may develop anxiety due to lack of knowledge on how to change the undesirable behavior (Moilanen, 2007). Anxiety may also occur when the child does not know how to behave or cope with emotional pressure. Researchers have correlated the lack of concentration, self-regulation, and the inability to maintain focus with lack of self-esteem, anxiety, perfectionism, and fears. In these cases, we also have to take into consideration developmental characteristics, as well as motivation and learning processes.

The ability to regulate attention develops gradually over the course of a life. Additionally, individual differences can affect the ability to regulate attention, as can behavioral disorders. Research on students diagnosed with Attentional Deficit and Hyperactivity Disorder (ADHD;

DSM-V, 2014) or Attentional Deficit Disorder (ADD; DSM-V, 2014) provide insight to the student's memory struggles and problems with planning and organizing (St. Clair-Thompson, 2011). In the present study, we use mindfulness tools and attentional games to have a better understanding of the behaviors mentioned above.

Counselors and therapists in schools know the severe impact that lack of attention and self-regulation can have in a child's development (Felver, Doerner, Jones, Kaye, & Merrel, 2013). In 2000, a United States Department of Health and Human Services report revealed that one in 10 children suffer from mental health conditions, and one in five suffer from some type of impairment that affects their daily academic and social aspects. The impact of poor regulation skills underlies more than just cognitive attention regulation but may also encompass emotional regulation. Emotions support executive functions when they are well regulated, and they will inhibit attention and decision-making capacities when they are poorly controlled (Eisenberg, Spinrad, & Eggum, 2011).

Self-Regulation and Executive Control of Attentional Skills

The ability to regulate behaviors and emotions gradually increases as we enter adulthood. Regulating behavior is fundamentally important during the early developmental stages of childhood and adolescence. According to Baummeister and Vohs (2007), learning to control emotions and behavior begins during the pre-school stages. The ability to self-regulate increases dramatically as children become older (Bandy & Moore, 2010; Baummeister & Vohs, 2007). Goal setting and self-monitoring become an important part of child's life (Bandy & Moore, 2010; Baummeister & Vohs, 2007). According to Baummeister and Vohs (2007), setting manageable goals may enhance self-regulatory skills by allowing children and young adults to have direct control of their behaviors and responses.

What about: "Self-regulation is an internal process through which individuals observe, prevent, persevere, and adapt their behaviors, emotions, attention, and cognitive strategies in reaction to direction from internal cues, the environment, and peers" (Moilanen, 2007; Novak & Clayton, 2001). Attention, memory, and motor skills are crucial for healthy self-regulation (Blair & Diamond, 2008) and academic ability (Flook, Smalley, Kitil, Galla, Locke, Kaiser-Greenland et al., 2010).

Executive functions are defined as the ability to enhance one's attention, motor, and memory capacities (Blair & Diamond, 2008). Executive functions are organized and exercise control in the cognitive processes. A feature of self-control is the ability to monitor and think about one's personal attention (Flavell, 1979). When talking about brain functioning, it is important to keep in mind that emotions support executive functions when they are well regulated, although the brain will inhibit attention and decision-making capacities when they are poorly controlled (Eisenberg, Spinrad, & Eggum, 2011).

Attentional skills improve as we mature, leading to a more successful performance (Plude, Enns, & Brodeur, 1994). Developmental changes in self-control reflect a shift from external to internal sources of control (Kopp & Neufeld, 2003). Piaget identified one's ability to monitor and regulate one's own thinking (Piaget, 1983). However, other theorists have disputed the "normative claim" and observed a more gradual capacity to increasingly direct thinking at younger ages (Eisenberg, Spinrad & Eggum, 2011). Advances in neuroscience indicate that self-regulation of cognitive abilities are evident at younger ages (Winter, 2010).

Developmental Process of Self-Regulation and Executive Control of Attentional Skills

Approaches to understanding normative developmental patterns, as well as neurological challenges to optimal self-regulation, benefit the educational and intervention opportunities for

children. Having the ability to exercise control over attention has been shown to be the core part of cognitive capacity (Posner & Rothbart, 2007; Ruff, 1990). The ability to exercise control requires one to have skills allowing the individual to regulate, redirect attention, and to avoid distractions by maintaining focus for a long period (Colombo & Cheatham, 2006; Ruff, 1990; Ruff & Rothbart, 1996; Scerif, 2010).

During a child's early development, their ability to pay attention is limited. As children get older, their on-task focus and overall attentional skills improve (Plude, Enns, & Brodeur, 1994). The ability to practice attentional control by the end of the first year of life appears to be mediated by the occurrence of neural circuitry (Harvey & Macklem, 2009). Still, Harvey and Macklem (2009) believed that attentional control capabilities continue to progress during the child's development (Davidson, Amso, Cruess Anderson, & Diamond, 2006), relative to exogenous aspects of attention which are more developed at younger age (Harvey & Macklem, 2009).

Children progress from basic modulation of stimulation (either reflexively as babies or by using sensorimotor abilities in early childhood) to behavioral strategies in order to adapt and direct cognitive resources (Eisenberg, Spinrad & Eggum, 2011). The shift is mediated by increase in the recruitment of higher order cognitive processes, referred to as executive control processes (Felver, Doerner, Jones, Kaye, & Merrel, 2013). Flook, Smalley, Kitil, Galla, Locke, Kaiser-Greenland, et al., (2010) found neurophysiological evidence in the improvement of adults' executive functioning (EF), including attention regulation (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2007; Flook et al., 2010) and metacognition (Flook et al., 2010).

Researches in several theoretical traditions have demonstrated executive control skills continually increase during school years and may slowly improve into adulthood (Leon-Carrion,

Garcia-Orza, & Perez-Santamaria, 2004). Improvement of executive attention was noted to increase until the age of seven but not after (Rueda et al., 2004). Crone, Donahue, Honomichl, Wendelken, and Bunge (2006) found persistence limited distraction errors from the age of eight until 18.

Individual Differences of Executive Control of Attentional Skills

There is substantial evidence supporting the existence of individual differences in executive control skills, in addition to developmental variability in the development of executive control skills (Williams et al., 1999). Variability of executive functioning and not simply a developmental function subject to the maturational processes**.** In addition to developmental differences, when individuals are less attention oriented and are not able to sustain attention in the earlier stages of development, they are more likely to have difficulties developing proper attentional skills, as well as cognitive and behavioral functioning skills (Ruff, 1990; Wass, Sceriff, & Johnson, 2012).

These individual differences often involve disparities in conscious awareness of strategic monitoring (Flavell, 1974), as well as variability in personal preferences for connecting with the world (i.e., cognitive style; Biemiller & Meichenbaum, 1992). Such stylistic diversity is likely to reflect both individual differences in salience of task features, as well as aspects of personal preference. For example, work on the Matching Familiar Figures Test (MFFT; Kagan, 1965; Zelniker, Jeffrey, Ault, & Parsons, 1972) indicate that both developmental and individual differences in information processing are influenced by the functional demands of attentional resources required to complete a given task. Specifically, personalized responses to task demands for cost/benefits of response latency (Bratman, Hamilton, & Daily, 2012) and error, as well as personal perceptual set (analytic or figural), influence response pattern (Duckworth & Kern,

2011). At the same time, developmental differences in cognitive control capacity operate to moderate response patterns. This may affect how children prioritize their goals and how those goals lead to different strategies for academic performance. Every child makes decisions reflected on different situations, and the way they perform their tasks can be either in a more attentive way, leading to a more accurate response, or a less attentive way that can sometimes be faster, although less accurate (Wechsler, 1991).

Conceptualizing the Targets for Remediation of Deficits in Executive Control Processes: Production or Meditational Deficiencies

Meditational capacity is the ability to effectively use and implement a strategy when needed. For example, meditational capacity is necessary when individuals improve their comprehension by re-reading a text passage (Yu-Fen Yang, 2002). Production capacity is the ability to recognize the need (import and/or value) of a particular strategy in order to improve performance at an appropriate time (Berkeley & Riccomini, 2013). For example, someone may not automatically reread a difficult text passage in order to comprehend the material, until after he/she is able to understand the passage. Historically, developmentalists have addressed deficits in optimal executive control processes as indicative of either meditational (inability to implement a resource) or production (lack of temporal awareness of the usefulness of a given resource) deficiency, initially identified in thinkers by Flavell (1987).

Traditionally, remediation of production deficiencies seem more easily remedied (by training), and further seems to reflect a lack of awareness or motivation for use of a strategy, rather than a processing deficit (Holmes et al., 2009). Moreover, training and practice in awareness of task features may likely influence less than optimal cognitive stylistic variations to tasks may prove adaptive. Interventions that involve the practice of focused attention during the

present moment, and include engagement in a functional and inherently motivating context (such as in a game context), might be especially useful to facilitate changes in executive functioning. Reflective (mindful practices) support an individual's awareness of the need to attend to the current cognitive environment (production deficiency). These interventions also provide opportunities to practice and develop a skill for monitoring awareness, which can improve the ability to act on awareness in a way that improves effective performance on the task at hand (meditational practice; Linehan, 2014; Flavell, 1974).

Mindfulness Interventions for Facilitating Self-Regulation and Executive Control Skills

Mindfulness is frequently defined as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 2005, p. 4). More specific to exploration of executive control processes, Felver et al., (2013) defines mindfulness as "the self-regulation of attention so that it is maintained on immediate experiences an orientation that is characterized by curiosity, openness, and acceptance" (p. 232). Core mindfulness skills involve the strategic directing of attention and focus to the present moment (Linehan, 2014; Kabat-Zinn, 2005). These mindfulness skills can be defined in two types: "what" and "how" skills. The "what skills are linked to practicing thinking or which thoughts take control of the mind. The "how" skills are related to the ability to accept what is happening in a nonjudgmental way, doing it mindfully and effectively (Linehan, 2014). Mindfulness is done by practicing observing and describing the behavior.

Mindfulness may be helpful when a new behavior is being learned (Linehan, 2014). Mindfulness constructs can be directly applied to an individual's self-regulation and attentional focus capacities (Linehan, 2014). Mindfulness is a deliberate skill requiring focus on what is being done (including which actions are called for in the situation). Mindfulness may be most

directly related to the observed remediation of production deficiencies in executive function (Posner & Rothbart, 2007). Previous research has suggested that mindfulness skills appear to increase traditional metrics of executive control, such as increasing strategic time on task (Jaeggi, Buschkuehl, Jonides, & Perrig, 2008), deliberate focused attention (Holmes et al., 2009), and depth of processing (Klingberg et al., 2005).

Further**,** according to Flook et al., (2010), emerging neurophysiological evidences suggest that mindfulness practice in adults increases aspects of executive functioning (EF), including attentional regulation (Jha et al., 2007; Zylowska et al., 2007) and metacognition (Teasdale et al., 2002). Flook et al., (2010) found that parents and teachers saw a significant improvement in behavioral self-regulation at home and school of the students who received a mindfulness-based intervention when compared to a control group (Felver, Doerner, Jones, Kaye, & Merrel, 2013). In their study, sixty-four second and third-grade children (mean age, 8.2 years; 55% female) were randomly assigned to either an experimental group (mindfulness-based intervention treatment) or to a control group. During 8 weeks, both groups experienced 30-minute mindfulness sessions in an elementary school. Children were assessed prior to the treatment and reassessed upon completion of the intervention (Flook et al., 2010).

Mindfulness may be a useful method in the prevention and treatment of a mental health diagnosis (Wisner, 2008). Mindfulness has been shown to reduce emotional distress, promote emotional balance, increase attention, and increase motivation. Research has shown that individuals who practice mindfulness on a regular basis can enhance tolerance for distress by changing automatic responses patterns, restoring emotional balance, and preventing disruptive classroom behavior (Flook et al., 2010; Taylor & Mireault, 2008; Wisner, 2008).

Mindfulness interventions have been shown to help individual's progress toward a goal and work through any circumstances during the process (Taylor & Mireault, 2008). Taylor and Mireault (2008) believed that social cognitive models of self-regulation are effective to individuals, depending on the individual's level of understanding and awareness of internal and external stimuli for effective self-control. Cognitive benefits of school-based mindfulness training for youth include the possibility to increase attention and concentration and decrease anxiety. Mindfulness meditation interventions also lead to increase emotional and behavioral self-regulation, tolerance for frustration, and self-control (Wisner, 2008).

In a mixed-methods study, Wisner (2008) provided an eight-week mindfulness meditation (MM) group program for high school students. Meditation moments increase over the sessions. Sessions began with four-minute meditation exercise and, towards the end of the treatment, increased to ten-minutes. Wisner (2008) conducted a pre- and post-test to measure progress and changes in students' behavior and emotional stance. Students indicated an increase in their interpersonal and intrapersonal capabilities, improvement with family relationships, enhanced school functioning, as well as overall effectiveness. More specifically, MM helped increase their self-regulation by helping students feel they were able to remain calm, relieve stress, feel more relaxed, and improve their emotional coping skills (Wisner, 2008). In addition, students reported having a better understanding of who they are. In addition to mindfulness intervention, self-regulation and attention skills have been facilitated by focused practice in gaming environments.

Neuropsychologically Informed 'Brain Training' Interventions for Facilitating Self-Regulation and Executive Control Skills

Neuroplasticity is the concept that brains are flexible and adaptable (Hardy & Scanlon, 2009). Neuroplasticity decreases as our neurological system matures (Doidge, 2007). There are

often claims of critical and sensitive periods (during an age where our brains' capacity to learn and adapt is most evident), after which little development or flexibility are possible (Kesler, 2008). Recently, neuroscientific findings have challenged previous beliefs about crucial and sensitive periods for neural adaptability. Accordingly, there is interest in taking advantage of neuroplasticity that might be evident (at least to some extent) across the life course. Programs such as Lumosity (Hardy & Scanlon, 2009) and others offer brain games to train the brain. These and other non-invasive treatments have proven useful in working with individuals with dementia (Hockenbury & Hockenbury, 2007), memory loss (Doidge, 2007; Hardy, 2009) attention deficit (Blair & Diamond, 2008), visual processing (Draganski, 2006), and speed of processing (Ball et al., 2002).

Multimedia technology, such as on-line or video games, can be used make individuals use their skills in an intensive, repeatable, adaptive, and highly targeted way (Green & Bavelier (2003). On-line games have been gaining impact on children' self-regulation and cognition (Hardy & Scanlon, 2009). Challenging the child to remember a sequence of targets, retain the information, and then manipulate the memories is one of the goals for on-line programs (Green & Bavelier, 2003). Studies conducted from video games found remarkable evidence of changes in the brain. A study by Green and Bavelier (2003) found individuals who play video games performed better in visual attention when compared to individuals who do not play video games.

Computer based programs have been shown to help children improve attention, executive functions, and to better self-regulate themselves in their daily lives (Hardy, 2011). Hardy and Scanlon (2009) in a similar study found how working memory programs can be beneficial for children with attention deficit hyperactivity disorder (ADHD). They believed that if a child works in their memory it will help them to process information in their environments, and will

improve the child's overall behavioral and academic performance outcomes. The program consisted a computer-based training that challenged the child to remember what to do, retain the information, and then manipulate it. In another study, improvements were seen regarding attention after the training in visual memory and response inhibition (Green & Bavelier, 2003; Hardy & Scanlon, 2009; Klingberg et al., 2005). Increased levels of working memory, attention, and mathematical reasoning performance were observed after the intervention (Olesen, Westerberg, & Klingberg, 2004; Holmes, Gathercole, & Dunning, 2009). This study is another example that cognition can be trained and positive outcomes can make an impact in people's lives (Hardy & Scanlon, 2009). These types' video games have shown to enhance student's motivation, increase their processing skills, their memory, attention, mental flexibility, and problem solving (Olesen, et al., 2004).

Based on neuropsychological data, developers of brain training resources such as *Lumosity* focus on challenging memory, and visual motor capacity by requiring individuals to take in information, create a situation from that information, retain it in the mind, and then manipulate it (Kpolovie, 2012). *Lumosity* is an on-line cognitive training that enhances an individual's memory and attention through innate neuroplasticity (Hardy, 2011).

Accordingly to Haier, Karama, Leyba, and Jung (2009), *Tetris* has also been shown to change of the brain. Haier et al., (2009) asked a group of adolescents to play *Tetris* during three months, during the three months the brain was recorded before and after playing. As a result of playing Tetris, the brain records demonstrated change in structure and functioning.

According to Green and Bavelier (2003) activities similar to Tetris are interactive and can be used to practice in an intensive, repeatable, adaptive, and targeted way. This advance in technology, combined with the brain's capacity to restructure itself, has led to an interest to use

of technology games. Individual participation in computer mediated 'micro worlds' facilitate engagement in goal structures that encourage and challenge the attentional resources incidentally (Haier et al., 2009). Individuals regulate their attention, make decisions, and allocate thinking resources as part of an overall activity goal; without realizing the extent to which they are exercising high level skills self-regulation skills (Green and Bavelier, 2003). Accordingly, the practice of these skills (and perhaps improvement in general capacity) is perceived as intrinsically motivating to the individual; it is part of the game (Deci et al., 2015). Given the considerable and foundational importance of self-regulation skills expected for our daily living process, opportunities to engage learners in deliberate practices that facilitate the development of their attentional control seems paramount.

Statement of the Problem

Attentional skills such as the ability to maintain focus in the context of distraction have been shown to be related to the overall cognitive performance (Test of Variables of Attention, 2013) especially related to academic performance in the classroom (Brown, 2006). Students exhibiting executive control (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011) recognize how to direct their cognitive resources in ways that facilitate their academic classroom performance. Previous work on attentional skills has illustrated individual difference (Moilanen, 2007), development differences (Scope, Empson & McHale, 2010) and deficits related to Executive Functioning for clinical populations (e.g., ADHD; Barkley, 2012). Learning how to control emotions and behavior begins in pre-school. Self-regulating skills are important for young children to develop in order for the children not to have difficulties in school as well as having healthy relationships with peers (Shonkoff & Phillips, 2000; Hair, Jager, & Garrett, 2001). Young adults who do not have self-regulation skills are more likely to struggle with

regulating emotions and behaviors, leading to risky and unhealthy behaviors (Grolnick, Gurland, Jacob, & Decourcey, 2002; Shapiro, 2000). Children and adolescents that are able to control or suppress impulsiveness, adjust behavior, and self-regulate have been linked to positive outcomes (Baummeister & Vohs, 2007). There is increasing interest in 'brain training programs such as Lumosity that address the cognitive functioning in adults and children. This emerging science of the brain is considerably changing the way we view how the brain works (Green & Bavelier, 2003). Lumosity stimulates and activates the brain in a way that changes its structure in a more efficient way of processing information, paying attention, remembering, thinking, and solving problems (Green & Bavelier, 2003; Hardy & Scanlon, 2009).

Empirically validated interventions are needed to address self-regulation of students in school settings. Contemporary research on effective interventions has shown to reduce mental health issues and improve academic performance and classroom behavior (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Greenbert et al., 2003; Zins, Weissberg, Wang, & Walberg, 2004).

The ability to exercise control over attention is essential for the acquisition of skills in a range of areas, including the academic performance in classroom (Wass et al., 2012). Previous work on attentional skills has illustrated individual difference (Moilanen, 2007), development differences (Scope, Empson, & McHale, 2010), and deficits related to executive functioning for clinical populations (Barkley, 2012). However, there is a paucity of research demonstrating the impact of short-term mindfulness-based attentional skills training (MBAST) on academic performance of school children.

Purpose of the Study

The purpose of this study was to explore the impact of attentional skills practice training on perceptions and self-regulation of attentional skills related to school performance of elementary school children. The goal of the study was to provide an opportunity for children to practice self-regulation skills as part of a structured training protocol involving mindfulness and skilled practice in motivational cognitive tasks.

This study used a mindfulness based attentional skills (MBAST) for elementary aged children. This study explored the impact of an 8-sessions attentional skills training protocol focused on attentional regulation skills (executive functioning) of elementary school children.

Research Questions

This multivariate repeated measures analysis of variance addressed four overarching research questions:

Research question 1. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on parent reports of their children's difficulties with self-regulation behaviors (e.g. managing time, impulsive control)? Prior to their participation in this study, parents were asked to describe any difficulties their children experienced with self-regulation over the past six months.

H_1: It was expected that parent scores on the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley, 2012) would indicate a significant reduction of self-regulation difficulties on the post-MBAST intervention when compared to pre-intervention scores (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences on parent scores on the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley, 2012) on the post MBAST intervention when compared to pre-intervention scores (pre-test).

Research question 2. What is the impact of an 8-session mindfulness-based attention skills training (MBAST) intervention on students self-reports of their intrinsic motivation and self-regulation beliefs related to academic (school related) behaviors (e.g. completing homework, maintaining focus during class work)? Students were asked about their motivation for classroom behaviors related to completion of their school work.

H_2: It was expected that student self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1999) would be significantly higher after their participation on the MBAST intervention (post-test), when compared to pre-intervention assessments (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no difference in students' self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1999) after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test).

Research question 3. What is the impact of an 8-session mindfulness-based attention skills training (MBAST) intervention on students' self-reported perceptions of mindfulness attitudes and beliefs? Children were asked to reflect upon their awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention. The MBAST protocol utilizes didactic approaches to facilitate self-understanding through mindfulness techniques.

H_3: It was expected that student self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the

Children Acceptance Mindfulness Measure (CAMM, 2005) would be significantly higher after their participation on the MBAST intervention (post-test), when compared to pre-intervention assessments (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences in student self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the Children Acceptance Mindfulness Measure (CAMM, 2005) after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test).

Research question 4. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on students' performance on two standardized (age normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints. Self-regulation and direction (executive control) of attentional resources is needed on vigilance tasks that require quick and accurate decisions. Children were asked to complete two standardized timed 'matching to sample' performance assessments (WISC-III – coding and symbol search performance subscales) during each of the 8 MBAST intervention sessions. Each of the performance tasks assesses performance based on accuracy of response and latency (speed) of response.

H_4: It was expected that students' performance on WISC-III coding and symbol search subtasks would show continuous improvement across 8 sessions of the MBAST intervention. This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences in students' scores on WISC-III coding, and symbol search subtasks would show continuous improvement across 8 sessions of the MBAST intervention.

Significance of the Study

Brown (2006) refers to cognitive function as the ability to maintain focus and shift one's attention from task to task. The inability to focus and sustain attention often leads to incomplete tasks. Insufficiencies in the ability to change attention may lead to repetitive behaviors in children. There is a need for consistent routines in children's their lives (Gioia et al., 2000).

This study provides further information to the current literature on how to help children learn more effectively in the classroom. While all children learn to self-regulate their behavior at some level, subclinical presentations of learning difficulties may impede some of the children's ability to benefit from standard classroom instruction. Posner and Rothbart (2007) stated that self-regulation, cognition, and emotions are important elements of the attentional executive control processes. This program explores the benefit of an empirically validated intervention on children's ability to direct and sustain their attention strategically in the context of self-reflection and application to a goal-orientated gaming environment. It was expected that generalization of the training techniques would facilitate the children's learning in the standard classroom environment. It was expected that the children would understand the benefits of practicing mindfulness techniques to their learning consistent with contemporary findings in neuroscience, our results may develop the ability to pay attention and set shifting in ADHD (Zylowska et al., 2008). Attention is an important role in the development of self-regulation and executive functions (Brown, 2006; Rueda, Posner, & Rothbart, 2004).

This study provides new tools and techniques for counselors, teachers, and those working

with children to help improve students' conduct, attention, cognitive function, and impulse control.

Population and Sample

The proposed sample for the current study included 24 children attending third to sixth grades in an elementary school. The selection of participants was on a voluntary basis, along with the approval of Institutional Review Board (IRB), parental consent, participant assent, and assent from the principal of the elementary school. All students were given the chance to participate, however only a few chose to participate. The students' estimated age ranged from eight- to 12-years-old. Five students belonged to the third grade; six were in fourth grade; six were in fifth grade; and seven were from sixth-grade. No incentives were offered, and participants were also given the option to discontinue at any time.

Participants were asked to participate in a Self-Regulation and Executive Function intervention consisting 8 sessions. After the students were recruited, a predetermined schedule was agreed upon with the principal and teachers.

Methodological Approach

A multivariate repeated measures ANOVA research design provided an opportunity to observe changes in skills as a function of participating in training sessions. This research design was chosen over a t-test with the intent to avoid type 1 error. As a variant of multiple baseline designs, a repeated measures MANOVA design can address changes in a group of individuals over time (Carey, 1998). A MANOVA study examines variables being assessed and monitors the group's change over time (Carey, 1998). A researcher uses multiple observations to monitor progress across time with a given intervention.

This study employs a doubly multivariate design in which two measures of attention are assessed during each treatment session. Changes in performance on coding and symbol search across sessions are hypothesized to reflect impact of the MBAST training sessions, in addition to the repeated measure of attentional skills (coding and symbol search). Pre-intervention parent and self-report measures (self-regulation and mindfulness) were collected. Pre-intervention measures were again collected during the final intervention session (session 8) to allow for a comparison between pre-intervention and post-intervention measures. Differences in parent-reported self-regulation and child-reported mindfulness would be used to evaluate the impact of the MBAST training program.

Data Collection and Analysis

This study addressed the self-regulation and executive control of attention skills (memory, visual perception, attention, planning, and decision-making) of children whose ages ranged from eight to 12. A battery of standardized, psychometrically sound measures of executive functioning was used. Specifically, the study provides an evaluation of an 8-session mindfulness based attentional skills (MBAST) intervention designed to increase the student's attention and self-regulation skills. The intervention incorporates mindfulness techniques within a series of sessions involving student engagement with computer-mediated gaming activities that require strategic utilization of visual processing, memory, and decision-making skills presented in functional contexts (e.g., games). In each of the 8 sessions, children participated in a mindfulness experiential activity and work independently (usually on a computer) on an interactive video game designed to assess their skills in a variety of attention and self-regulation tasks. Performance measures (response time, accuracy of response) are recorded for each gaming session. Students' participation in MBAST sessions was monitored and expected to have a

positive impact on their ability to regulate attentional resources. In addition, the MBAST protocol utilized engaging 'game like' activities to facilitate student motivation. In specific student regulation of attentional skills was assessed at the end of each session by measures of performance on two standardized measures of visual attentional skills (WISC-III, coding subtest, and the symbol search subtest). The coding subtest assesses visual-motor dexterity, speed, accurateness, and the student's ability to manipulate a pencil (WISC-III; Wechsler, 1991). The subtest symbol search assesses student's ability to select if the sample symbol appears among the ones on the search group. Perception and recognition are the two crucial requirements, in addition to speediness, accuracy, attention, and concentration (WISC-III, 1991).

Students participated in the program two times each week. During the 8-sessions, empirically validate cognitive subcomponents were challenged by tasks within each session, including video simulations focused on working attention, memory, executive function, self-control, self-regulation, logic, and reasoning. Activities included online games, such as those widely available on public websites (e.g., http://www.pomindcake.com/).

MBAST protocol topics were presented in eight 45-50 minutes in a group sessions with a maximum number of 20 students. Group sessions were formatted as psycho-educational training sessions. During the sessions, the researcher included exercises related to the areas mentioned above.

During the first session no interventions were used; this period was used as a baseline pre-testing phase (Sheperis & Miller, 2008). The following instruments were used: Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley & Russel, 2012), Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005), the

Questionnaire on Academic Self-Regulation (SRQ-A; Ryan & Connell, 1989), and the Wechsler Intelligence Scale for Children (WISC-III, 1991).

In each of the following 6 sessions, students participated in mindfulness activities, engaged in computer mediated attentional skills practice, and completed two standardized attentional skills assessments (WISC-III coding and WISC-III symbol search). The intervention consisted of consecutive sessions lasting for 45-50 minutes. During the sessions, activities were provided to the students. The outline of MBAST sessions follows:

Session 1: All participants completed four brief pretests: Child Acceptance and Mindfulness Measure (CAMM), the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA), the Questionnaire on Academic Self-Regulation (SRQ-A), and the Wechsler Intelligence Scale for Children (WISC-III). The primary researcher collected all of the surveys.

Session 2: What is mindfulness?; mindfulness activity; attention bird alert game (http://www.pomindcake.com/game/birds); assessments.

Session 3: Breathing techniques; where's Waldo picture; attention bird alert game; assessments.

Session 4: Mindfulness meditation; drawing of environment picture; executive function climb it online game (http://www.pomindcake.com/game/climb); assessments.

Session 5: Mindfulness activity; Stroop game; working memory, twins online game (http://www.pomindcake.com/game/twins); assessments.

Session 6: Mindfulness breathing; executive function soda game (http://www.pomindcake.com/game/soda); assessments.

Session 7: Mindfulness activity; Stroop test; closing session

Session 8 (follow- up): Participants were asked to complete the four surveys during a time that was acceptable to their respective teachers. In this phase, interventions were longer used. The purpose of this phase was to analyze if changes occurred after the intervention in students behaviors, attention levels, and self-regulation. Again, the same instruments would be administered in the same days of the week.

Instrumentation

Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley, 2012)

BDEFS-CA (2012) is a rating scale designed to evaluate the major components of executive functioning in daily life activities of children, as reported by their parents (Barkley & Russel, 2012; Berkeley & Riccomini, 2013).

Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005)

CAMM (2005) is a 25-item measure of mindfulness and assesses the level to which children and adolescents are capable of observing internal experiences, acting with consciousness, and accepting intrinsic experiences without judging them. Participants are asked to indicate how true each item reflects their experience using a five-point scale ranging from 0 (Never true) to 4 (Always true).

The Academic Self-Regulation Questionnaire (SRQ-A; Ryan & Connell, 1989)

SRQ-A (1989) evaluates the flexibility to stimulate, observe, prevent, persevere and/or adapt an individual behavior, attention, emotion, and cognitive strategy in reaction to direction from internal cues, environment, and peers influence.

The Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991)

WISC-III (1991) is an individually administered instrument that is designed to evaluate multiple aspects of a child's intellectual ability (Pearson Education, 2008). Two subtests were utilized on the WISC-III: coding and symbol search. Symbol Search is a supplementary performance subtest from WISC-III, as well as coding. WISC-III subtests are useful and appropriate for a number of purposes. These include psycho-educational assessment as a part of educational planning, and placement and diagnostic assessment among school-aged children and research. Performance subtests (i.e. coding and symbol search) can be scored independently and have been validated as subtests of the WISC-III for quickly scanning and correctly sequencing simple visual stimuli.

The researcher's primary interest was in intra-individual variation in executive control functioning of children across time in this study. The symbol search and coding subtests are not appropriate for making claims about general intellectual functioning. The standard administration of WISC-III was individualized; however, group administration modifications were allowable under administration guidelines. An overview of the scoring of the symbol search and coding guidelines is: symbol search (WISC-III subtest) has two levels, A and B. Both levels are included in a single booklet separate from the Record Form, and each level contains 45 items. For each item, the child visually scans groups of symbols, a target group, and a search group. The child indicates whether or not a target symbol appears in the search group by marking the appropriate box. Administration and scoring: The time limit for this subtest is 120 seconds. A child's score is the total number of correct responses minus the total number of incorrect responses. The examiner scores the responses with the symbol search-scoring template. The coding (WISC-III) subtest also contained two levels: coding A and coding B (according to age

ranges). The coding test has a time limit of 120 seconds. The total number of items is 59 for coding A and 119 for coding B. Administration and scoring: WISC-III retains two starting points, and the number of items with two trials is two. Additionally, only two WISC-III items have alternative arrangements that receive credit.

A demographic questionnaire included age, ethnicity, gender, and grade level. The demographic questionnaire was provided to the participants in the beginning of the intervention.

Key Concepts and Definitions

Several terms were used throughout the writing of this study:

Executive function is the regulation of cognitive processes including attention, memory, and motor skills (Blair, 2002; Blair & Razza, 2007).

Attention is a state of focused awareness on a subset of the available perceptual information (Richard & Zimbardo, 2002).

Mindfulness is being able to purposefully pay attention to the present moment and remaining non-judgmental (Kabat-Zinn, 1994).

PYD is Positive Youth Development.

Self-regulation is the ability to control impulsive behavior (Moilanen, 2007, Demetriou, 2005, Novak and Clayton, 2001).

*Cognitive self-regulatio*n is a child's self-reflectiveness, planning, and thinking ahead. Children with these capabilities are in control of their thoughts, tend to monitor, evaluate, and adjust when necessary their own behavior and abilities (Bandy & Moore, 2010).

Social-emotional self-regulation is the ability to reframe from negative responses and delay gratification (Bandy & Moore, 2010).

Limitations

Considering the fact that the study only covers children and parents from a singular elementary school in South Texas, the results may not be generalizable to other settings. There is also a concern related to the short period of the study (four weeks), therefore the results might not be generalizable to a larger population.

The researcher cannot be certain the intervention alone caused any change; extraneous variables may have influenced and affected any possible outcome. Another additional limitation regarding this design is the fact that coding and symbol search subtests were used a total of eight times, which might create a practice effect due to the repeated administration of the same test.

An additional limitation to this study is the internal validity of the parents' responses. These types of measures are susceptible to bias by the guardians (Heppner, Wampold, & Kivlighan, 2008).

Organization of the Dissertation

Chapter two of the dissertation presents the literature review related to the topic. Chapter three discusses the methodological approach used in this study, including data analysis. Findings are reported in chapter four. Chapter five contains the discussion of finding, implications, and recommendations for future research.

CHAPTER II: LITERATURE REVIEW

This chapter reviews the empirical literature on self-regulation and executive control processes that are foundational to an individuals' capacity to direct their own behavior (thinking resources) in daily life. While this research project and literature review often treat two constructs as synonymous, this chapter consolidates the contribution of literature from distinct philosophical traditions addressing human developmental processes; Social learning and Social Cognitive (Bandura, 1997; Zimmerman, 2000) emphasizing the term Self-Regulation and Human Information Processing (Norman & Bobrow, 1975) emphasizing Executive Control processes. This project emphasizes exploration of both perceptual self-report processes (akin to social cognitive approaches), as well as psychometric investigations of processing capacity on WISC-III subtasks (akin to Human Information Processing theoretical approaches).

Research on so-called "executive control processes" describes individual capacity and tendency to direct one's own resources (Moilanen, 2007). Research findings in this area are considered synonymous with efforts to describe self-regulation processes (Deci, Ryan, Schultz, & Niemiec, 2015). The terms have emerged from different research traditions and, accordingly, emphasize different constructs. Self-regulation processes emerge from social cognitive theories of development (Bandura, 1997; Zimmerman, 2000) as they emphasize the interaction of organismic variables (e.g., personal beliefs, behavioral tendencies) and their reciprocal interaction (Bandura, 1997) with environmental stimuli as foundation to behavioral expression.

Research on exploration of executive control processes emphasizes the role of cognitive processes within tradition of human information processing theories (Norman & Bobrow, 1975; Erikson & Driver, 1983). This theoretical approach often metaphorically conceptualizes as a

computer metaphor (Barsalow, 2014) emphasizes cognitive subcomponents such as (short term and long term memory capacity) that are foundational to cognitive performance (Kellogg, 2015).

Self-Regulation and Executive Control of Attentional Skills

Self-regulation can be perceived by the management of intellectual functioning components, such as thoughts and feelings (Zimmerman, 2000). Attentional self-regulation is one's capacity to manage and direct attentional resources to effectively accomplish tasks. Self-regulated behavior includes key executive control processes (Moilanen, 2007) and components which help individuals adapt; stimulation flexibility, observe, prevent, persevere, adapt an individual behavior, emotions, attention, and cognitive strategies in reaction to direction from internal cues, environment, and peers influence (Hrbackova & Vavrova, 2015; Moilanen, 2007; Demetriou, 2005; Novak & Clayton, 2001).

Self-regulation skills are important to academic school tasks, as well as to success with peers (Shonkoff & Phillips, 2000; Hair, Jager, & Garrett, 2001). Young adults who do not have self-regulation skills will more likely develop issues with regulating emotions and behaviors, leading to risky and unhealthy behaviors (Grolnick, Gurland, Jacob, & Decourcey, 2002; Shapiro, 2000). Children and adolescents that are able to control or suppress impulsiveness, adjust behavior, and self-regulate are linked to positive outcomes (Baummeister & Vohs, 2007). Auto-regulation is important during a child and adolescent development because it enhances well-being and also influences how other people see them as being responsible for their own behaviors. According to the Early Child Care Research Network (NICHD, 2003), children who are not well-regulated are more likely to evoke negative reactions from others. Moreover, the ability to control behaviors is fundamental for learning (Belsky, Friedman & Hsieh, 2001; NICHD, 2003). Attention, memory, and motor skills are crucial subcomponents of the attentional

self-regulation system (Blair & Diamond, 2008) and are therefore critical to academic performance (Flook, et al., 2010; Lenz, 2013).

A study by Napoli, Krech, and Holley (2005) showed that, overall, the 194 randomized school children from first through third grade improved on attention measurements, as well as selective attention scores (Deci et al., 2015). Counselors and therapists in schools know the severe impact that lack of attention and self-regulation can have on a child's development (Felver et al., 2013). In 2000, the United States Department of Health and Human Services reported that one child in 10 suffers from a mental health condition and one in five suffers from some type of impairment that affects their daily academic and social aspects.

Self-regulation capacities serve to facilitate adaptive functioning in both affective and cognitive domains. Well-regulated emotions support cognitive functions, although they will inhibit attention and decision-making capacities when they are poorly controlled (Eisenberg, Spinrad, & Eggum, 2011).

Zimmerman (2000) and Silva et al., (2004) state that self-regulated actions occur in a number of phases and are often related to an individual's conceptualization of the goal and perhaps its anticipated rewards. Anticipation and preparation are related to the establishment of the pedagogic goals and the choice of a plan. In this anticipation and preparation phase, the child choses what he/she is going to do and what is the main goal. This phase is obviously influenced by motivational constructs. Silva, Duarte, and Simão (2004) believed that if the students are actively involved in the education process, it is necessary that they understand and value the learning and their efforts to be successful, even when the activities do not seem very interesting. It is necessary that the student values the goals, establishing them as his/her own, even though they are not exclusively ruled by pleasure but fundamentally by the need of belonging and

wanting to achieve a higher goal. The second phase is referred to the execution and control, which means that goals have to be accomplished after the first phase. The child is now responsible for his/her own learning strategies and attention span, time, behavior, physical environment, and their own internal processes. In this phase, it is important that an external person reminds the child of its own responsibilities. The third and last phase is called self-reflection and self-reaction, which refers to the possibility and tendency of the child to evaluate the process and its results. This evaluation is mostly influenced by motivational and cognitive constructs. These phases happen in a dynamic way and can differ in direction and time frame.

Executive Control of Attentional Skills

Executive control is the ability to regulate cognitive processes including attention, memory, and motor skills (Blair, 2002; Blair & Razza, 2007). Executive control of attentional skills have been the focus of several studies and can be defined as the ability to maintain focus in the context of distraction, and have been shown to be related to overall cognitive performance (Test of Variables of Attention, 2013), especially related to academic performance in the classroom (Brown, 2006). Executive control and functions play a complex role in children development. Executive functions are defined as the ability to enhance one's capacities such as attention, motor skills, and memory (Blair & Diamond, 2008). Executive functions are organized and exercise control in a specific way on the cognitive processes. These allow the individual to have more flexible strategic thinking, as well as to self-regulate, control impulses, decision-making, planning, and solution-focused thinking, and to direct their attention in ways that support task completion. This group of cognitive and metacognitive processes is responsible for the control and redirection of behavior (Carvalho & Abreu, 2014; Dias, 2013).

Humans have the capacity to exercise control over attention, and this has been shown to be the core part of our cognitive capacity (Posner & Rothbart, 2007; Ruff, 1990). This capacity requires acquisition of skills that will allow individuals to regulate, redirect attention, and to avoid distractions by maintaining focus for a long period (Colombo & Cheatham, 2006; Ruff, 1990; Ruff & Rothbart, 1996; Scerif, 2010). Attentional skills improve as we mature, leading to a more successful on-task concentration that improves performance (Plude, Enns, & Brodeur, 1994). Students exhibiting executive control (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011) recognize how to direct their cognitive resources in ways that facilitate their academic classroom performance. Previous work on attentional skills has illustrated individual difference (Moilanen, 2007), development differences (Scope, Empson & McHale, 2010), and deficits related to executive functioning for clinical populations (e.g., ADHD; Barkley, 2012).

Rothbart (1998) believed that the ability to inhibit a dominant response in order to implement a subdominant one is called “control.” The effort to control includes the capacity to voluntarily generate attention (auto-regulation) and inhibit (inhibit control) or activate (activate control) behaviors every time it is necessary to adapt.

Development of Self-Regulation and Executive Control skills

Children’s development of attentional self-regulation skills may involve general regulation of emotional content (Kopp, 2002). Emotional regulation as an integrative process of functioning and psychological development that connects between the emotional regulation and the cognitive processes, like attention (Kopp, 2002; Cole, Martin, & Dennis, 2004; Bridges, Denham, & Ganiban, 2004). According to Schore (2001, p.9) “ the regulation of affect is a central organizing principle of human development and motivation.” This plays a central role in development, implicating the social and cognitive development (Calkins, 1994; Martins, 2007),

and makes it fundamental to the understanding of adaptation trajectories (Martins, 2007). When there is a lack of emotional regulation, this brings a negative impact in other behavior systems (often causing disrupt behavior), dampens personal goal completion, and negatively affects interaction with the environment and the child's integrity and emotional wellbeing (Bridges et al., 2004).

Children present great progress when talking about the effort to control a behavior, and, consecutively, in their auto-regulation, in their first five years of life (Rothbart, 1998). It is believed that certain aspects of personality come from biological factors (such as hereditary and environment factors) like pre-natal environment and can be affected by those during infancy. The effort to control involves the capacity of executive attention. This type of capacity is related to the voluntary control of thoughts and feelings, problem solving discrepancies, correction of mistakes, and when doing new things (Posner & Rothbart, 1998).

Normative Developmental Patterns of Self-Regulation of Attentional Skills

Approaches to understand the normative developmental patterns became popular in the last few decades. Connected to these patterns are the executive functions, which continuously develop until the beginning of adulthood. During the developmental ages of four and eight, the executive function is the most intense (Center on Developing Child, Harvard University, 2011; CDCUH). Because of this long process, the development and maturation of the EF are susceptible for changes in behavior, making these changes harder for those who suffer from them. CDCUH (2011) found that EFs are essential for cognitive and social development; children are born with the ability to develop EFs; and between the ages of three and five, EFs have the biggest window for development. At the age of three, children are capable of following rules and directing their attention for a short amount of time. At age five, children can change

from task to task and still memorize the previous task, and are more resistant to distractions. At the age of seven, the brain structures become more similar to the adult brain, and children have the ability to plan, follow rules, focus, and control impulses.

Research in several theoretical traditions has demonstrated executive control continually increases during school years and may slowly improve into adulthood (Leon-Carrion, Garcia-Orza, & Perez-Santamaria, 2004). Improvement of executive control of attention was noted to increase until the age of seven, but not thereafter (Rueda et al., 2004). Crone, Donohue, Honomichl, Wendelken, and Bunge (2006) found persistence limited distractional errors from the age of eight until 18. Developmental changes in effortful self-control reflect a shift from external to internal sources of control (Kopp & Neufeld, 2003).

A feature of effortful control is the ability to monitor and think about one's personal attention (Flavell, 1979). Piaget identified one's ability to monitor and regulate one's own thinking (Piaget, 1983). However, other theorists have disputed the "normative claim" and observed a more gradual capacity to increasingly direct thinking at younger ages (Spinrad & Eggum, 2011).

Historically, developmentalists have addressed deficits in optimal executive control processes as indicative of either a meditational (inability to implement a resource) or production (lack of temporal awareness of the usefulness of a given resource) deficiency initially identified in thinkers by Flavell (1987). Meditational capacity is the ability to use and implement a strategy effectively when needed. For example, meditational capacity is necessary when individuals improve their comprehension by rereading a text passage (Hahn, 1984; Yu-Fen Yang, 2002). Production capacity is the ability to recognize the need (import and/or value) a particular strategy for improving performance in appropriate time (Berkeley & Riccomini, 2013). For example,

someone may not appreciate in the moment that rereading a difficult text passage will likely improve his or her comprehension.

Traditionally, remediation of production deficiencies seem more easily remedied (by training), and further seems to reflect a lack of awareness, or motivation for use of a strategy rather than a processing deficit (Holmes et al., 2009). Children can be taught strategies which help remind themselves about the usefulness of specific metacognitive tools in a given problem-solving situation. Moreover, training and practice in awareness of task features may also likely influence "less than optimal cognitive stylistic variations to a task" and may prove adaptive. In contrast, meditational interventions actually involve efforts to enhance cognitive capacity for effective problem solving. Meditational interventions involve teaching specific strategies that students can demonstrate for impactful use. Interventions that involve the practice of focused attention on the present moment, and include engagement in functional and inherently motivating context (such as in a game context), might be especially useful to facilitate changes in executive functioning.

Neuropsychological Studies in the Development of Self-Regulation of Attentional Skills

Advances in neuroscience indicate that self-regulation of cognitive abilities are evident at younger ages (Johnson, 2010). The ability to practice attentional control by the end of the first year of life appears to be mediated by the occurrence of neural circuitry (Harvey, Smith, & Macklem, 2012). Still, according to a Harvey et al., (2012) study, researchers were led to believe that attentional control capabilities continue to progress during the child's development (Davidson et al., 2006), relative to exogenous (i.e. stimulus-driven) aspects of attention, which are relatively more mature at younger age (Harvey et al., 2012).

Further, it is clear that dynamic changes in neural processing capacity continue to emerge across the life course. This adaptability of neural networks is generally referred to as neuroplasticity (flexible, adaptable; Hardy & Scanlon, 2009), which seems primarily responsible for developmental changes across the life course. It has been generally accepted that neuroplasticity decreases as our neurological system matures (Doidge, 2007). There are often claims of critical or sensitive period, during which our brains capacity to learning and adapt is most evident, after which little development or flexibility is possible (Kesler, 2008). Recently, neuroscientific findings have challenged previous beliefs about crucial and sensitive periods for neural adaptability. Accordingly, there is interest in taking advantage of neuroplasticity across the life course. Programs such as Lumosity (Hardy & Scanlon, 2009) offer games to train the brain. These and other non-invasive treatments have proven useful in working with individuals with dementia (Hockenbury & Hockenbury, 2007), memory loss (Doidge, 2007; Hardy, 2009) attention deficit disorder (Blair & Diamond, 2008), visual processing (Draganski, 2006), and speed of processing (Ball et al., 2002).

Approaches to understanding the neurological challenges to optimal self-regulation promise benefits to educational and intervention opportunities. Research studies on students who are diagnosed with Attentional Deficit and Hyperactivity Disorder (ADHD; DSM-V, 2014) or Attentional Deficit Disorder (ADD; DSM-V, 2014) provide insight to the student's memory struggles and problems with planning and organizing (St. Clair-Thompson, 2011). According to a Bryant, Kim, Ok, Kang, and Bryant, et al., (2015) study, students with learning disabilities were more engaged and had better academic performance using electronic devices than the ones using traditional teaching methods.

The structure of the brain is susceptible to negative influences such as stress and fear. This exposition can harm and can be considered a risk factor to the development of executive functions. Diamond (2013) believed that the main risk factors could be: parent neglect, violence and abuse, the use of illegal substances during pregnancy, etc. Another aspect that is important to mention is the social economic status, which CDCHU (2011) believed is a major factor showing high-correlation with poor test performance. Petersen and Wainer (2011) also had the same opinion. In their study, they found that children inserted in a stimulated environment could develop better EFs than the ones in poor environments. Environments that facilitate resiliency and cognitive development are less vulnerable to risk factors.

In yet another article, Bosa (2001) explained how the frontal lobe has an important role in the behaviors of an individual with autism syndrome. In 1986, Duncan found a high correlation of executive functions are compromised if there is a cortical pre-frontal dysfunction (Bosa, 2001). People who had suffered from trauma to these areas of the brain had presented changes in irritability, critical thinking, attention, and memory (Eslinger & Damasio, 1985).

In his qualitative clinical case study, Ott (2002) found that mindfulness training is associated with self-reported improvements in GERD symptoms, medication use, and sleep disturbances. Liehr and Diaz (2010) in their pilot study tried to examine the effect of mindfulness on depression and anxiety for minority children during 10 weeks. Sessions were provided during 15 minutes, five times per week. They found the mindfulness treatment group reduced depressive and anxiety symptoms compared to control group. Mendelson, Greenberg, Dariotis, Gould, Rhodes, et al., (2010) also found their treatment group reduced problematic involuntary responses to social stress and subscales of rumination, intrusive thoughts, and emotional arousal

($p < .01$) compared to controls. According to Pace, Negi, Dodson-Lavelle, Ozana-de Silva, Reddy, et al., (2013), meditation practices correlate with changes in C-reactive protein levels.

Van Der Oord, Bogels, and Peijnenburg (2012) believed that there was an effective relationship between mindfulness for children with ADHD and having mindfulness in parenting. In their study, they included students between age's eight to 12 ($n = 22$), participating in 90 minutes sessions once per week during 8 weeks with a two-month follow-up. Mindfulness training showed that parents and teachers noted improvements in ADHD symptoms of inattention and hyperactivity/ impulsivity. Parent-rated improvements were maintained during the follow-up session. Self-reported levels of child mindfulness also increased at post-test.

Van de Weijer-Bergsma, Formsma, de Bruin, and Bogels (2012) found that MBSR and ADHD could also be positively correlated. They found that these MBSR could improve externalizing problems (by fathers report at posttests), attention problems (by self-report and father-report at the two-month follow-up meeting), metacognition and behavioral regulation (by father-report at the two-month follow-up meeting) and computerized attention test speed and false alarms (at posttest).

Zylowska, et al., (2008) found that 150 minutes sessions done on a weekly basis during 8 weeks of MBSR can be associated with an improvement in ADHD inattention and hyperactivity, attention conflict test, Stroop color-word test, and digit span test. However, youth results could not be independently extracted from those of adults.

When speaking about executive functions, it is important to remember that lack of these can bring serious repercussions later in life. Individuals with challenged memory can develop dementia in an early stage (Gallucci, Tamelini, & Forlenza, 2005). Individuals who develop vascular dementia typically present with dementia syndrome in the cortex; meanwhile, the

primary symptoms are related to the executive functions (Gallucci, Tamelini, & Forlenza, 2005; Roman, 2002). These changes in the executive functions will affect memory, depression, motor skills; meanwhile, individuals may develop Parkinson's disease, urinary issues, and types of paralysis (Gallucci, Tamelini, & Forlenza, 2005).

With some regularity, executive functions are part of several neuropsychological and pathological diagnoses, including ADHD and several other pathologies. Diamond (2013) believed that EFs have an influence in several mental disorders, such as substance use, ADHD, conduct disorders, depression, obsessive-compulsive disorder, and schizophrenia. In her article, she also found that EFs could have an impact in the physical health. When EFs are less developed, this can lead to obesity, eating disorders, substance abuse, and poor adherence to treatments (Diamond 2013).

Individual Differences: Clinical and Sub-Clinical Deficits in Self-Regulation and Executive Control of Attentional Skills

Children progress from basic modulation of stimulation (either reflexively as babies or by using sensorimotor abilities in early childhood) to behavioral strategies in order to adapt and direct cognitive resources (Spinrad & Eggum, 2011). The shift is mediated by increases in the recruitment of higher order cognitive processes referred to as executive control processes (Felver, Doerner, Jones, Kaye, & Merrel, 2013). Flook, Smalley, Kitil, and Galla (2010) found that neurophysiological evidence entails improved aspects of executive functioning (EF) in adults, including attention regulation (Jha et al., 2007; Flook et al., 2010) and metacognition (Teasdale et al., 2002; Flook et al., 2010).

Brown (2006) refers to executive control of cognitive function (attentional skills) as the ability to maintain focus and shift one's attention from task to task. The inability to focus and

sustain attention often leads to incomplete tasks. Insufficiencies in the ability to direct or regulate attention may lead to repetitive behaviors in children. Children benefit from adaptive, consistent routines in their lives (Gioia et al., 2000).

According to Williams et al., (1999) research traditions are a variation of executive functioning and not simply a developmental function subject to maturational processes. In addition to developmental differences, when individuals are less attention-oriented and unable to sustain attention in an earlier stage of their development, they will most likely have issues attention development later in life, as well as other cognitive and behavior functions (Ruff, 1990; Wass, Sceriff, & Johnson, 2012).

These individual differences often involve differences in conscious awareness of strategic monitoring (Flavell, 1974), as well as variability in personal preferences for connecting with the world (i.e., cognitive style; Biemiller & Meichenbaum, 1992). As such, stylistic diversity is likely to reflect both individual differences in salience of task features, as well as aspects of personal preference. For example, work on the Matching Familiar Figures Test (MFFT; Kagan, 1978; Zelkiner, Jeffrey, Ault, & Parsons, 1972) indicates that both developmental and individual differences in information processing have shown to be influenced by the functional demands for attention resources required to complete a given task. Specifically, personalized responses to task demands for cost/benefit sets (analytic or figural) influence response patterns (Duckworth & Kern, 2011). At the same time, developmental differences in cognitive control capacity operate to moderate response pattern, as well.

Some studies in executive function suggest the existence of a correlation between social economic status (SES) and children's executive function development (Hook, Lawson, & Farah, 2013). Farah (2006) and Rhodes, Greenberg, Lanza, and Blair (2011) evaluated children in

kindergarten levels within a low-medium SES and found that the medium SES children performed better on executive function skills than the ones with low SES. In both studies, there were no differences on task performance on the low SES, although children with a medium SES performed better. Rhodes et al., (2011) believed that environmental factors such as stress, stimulation at home, and pre- and post-natal nutrition could play a role on children's executive function development. Adding to that, stress levels in babies could explain partially the effect of the positive care between parents/ child and executive functions, suggesting that parental care can affect the child, modulating the child responses to stress (Blair, Grander, & Willoughby, 2011). Other studies indicate that parental support to a child's autonomy (Bernier, Carlson, & Whipple, 2010), the parental support and non-intrusive orientation, and a non-chaotic family environment (Bibok, Carpendale, & Muller, 2009; Hughes & Ensor, 2009) are important predictors of the future development of a child executive functions in the first infancy.

Mediation vs. Production

Executive control of attentional skills is facilitated and maximized in performance contexts that are engaging and meaningful for individuals. If individuals are skillful in execution of attentional resources or cognitive tool (no mediation deficiency), engaging elements of the task often support awareness and ultimately utilization of a specific cognitive tool that will meaningfully improve performance (Flavell, 1987; Flook, et al., 2010).

To help children to achieve their goals, it is necessary for teachers, guardians, and helpers to promote interest and enthusiasm for the scholarly activities (Pajares & Schunk, 2001).

Motivation in the academic context has been evaluated as a fundamental tool for academic performance and success. Guimarães (2004) stated that a student, when motivated, presents himself/herself as more engaged to learn, making more efforts to solve challenges by

trying to find different approaches to solve the problem and ultimately developing new abilities of comprehension and academic skills. Moreover, the child presents more enthusiasm in the execution of the activities and exhibits proudness about the results when achieved.

Individuals with developed EFs tend to have a better quality of life, better abilities for reading and mathematics, and higher employment productivity. Poor development of EFs can lead to issues with social behavior, imprudence, violence, and a lack of emotionally regulation (Diamond, 2013). On the same note, Lopez, Nascimento, and Bandeira (2005) believed that organization, anticipation, planning ahead, control, working memory, flexibility, self-regulation, and conduct control are important requisites to problem solving in an effective and efficient way.

In the last decade, interventions and training have sought to understand the impact of mindfulness on executive functions. Executive functions positively correlate with academic achievement, which fundamental for a child's success.

Napoli, Kreck, and Holley (2005) found that students between first and third grades (n = 194) included in the treatment group self-reported decreased test anxiety scores and increased selected visual attention. They also had fewer teacher-rated problems in attention and social skills compared to the control. The treatment group completed 45 minute sessions twice per month during 24 weeks. In a similar study developed in 2008 by Lee, Semple, Rosa, and Miller, students (n = 25) between ages nine and 13 years old with delayed learning decreased their Child Behavior Checklist total scores, and also better externalized problems when compared to controls. In a Lau and Hue (2011) study, students with low achievement (n = 48) with ages between 14-16 years old reported a decrease in depression and stress combined scores, increasing their mindful presence and personal growth compared to the control.

Schonert-Reichl and Lawlor (2010) found that mindfulness meditation in 9-13 year old youth (n = 246) during 45 minutes once per week across nine weeks can show improvements in optimism, teacher-reports, and domains of social-emotional and attention/concentration competence compared to controls. Sibinga et al., (2008) also found that mindfulness training was associated with qualitative self-reported improvements in positive attitude, behavior regulation, and self-care. Sibinga et al., (2011) also found that MBSR in a HIV risk group (n = 33) with MT can be associated with reduced hostility, general discomfort and emotional discomfort; meanwhile, qualitative improvements could be observed in relationships and in schoolwork, as well as on their physical health and stress.

In a Singh et al., (2007) study, researchers showed that mindfulness training during 15 minutes, three times per week during four weeks decreased aggressive behavior/bullying at a posttest and follow-up session. Later, in 2010, Singh et al., found that MT could also be associated with parents' reports of improved child compliance to parent requests, as well as a decrease in sibling- and parent-reported aggressive behavior at posttest and follow-up session in males with autism spectrum disorder and Asperger Syndrome (Singh, Lancioni, Manikam, Winton, 2011).

Executive function is frequently considered a major part of the cognitive function. This means that it is involved in all behavior regulation, such as language, memory, and the thinking process. However, some research has proven emotional and social behavior, as well as motivation, are somewhat more difficult to control (Olsson & Ochsner, 2008; Zelazo & Cunningham, 2007).

The academic environment is favorable to the implementation of interventions with the aim to stimulate and work in prevention. In the school setting can be developed academic skills

related to socio-emotional development and control mechanisms. Along with these skills, executive abilities such as planning, organization, inhibition, and problem solving have been emphasized by Diamond, Barnett, Thomas and Munro (2007) and Meltzer (2010) as capacities to be taught and trained at school.

Children who are motivated, confident, persistent, and flexible are more likely to succeed when compared to children who lack these skills (Yen, Konold, & McDermott, 2004). These findings promote the application of interventions and programs to facilitate training of cognitive abilities and child conduct, such as control of impulsivity, problem solving, self-regulation, and cognitive functioning (working memory). Programs/interventions that facilitate cognitive abilities and cognitive functions usually include ludic and interactive activities, which aim to improve behaviors in the school setting. Bodrova and Leong (2001) created the Tools of Mind program for preschoolers and worked to improve executive functions. This program promotes socialization by the Vygotsky theory, and the use of external mediators such as planning and language to promote attention and memory (Bodrova & Leong, 2001; Diamond, Barnett, Thomas, & Munro, 2007). PATH (Promoting Alternative Thinking Strategies) was created to help develop socioemotional skills, helping children with behavior (Domitrovich, Cortes, & Greenberg, 2007). Children who participated in this study demonstrated better social and emotional competences, as well as better attentional capacities (Arda & Ocak, 2012; Domitrovich et al., 2007). Other interventions such as "*Pay Attention!*" (Tamm, Hughes, Ames, Pickering, Silver, Stavinoha, & Emslie (2009) have demonstrated significant improvements of cognitive functions and behavior changes. "Pay Attention!" utilizes techniques to control behavior, impulsivity, and anxiety, while trying to improve cognitive functions like working memory and attention.

Studies have found that children who participate in interventions with the aim of working and developing executive functions have better results in executive function tasks. They also exhibit improvement in alphabetization and math when compared to children in the traditional curriculum (Bierman, Domitrovich, Nix, Gest, Welsh, Greenberg, 2013; Diamond et al., 2007; Dias, 2013; Raver, Jones, Ligrining, Zhai, Bub, & Pressler, 1987).

Mindfulness Interventions on Self-Regulation and Executive Control of Attention Skills

Mindfulness is frequently defined as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 2005, p. 4). More specific to exploration of executive control processes, Felver et al., (2013) defines mindfulness as "the self-regulation of attention so that it is maintained on immediate experiences and orientation that is characterized by curiosity, openness, and acceptance" (p. 232). Core mindfulness skills involve the strategic directing of attention and focus to the present moment (Linehan, 2014; Kabat-Zinn, 2005). These mindfulness skills can be defined in two types: "what" and "how" skills. The "what skills are linked to practicing thinking or skills that take control of our mind. We observe, describe, and practice a behavior. These skills can be helpful when a new behavior is being learned (Linehan, 2014). The "how" skills are related to the ability to accept what is happening in a nonjudgmental way, completing the skills mindfully and effectively (Linehan, 2014). As such, mindfulness constructs apply directly to our capacity for self-regulation, directing our attentional focus (Linehan, 2014). The skills call for the deliberate focusing on what is (including what actions are called for in the situation) and doing. Mindfulness may be most directly related to the observed remediation of production deficiencies in executive function (Posner & Rothbart, 2007).

Mindfulness trainings can be a tool implemented in schools to promote social and emotional learning. Mindfulness practices can impact psychosocial variables, including socioemotional outcomes fundamental for children's lives. Deci et al., (2015) believed that mindfulness programs are "associated with improvements in emotional regulation, emotional wellbeing, interpersonal relationships, and stress reduction" (p.300), as well as increase in neural activity.

Deci et al., (2015) also believed that mindfulness training can be associated with various improvements in self, parent, and teacher reports, as well as objective measures of attention. Flook et al., (2010) found that the lowest performing youth on neurocognitive performance measures may benefit most from mindfulness training (Deci, Ryan, Schultz, & Niemiec, 2015). Mindfulness programs can also produce immediate improvements in people with depression and anxiety, rumination, externalizing problems, and prosocial skills.

Gregoski, Barnes, Tingen, Dong, Zhu, Harshfield, et al., (2011, 2012) found that a 12-week mindfulness training intervention was effective for improving hemodynamic function (systolic and diastolic blood pressure and heart rate) and for sodium handling when compared to the control group. The groups that reported high social stress from exposure to discrimination showed lower blood pressure by the end of the training.

Hilt and Pollak (2012) found differences between pre and posttest in a one-time eight minute audio mindfulness exposure. Mindfulness exposure reduced state rumination after negative mood induction compared to the problem-solving group. Van de Weijer-Bergsma et al., (2014) also found a significant improvement in analysis of emotions, rumination, and parent-reports compared to controls. The study also found the poorest scoring children at baseline showed the most improvement.

Previous research has suggested that mindfulness skills appear to increase traditional metrics of executive control, such as increasing strategic time on tasks (Jaeggi et al., 2008), deliberately focused attention (Holmes et al., 2009), and depth of processing (Klingberg et al., 2005). Further**,** according to Flook et al., (2010) emerging neurophysiological evidences suggest that mindfulness practice in adults increases aspects of executive functioning (EF), including attentional regulation (Jha et al., 2007; Zylowska et al., 2007) and metacognition (Teasdale et al., 2002). Flook et al., (2010) also found that parents and teachers saw a significant improvement in behavioral self-regulation at home and school in the students who received a mindfulness-based intervention when compared to a control group (Felver, Doerner, Jones, Kaye, & Merrel, 2013). In their study, 64 second and third grade children (mean age, 8.2 years; 55% female) were randomly assigned to either an experimental group (mindfulness-based intervention treatment) or to a control group. During 8 weeks, both groups experienced 30-minute mindfulness sessions in an elementary school. Children were assessed prior to the treatment and reassessed upon completion of the intervention (Flook et al., 2010).

Mindfulness interventions have been shown to help individuals' progress toward a goal and work through any circumstances during the process (Taylor & Mireault, 2008). Taylor and Mireault (2008) believed that social cognitive models of self-regulation are effective to an individual, depending on the individual's level of understanding and awareness of internal and external stimuli for effective self-control. Cognitive benefits of school-based mindfulness training for youth include the possibility to increase attention, concentration, and, as consequence decrease anxiety. Mindfulness meditation interventions also lead to increase emotional and behavioral self-regulation, tolerance for frustration, and self-control (Wisner, 2008).

Barnert, Himelstein, Herbert, Garcia-Romeu, and Chamberlain (2014) studied incarcerated youth males with ages between 14-18 years old, (n = 29). Mindfulness sessions had duration of 60 minutes per week during 10 weeks, with seven hours of retreat. Measurements were taken before and after the study. Barnet et al., (2014) found an improvement in self-regulation in the posttest measurement. Although mindfulness, impulsivity, and perceived stress scores improved, they did not reach a significant level.

Beauchemin, Hutchins, and Patterson (2008) studied the impact of a mindfulness stress reduction (MSBR) program with learning disable students between 13-19 years old during 5-10 minutes, five days per week during five weeks. The mindfulness training group showed reduced trait and state anxiety scores at posttest, and decreases in teachers' ratings on problem behavior.

In other study, Bei, Byrne, Ivens, Waloszek, Woods, Dudgeon, et al., (2012) believed that a mindfulness based cognitive training among 13-15 years old (n = 10) during 90 minutes, once per week during six weeks, would be associated with objective and subjective improvements in sleep quality with effect sizes, ranging from small to large. Small effect size demonstrated an improvement in anxiety symptoms. Biegel, Brown, Shapiro, and Schubert (2009) found that mindfulness-based stress reduction in outpatient psychiatry improved subjects' anxiety and depressive symptoms, somatization, self-esteem, mental health, and sleep quality relative to controls. Clinicians rated higher DSM Global Assessment of functioning and diagnosis change for the mindfulness training group compared to the control at posttest.

In a more recent study completed with grades K-6 in a low SES ethnic minority (n = 409), Black and Fernando (2014) found that mindfulness meditation training improved students' behaviors (attention, participation, caring and respect for others) in teachers' reports. The treatment had duration of 15 minutes with training three times per week during five weeks, with

a follow-up on the seventh week. Coholic, Eys, and Lougheed (2012) worked with youth ages eight through 14 years old under mindfulness meditation training. Subjects underwent training for 120 minutes once per week during 12 weeks. Researchers found that self-reported emotional reactivity (i.e., the ability to regulate the speed and intensity of negative response relative to controls) improved substantially.

According to Diamond and Lee (2011), attention-training methods, including mindfulness trainings, can improve EF in children from preschool up to age seven. Other studies found that EF positively correlates with school readiness, prosocial behavior, and enhances academic achievement (Brock, Rimm-Kaufman, Natahnson, & Grimm, 2009; Bull, Espy, & Wiebe, 2008; Deci, Ryan, Schultz, & Niemiec, 2015). Mental trainings can be one way to help children with poor impulse control, lagged working memory, failure to complete tasks, and disruptive behavior (Anderson, 2002; Deci, Ryan, Schultz, & Niemiec, 2015). Studies reviewed on Deci, Ryan, Schultz, and Niemiec (2015) showed that different types of mindfulness trainings, such as Mindfulness-Cased Cognitive Therapy for Children (MBCT-C), Mindful Awareness Practices (MAPs), and Attention Academy Program (AAP) can positively increase the levels of executive function. A Semple, Lee, Rosa, and Miller (2010) study found that youth between ages nine and 13 improved their academic performance, decreasing attention problems (Deci, Ryan, Schultz, & Niemiec, 2015).

Mindfulness training has proven to change brain structure and function in a manner that helps to protect against deregulated stress. This can happen by the use of meditation, which can activate neural structures that regulate the autonomic nervous system in a way that increases the possibility for relaxation (Holzel et al., 2010; Deci, Ryan, Schultz, & Niemiec, 2015), reducing perceptions of psychological stress, boosting immune function parameters, and to attenuate

biomarkers of inflammation (Creswell et al., 2012; Deci, Ryan, Schultz, & Niemiec, 2015). One study showed that mindful breathing practice increased the prefrontal cortex activation, which may reflect stronger processing of distracting events and emotions, respectively (Burdick, 2013; Holzel, Ott, Hempel, et al., 2007).

In several studies, it was found that children who completed 10 minutes of daily mindfulness training during 12 weeks decreased blood pressure (Barnes, Davis, Murzynowski, & Triber, 2004; Barnes, Pendergrast, Harshfield, & Treiber, 2008; Gregoshi, Barnes, Tingen, Harshfield, & Treiber, 2011). Barnes et al., (2008) replicated his study four years later (n = 66) and found the same results.

Joyce, Etty-Leal, Zazryn, and Hamilton (2010) provided a MBSR to 10-12 years old (n = 141) during 10 lessons with duration of 45 minutes each lesson. They found that mindfulness training was associated with reduced emotional and behavioral problems, as well as depressive symptoms.

In a standard eight week MBSR program with high-risk students between ages 13-19 years old, Kerrigan et al., (2011) found that mindfulness training was associated with qualitative reports of greater awareness and acceptance of thoughts and feelings, reduced stress and hostility, and increased relaxation.

Mindfulness interventions have been proven to help individuals progress toward a goal and work through any circumstances during the process (Taylor & Mireault, 2008). Taylor and Mireault (2008) believed that social cognitive models of self-regulation are effective to individuals, depending on the individual's level of understanding and awareness of internal and external stimuli for effective self-control. Cognitive benefits of school-based mindfulness training for youth include the possibility to increase attention, concentration, and, as

consequence, decrease anxiety. Mindfulness meditation interventions also lead to increase emotional and behavioral self-regulation, tolerance for frustration, and self-control (Wisner, 2008).

In a mixed-methods study, Wisner (2008) provided an eight-week mindfulness meditation (MM) group program for high school students. Meditation moments increased over the sessions. Sessions began with four-minute meditation exercise and, towards the end of the treatment, sessions increase to 10 minutes. Wisner (2008) conducted a pre- and post-test to measure progress and changes in students' behavior and emotional stance. Students indicated an increase in their interpersonal and intrapersonal capabilities, improvement with family relationships, enhanced school functioning, as well as overall effectiveness. More specifically, it appeared that MM helped students to increase their self-regulation by helping them feel they were able to remain calm, relieve stress, feel more relaxed, and improve their emotional coping skills (Wisner, 2008). In addition, students reported having a better understanding of who they are. Along with mindfulness intervention, self-regulation and attention skills have been facilitated by focused practice in gaming environments.

Neuropsychologically Informed Brain Training Interventions for Facilitating Self-Regulation and Executive Control Skills

Studies conducted from video games found remarkable evidence of changes in the brain. A study by Green and Bavelier (2003) found that individuals who play video games performed better in visual attention when compared to individuals who do not play video games. Based on neuropsychological theory, Lumosity works memory by forcing individuals to take in information, create a situation for the intake of that information, hold it in their mind, and then manipulate it (Kpolovie, 2012). Lumosity is an online cognitive training program that enhances

an individual's memory and attention through innate neuroplasticity (Hardy, 2011).

Hardy and Scanlon (2009) found that working memory programs can be beneficial for children with attention deficit hyperactivity disorder (ADHD). They believed that if a child works their memory, it will help them to process information in their environments and will improve the child's overall behavioral and academic performance outcomes. The program consisted of computer-based training to challenge the child to remember what to do, hold that information and then manipulate it, referring to memories. In another study, improvements were seen after the training in visual memory and response inhibition (Green & Bavelier, 2003; Hardy & Scanlon, 2009; Klingberg et al., 2005). Increased levels of working memory, attention, and mathematical reasoning performance were observed after the intervention (Olesen, Westerberg, & Klingberg, 2004; Holmes, Gathercole, & Dunning, 2009). This study is another example that cognition can be trained and positive outcomes can make an impact in people's lives (Hardy & Scanlon, 2009). These types of games have shown to enhance student's motivation, increase their processing skills, their memory, attention, mental flexibility, and problem solving (Olesen, et al., 2004).

According to Panoutsopoulos and Sampson (2012), the use of educational games as part of math classrooms at the school level can be as successful as non-gaming approaches regarding the achievement of subject matter educational objectives (Rosas et al., 2003; Williamson Shaffer, 2006; Ke, 2008). By engaging students in activities involving games, they will more likely develop problem-solving skills, as well as achieve the primary goal: to have good grades in math (Bottino et al., 2007). Panoutsopoulos and Sampson (2012) believed that several matters could increase and improve with the use of video games, such as students motivation, improvement of peer relationships (Robertson & Miller, 2009), improvement of communication, collaboration

between peers and teachers (Rosas et al., 2003), positives changes in students' discipline, as well as on task concentration, peer collaboration, perseverance in task completion (Rosas et al., 2003), responsibility (Rosas et al., 2003; Robertson & Miller, 2009), and, in general, positive effects on elementary school students' accuracy and speed in conducting numerical operations (Robertson & Miller, 2009; Panoutsopoulos & Sampson, 2012).

Foursquare (2012) believed game techniques can be useful when applied to different areas such as education, health, productivity (Deterding, Dixon, et al., 2011), and the academic environment (Huotari & Hamari, 2011). Gamification is the term utilized to represent the game element, techniques, and design in contexts not traditionally related to games (Werbach & Hunter, 2012). Gamification works directly with individuals' motivation. A way to keep individuals motivated is by giving them prizes so they may be extrinsically motivated to play the game. When projecting an activity, gamification is necessary to think about what will motivate the person playing the game. Learning and having fun at the same time has been proven to increase learning capacities, as well as motivation (Marins, 2013). When the aim of a game is to make the person feel happy, automatically the person will be motivated to play it. When this happens, there is a change in the way the human mind works (Schell, 2008).

The use of video games has become more prevalent in American youth. Gentile (2009) found that 88% of adolescents between ages eight and 18 spent an average of 13.2 hours per week playing video games. Lerner, Dowling, and Anderson (2003) found that "video games may facilitate positive youth development" (PYD) (Adachi & Willoughby, 2012, p. 156). According to several authors (Larson, 2000; Olson, Kitner, & Wagner, 2008), adolescents feel intrinsically motivated to play video games. This video game activity is usually not supervised, which might bring more excitement to the adolescent. They may also be drawn to the challenging content and

the fact that it will bring them the social benefits that come with interacting with their peers. Even though this activity of playing video games is somewhat disorganized, it requires that the adolescents are concentrated, are able to follow rules, and do all this while under a constant challenge. The use of video games, according to Larson's theory, will develop new skills including problem solving and adaptation skills (Adachi & Willoughby, 2012).

Some studies, however, concluded that video games could promote violence and aggression (Adachi & Willoughby, 2011; 2012; Konijn, Nije Bijvank, & Bushman, 2007), addiction (Bushman & Gibson; Porter, Starcevic, Berle, & Fenech, 2010; Rehbein, Kleimann, & Möβle, 2010), risk-taking behavior (Adachi & Willoughby, 2012; Beullens, Roe, & Van den Bulck, 2010), and decreased empathy (Krahé & Möller, 2010). However, it's been shown in other studies that video games can produce PYD, promoting well-being, and social and organizational skills (Larson, 2000). Olson et al., (2008) studied adolescent boys with ages 12-14 and found that, even though they find non-violent video games fun, they play violent ones to pursue their fantasies of power and glory. In the same study, Olsen also affirmed that video games could promote their social network, and that can be the link to make the connection with new peers. In a Colwell and Kato (2003) study, researchers wanted to understand if adolescents preferred to spend time playing video games instead of spending time with friends. They found that the scores demonstrated that adolescents preferred playing video games, which can be associated with loneliness or with having an emotional substitute at a time when adolescents are going through difficult phase of their lives. Durkin and Barber (2002) found that playing video games was associated with PYD. Gentile et al., (2009) supported this with yet another study in Singapore. The results of a correlational study of youth subjects (M = 13 years old) showed that

playing prosocial video games was related to helping behaviors, cooperation and sharing, and empathy (Adachi & Willoughby, 2012; p.160).

Several authors (Gee, 2003; Prensky, 2001; Simoes, Redondo, & Vilas, 2013) believed that video games could be used during the process of learning. Gee (2003) found a positive correlation between video games and cognitive development. Game-based learning has become popular in schools, using games for play and serious time. Programs such as those found at www.schoooools.com have been created to promote social learning among students (Simoes & Aguiar, 2011). This program was developed for students between ages K-6. As of 2015, 240 schools were registered and using the program to increase social development among children. This same project was applied in a school in Texas and Chile and has been showing a positive correlation between social learning and the use of games in the classroom setting (Simoes, Redondo, & Vilas, 2013).

Games can also have a PYD by applying the trial-and-error approaches to learning opportunities (Oblinger, 2004; Panoutsopoulos & Sampson, 2012; Prensky, 2011; Chen & Shen, 2010). According to Panoutsopoulos and Sampson (2012), games can integrate "teaching practices with the purpose to facilitate the achievement of standard curriculum educational objectives, increase students' motivation, and develop positive attitudes toward specific subjects and/or school education in general" (p.16). In another study, Vaghetti, Vieira, Mazza, and Botelho (2013) found that Exergame "Kinect XBOX 360" table tennis network could increase intrinsic motivation when done in a cyberspace environment (n = 39). Children played the game by creating their own avatar, learning the tennis table techniques, identifying their mistakes, and learning from them. The results showed a strong positive correlation between multiplayer games and single player games. Interaction and competition amongst players increased when there were

multiplayers instead of single players games.

According to a Panoutsopoulos and Sampson (2012) study (n = 59), commercial/general games were found to provide positive contributions to the mathematics curriculum achievement. Flook, Smalley, Kitil, Galla, Kaiser-Greenland, Locke, et al., (2010) evaluated a group of 64 children with ages between seven and nine years old during 8 weeks, 30 minutes twice per week. Control and experimental groups showed significant differences between baseline and posttest EFs. Children who participated in the MAPs group showed improvement in their scores when compared to the control.

Another type of training can occur when utilizing incidental learning or informal learning. Incidental or informal learning occurs without any intention to learn. In a research study, the participants are not aware that they will be tested on their memory of the learned material; individual learning happens in an unintentional or unplanned way. This incidental learning might occur through observation, repetition, social interaction, and problem solving (Kerka, 2000), and from implicit learning, correcting mistakes, etc.

Bryant, Kim, Ok, Kang, Bryant, et al., (2015; Bryant & Bryant, 2011) found that technology can increase students' functional skills, including students with learning disabilities affecting reading performance (Hall, Hughes, & Filbert, 2000).

Yet another study from Okolo (1992) found that the use of technology may facilitate an increase in student motivation, as well as promoted student tasks engagement. Fisher (1983) measured motivation by the attention an individual applied while learning, the time an individual invested in a task (Okolo, Bahr, & Rieth, 1993), and independence (Manset-Williamson, Dunn, Hinshaw, & Nelson, 2008).

The use of games in education has a variety of benefits, and attentional games have demonstrated success in educational environments (Hanus & Fox, 2015; Stott & Neustaedter, 2013). One factor that helps an individual stay motivated to play is the fact that, independently of how many mistakes they make, they can always restart or play again. The fact that a student has the opportunity to fail and restart again allows them to have no fear increasing their engagement (Lee & Hammer, 2011).

Kapp (2012) explored the influence games can have in a classroom setting. In the last decade, students have become surrounded by technology and video games, in such a way that games are now integrated as a way to improve students' motivation while participating in a classroom gamification (Glover, 2013). With the increased use of gamification in the classroom setting, it became necessary to understand the effects and efficiency of it. Since the majority of the studies suffer from limited samples, comparison groups, singular assessments, and short treatments, there is still a need to study gamification (Hanus & Fox, 2015).

Ke and Abras (2013) explored the possibility of implementing math learning through games with special learning needs students. The purpose of their study was to start a new design and possible future implementation of learner-adaptive educational games, and to find possible features of a game that helps to promote learning while maintaining engagement for such students. During three weeks, they implemented a program in two middle schools in the U.S with a total of 15, one-hour game-play sessions. Ke and Abras (2013) found that educational games, when well-designed or adapted, can promote engagement and learning for these students. Meanwhile, they found that speeded challenge should be avoided to provide more cognitive processing time to students who have decreased understanding of "abstract meaning," poor retention of learned information, and language barriers (Rezaiyan et al, 2007; Ke & Abras,

2013). When students are engaged, this automatically promotes intrinsic motivation. Intrinsic motivation leads the student to feel engaged and is the phenomenon that best represents the positive potential of individuals being considered by Deci and Ryan (2000) the basics for human growth, for psychologically integrity and social cohesion. Intrinsic motivation is when individuals motivate themselves either because they have interest in the activity or curiosity, etc. (Self-Determination Theory, 2012; SDT). Intrinsic motivation is not necessarily externally rewarded, although it can develop passion for an activity and creativity, and cause individuals to go the extra mile to complete a task.

Intrinsic motivation encourages an individual to complete a task without any obvious external rewards. Individuals simply enjoy an activity or see it as an opportunity to explore, learn, and have fun (Coon & Mitterer, 2010). Intrinsic motivation is the reason behind the fact that individuals perform certain activities for inherent satisfaction or pleasure (Brown, 2007; Ryan & Deci, 2000). When individuals are intrinsically motivated, they tend to be more open to new experiences and to be aware of themselves and the activity as they engage in (Deci, Ryan, Schultz, & Niemiec, 2015).

The concept of intrinsic motivation was introduced by Harlow (1950; Deci et al., 2015) and then elaborated by White (1959). White (1959) believed that intrinsic motivation develops as people feel their competencies growing and feel the sense of efficacy. Deci and Ryan (1980; Deci, Ryan, Schultz, & Niemiec, 2015) believed that underlying intrinsic motivation is a basic psychological need for competence and autonomy. They believed that even though intrinsic motivation is a natural propensity, improvement or maintenance of motivation requires a person to experience competence and autonomy satisfaction. Deci and Ryan (2012) believed that children who experience satisfaction in an activity are more likely to succeed and integrate

regulation of the behavior (Deci et al., 2015).

Intrinsic motivation automatically leads to the Self-Determination Theory (SDT; Deci & Ryan, 1985). SDT supports the fact that, by nature, individuals are active, motivated, curious, and interested in succeeding in life. However, SDT also recognizes that some individuals might act in a more passive and hostile way. These actions can be the result of individuals' interactions with peers, by doing different activities, and also due to different social environments (Engermann, 2010). Intrinsic motivation is directly connected with SDT and is when a person acts on though his or her own will, spontaneously, without the need of external motivators. Intrinsic motivation is built on the need for autonomy, competence, and belonging (Deci & Ryan, 2000). Games can be the perfect example that illustrates the best the Self-Determination Theory.

Extrinsic motivation can also be accompanied by intrinsic motivation. Generally speaking, motivation causes someone to behave in a certain way, depending on the situation or circumstance (Engelmann, 2010). Motivation causes someone do something (Werbach & Hunter, 2012). Some people feel more motivated by receiving rewards, and some feel motivated because they just enjoy the task, doing it just for fun (Werbach, 2012).

Conclusion

Playing attentional games can improve students' learning performance (Gee, 2003; Green & Bavelier, 2003; Redondo & Vilas, 2013). Playing games and practicing mindfulness can be fun and learning-based at the same time. Meanwhile, students can learn to regulate themselves, improving self-regulation skills (Semple, Lee, Rosa, & Miller, 2010). Mindfulness concepts such as non-judgment, presence, acceptance, and understanding can promote the ability to focus and remain focused (Kabat-Zinn, 1990). Intervention/programs that reflect mindfulness concepts

have been shown to increase attention and executive functions (Taylor & Mireault, 2008). This study examines further the effect of a mindfulness based attentional training (MBAST). This project contributes to the counseling research and literature in the mental health field by examining the effects of the MBAST with elementary school age children. It explores how a mindfulness attentional training affects and impacts students' mindfulness, self-regulation, and attentional skills.

CHAPTER III: METHODOLOGY

Research Design and Methodology

This chapter describes the methodology and research approach for exploring the impact of mindfulness based intervention on self-regulation of attentional skills on third to sixth grade students. The methodology addresses data collected from parent and child self-reports of perceptual variables with empirical validity shown to be related to student self-regulation. In addition, standardized student performance on measures of attentional skills is assessed at multiple intervals within the intervention. Accordingly, two principle approaches were employed to address a series of four research questions and associated hypotheses described in more detail below. Perception data (parents and children) and mindfulness skills were assessed using multivariate metrics for assessing pre-intervention/post-intervention comparisons of group scores. An ANOVA analysis of variance was utilized (instead of t-test) with the intent of decreasing the probability of type 1 error to occur, making sure that type 1 error remains at 5%.

Performance measures of visual attention skills were collected during each of 8 sessions during the intervention and were accordingly analyzed using a multivariate repeated measures analysis of variance to capture the potential for continuous improvement in performance on accuracy and speed across intervention sessions.

Research Questions

Research question 1. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on parent reports of their children's difficulties with self-regulation behaviors (e.g. managing time, impulsive control)? Parents were asked to describe any difficulties their children experienced with self-regulation over the past six months at the beginning of their participation in this study.

H_1: It was expected that parent scores on the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley, 2012) would indicate a significant reduction of self-regulation difficulties on the post-MBAST intervention when compared to pre-intervention scores (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences on parent scores on the Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012) on the post MBAST intervention when compared to pre-intervention scores (pre-test).

Research question 2. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on students self- reports of their intrinsic motivation and self-regulation beliefs related to academic (school related) behaviors (e.g. completing homework, maintaining focus during class work)? Students were asked about their motivation for classroom behaviors related to completion of their schoolwork.

H_2: It was expected that student self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1999) would be significantly higher after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences on students' self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1999) after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test).

Research question 3. What is the impact of an 8-session mindfulness-based attention skills training (MBAST) intervention on students self-reported perceptions of mindfulness attitudes and beliefs? Children were asked to reflect upon their awareness and acceptance of

feelings, reactions, and responses to typical life events before beginning the MBAST intervention. The MBAST protocol utilizes didactic approaches to facilitate self-understanding through mindfulness techniques.

H_3: It was expected that student self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the Children Acceptance Mindfulness Measure (CAMM, 2005) would be significantly higher after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences on student self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the Children Acceptance Mindfulness Measure (CAMM, 2005) after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test).

Research question 4. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on students' performance on two standardized (age normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints. Self-regulation and direction (executive control) of attentional resources is needed on vigilance tasks that require quick and accurate decisions. Children were asked to complete two standardized timed 'matching to sample' performance assessments (WISC-III, coding and symbol search performance subscales) during each of the 8 MBAST intervention sessions. Each of the performance tasks assesses performance based on accuracy of response and latency (speed) of response.

H_4: It was expected that students' performance on WISC-III coding and symbol search subtasks would show continuous improvement across 8 sessions of the MBAST intervention. This hypothesis will be explored in the context of evaluating the specific null hypothesis.

H_0: There will be no differences on students' scores on WISC-III coding and symbol search subtasks would show continuous improvement across 8 sessions of the MBAST intervention.

Research Design

The focus of this investigation was on the impact of a multifaceted mindfulness based training protocol on self-regulation of attentional skills of elementary aged children. The study employed a multivariate repeated measures analysis of variance design in which performance on two attentional skills tasks were measured across each of 8 sessions during a 4-week period. Specifically, the scores on two attentional skills tasks, coding and symbol search, were collected. In addition, parental and student self-reports of self-regulation and mindfulness skills were collected in session 1 and session 8 for analysis of pre-post intervention differences.

The research questions guiding the current study were designed to investigate the extent to which teaching children to use mindfulness and practice attention and self- regulation techniques in the context of engaging interactive micro-worlds (e.g., video games) will increase their attention skills and executive functions relevant to academic performance. The impact of the program will be evaluated using both pre-post comparisons of group performance as well as the results of the multivariate repeated measures analysis.

Participants

The study included (n = 24) participants, eleven females and thirteen males with a mean age 10 years and six months, all full registered in third to six grade on elementary school.

Participants' names were not used; rather, participants were assigned letters to protect their identity. The selection of participants was on a voluntary basis along with the approval of Institutional Review Board (IRB), parental consent, participant assent, and assent from the principal of the elementary school. All of the students were given the opportunity to participate, however, just a few accepted to participate. Five students from third grade, six from fourth grade, six from fifth, and seven from sixth-grade participated in this study. There were no incentives, and participants were also given the option to discontinue at any time.

An informed consent statement and a letter of permission from the Corpus Christi Independent School District (CCISD) authorized the researcher to use the facility for the study. The letter of permission from CCISD allowed the researcher to ask the Institutional Review Board (IRB) at Texas A&M University-Corpus Christi (TAMUCC) for permission to conduct the study and to further contact the students legal guardians for consent and assent from volunteer participants. The legal guardians of the students who consented to participate filled consent and informed consent forms giving permission to participate in the study. There were no monetary incentives, and participants had the option to opt out from the study at any given time.

Setting

This study was conducted in the southwest region of the United States. The study took place in the elementary school were the students were registered. The sessions were conducted in a classroom setting. The classrooms had computers which students had access to.

The researcher met with the students 8 times. The teachers provided the best time frames for the study to take place. The first person conducted the program in a computer classroom equipped with tables, chairs, and laptops.

Data Collection

Data were collected through a variety of sources. Data sources included the Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012), Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005), the Questionnaire on Academic Self-Regulation (SRQ-A; Ryan & Connell, 1989), and the Wechsler Intelligence Scale for Children Coding and Symbol Search subtests (WISC-III; Wechsler, 1991). Pseudonyms were utilized to ensure confidentiality of participants.

MBAST sessions were scheduled with consent from the school principal and teachers. During the first session, the primary investigator reviewed the assent form, including participants' rights and addressed any questions. Following the children assent, the main investigator administered the pre-test assessments and a demographic survey. The demographic survey was used to provide detailed information for the results and included age, gender, grade level, and ethnicity.

Students were asked to participate in a series of sessions involving skill training in specific attentional skills in a group format. Each session contained an opening mindfulness activity drawn form (Kabat-Zinn, 2005). This was followed by student engaging an interactive computer activity focused on the practice with a number of attentional skills. The use of games to promote student engagement and awareness has been shown to maximize student interest and motivation for development of school based activities (Green & Bavelier, 2012).

Students' progress was monitored after each programmed session through analysis of documentation of session performance. Analysis of impact of training protocol focused on changed pre-post test comparisons on standardized assessments as well as on the continuous record of student performance collected each session as part of the program lesson.

It was hypothesized that teaching children mindfulness, attentional skills, and self-regulation techniques in the context of engaging interactive games would increase their attention skills and executive functions relevant to academic performance. The impact of the program was evaluated using both pre-post comparisons of group performance as well as a multivariate repeated measures analysis of variance within the group in mindfulness based training protocol on the influence of self-regulation of attentional skills across the training sessions.

Mindfulness Based Attentional Skills Training (MBAST) Procedure

Participants were asked to participate in an 8-session intervention focused on self-regulation of attentional resources. After the students have been recruited, students were asked to participate in this program on times pre-scheduled with the principal and teachers. In the 8-session intervention the following areas were covered: work attention, memory, executive function, self-control, self-regulation, and logic and reasoning. Activities included on-line games from the website http://www.pomindcake.com/. This website was developed by psychologists interested in working cognitive abilities by training different mind skills like the areas referred above. The *Piece of Mind Cake* contains the areas that we wanted to address in our study, being the perfect compilation of games to utilize in our intervention.

The above-mentioned topics were taught by using the following activities described in the intervention plan scheduled on annexed. Several groups were necessary to conduct the sessions due to incompatible schedule and/or excessively large groups. Group sessions were formatted as psycho-educational training sessions. During the sessions the researcher included exercises related to the areas mentioned above.

Table 1

Data Collection and Intervention Schedule

	Pre-test	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Post-test
3rd grade	2/13	2/17	2/19	2/20	2/23	2/25	2/27	3/02
4th grade	2/13	2/17	2/19	2/20	2/23	2/25	2/27	3/02
5th grade	2/13	2/17	2/19	2/20	2/23	2/25	2/27	3/02
6th grade	2/13	2/17	2/19	2/20	2/23	2/25	2/27	3/02

Note. Sessions were all conducted on the same days for the different grades.

Quantitative data were collected via coding and symbol search subtests during intervention. The four questionnaires were acquired during baseline moments (pre and post intervention), while performance measures (coding and symbol search) were acquired during the intervention phase (sessions 2 to 7).

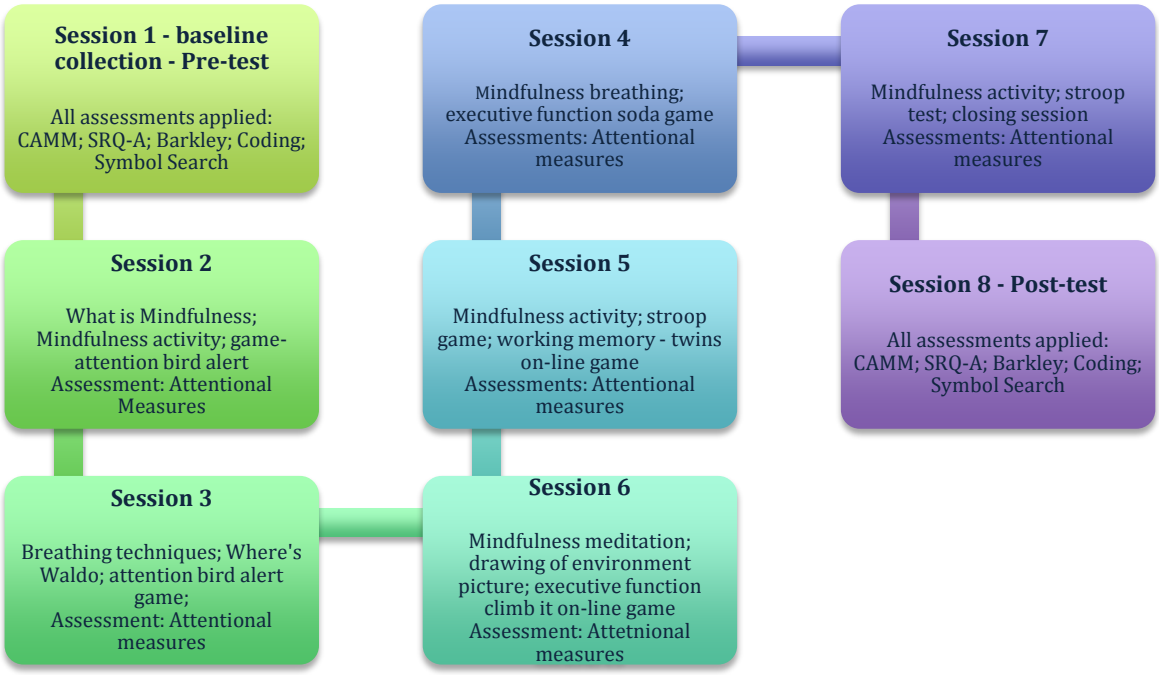
Mindfulness Based Attentional Skills Training (MBAST) Protocol

MBAST was implemented over 8 sessions. Two sessions (pre and posttest) consisted of collection of baseline measures of attentional measures (coding and symbol search), mindfulness skills (CAMM), and self-regulation skills (SRQ-A and Barkley). Session 1 can be seen as a pretesting phase (Sheperis & Miller, 2008). Instruments- Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012), Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005), the Questionnaire on Academic Self-Regulation (SRQ-A; Ryan & Connell, 1989), and the Wechsler Intelligence Scale for Children (WISC-III, 1991) were used during this phase.

In the following sessions (2-7 session), a MBAST was provided to the children. During this period trainings were provided along with continued performance measures (Foster, 2014). After pre-test session (session 1), 6 consecutive 45-50 minutes MBAST sessions were conducted

in a room situated at the school with children during counseling period or at a time negotiated with teachers. Accordingly, the research involved three phases a pretest – treatment – post-test. Treatment consisted of the MBAST treatment protocol (see figure 1). As noted in the diagram, dependent measures of attentional measures Coding and Symbol Search subtests were collected during each MBAST session.

Figure 1. Plan of activities across sessions 1 through 8



Session 1/Pre-test: All student participants completed 4 brief pretests: Child Acceptance and Mindfulness Measure (CAMM; see attached), the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; see attached), the Questionnaire on Academic Self-Regulation (SRQ-A; see attached), and the Wechsler Intelligence Scale for Children (WISC-III; see attached). The primary researcher collected all surveys.

Session 2: What is mindfulness; mindfulness activity; attention bird alert game (http://www.pomindcake.com/game/birds); attentional measures. Bird Alert game practices

awareness and divided attention and has the purpose of improve an individual awareness in many simultaneous events.

Session 3: Breathing techniques; where's Waldo picture (practices attention and focus on the task); attention bird alert game; attentional measures.

Session 4: Mindfulness meditation; drawing of environment picture; executive function climb it on-line game (http://www.pomindcake.com/game/climb); attentional measures. Climb it right game practices executive functions directed to response selection having as purpose the selective brain activity, choosing the correct direction of the game.

Session 5: Mindfulness activity; Stroop game (provides a demonstration of interference in the reaction time of a task); working memory - twins' on-line game (http://www.pomindcake.com/game/twins); attentional measures. The twins game works memory and spatial memory and has the objective is to remember colors in changing locations.

Session 6: Mindfulness breathing; executive function soda game (http://www.pomindcake.com/game/soda); attentional measures. The soda game was designed to help train executive functions by subjecting the individual to right and wrong action alternatives. The challenge is to select the correct choice quickly enough.

Session 7: Mindfulness activity; Stroop test; closing session; attentional measures

Session 8/Post-test): Participants were asked to complete the four surveys during a time that is acceptable to their respective teachers. In this phase interventions were no longer used. The purpose of this phase was to analyze if changes occurred after the intervention in students behaviors, attention levels, and self-regulation.

Instrumentation

Five instruments were utilized in this study. The instruments were the Barkley Deficits in Executive Functioning Scale for Children and Adolescents (BDEFS-CA; Barkley, 2012), Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005), the Questionnaire on Academic Self-Regulation (SRQ-A; Ryan & Connell, 1989), and the Wechsler Intelligence Scale for Children Coding and Symbol Search subtests (WISC-III, 1991).

Executive function: Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012). The dependent variable, parents' perceptions of their child executive functioning, was operationally assessed by the Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA). This instrument was designed to evaluate major components of executive functioning in daily life activities of children (6-17 years old) as reported by their parents (Barkley, 2012). For this research we used the BDEFS-CA short form (20-item) version. This test was theoretically based having EFs as main constructs, particularly in neuropsychological literature (Barkley, 2012). The BDEFS-CA can be used in clinical practice and research when the assessment of parental reports concerning EF deficits in daily life activities in their children is of interest.

The term validity typically refers to the correctness, accuracy, or truth of an assertion or conclusion against empirical evidence (Bryant, 2000). Much of the work on validating the BDEFS-CA was done over the previous decade with the prototype version of the adult form. The evidence for the reliability and validity of this scale is substantial (Barkley, 2012). This scale has high conceptual or face validity in that its items were chosen to reflect the major components of the EF theory: inhibition; nonverbal working memory, sense of time, self-management to time; verbal working memory and its planning, problem solving, and behavior; self-regulation of

emotion and motivation; and reconstitution or goal-directed innovation and creativity (Barkley, 2012.

THE BDEFS-CA short form EF summary was found to correlate highly with the same score from the full BDEFS-CA long form: $r = .98$ ($p < .001$); indicating that the short form is a very good approximation of the results that would be obtained from the longer version of the scale. This was also the case for the EF Symptom Count score from both forms: $r = .97$ ($p < .001$). The short form had internal consistency (Cronbach's alpha) of $r = .094$. The test-retest reliability was .79 which indicates a reasonable level of test-retest reliability.

Mindfulness: Children Acceptance Mindfulness Measure (CAMM; Greco, Dew, & Baer, 2005). CAMM (2005) is a 25-item measure of mindfulness and assesses the level to which children and adolescents are capable of observe internal experiences, act with consciousness, and accept intrinsic experiences without judging them. Scoring: Participants are asked to indicate how true each item reflects their experience using a 5-point scale ranging from 0 (Never true) to 4 (Always true). A total acceptance mindfulness score can be generated by reverse scoring, yielding a possible range in scores from 0-100. Higher scores indicate higher levels of acceptance and mindfulness skills. The reverse-scored items are: 2, 4, 5, 7, 8, 10, 11, 15, 16, 17, 18, 19, 20, 21, and 25.

Several psychometric properties of CAMM were validated to several cultures. On this study we utilized the CAMM validated to the American population. This instrument was evaluated with a sample of 606 students with a mean age of 12.8 years. The CAMM demonstrates good internal consistency, with Cronbach's alpha =.84. Concurrent validity has also been supported for the CAMM.

Self-Regulation: The Academic Self-Regulation Questionnaire (SRQ-A; Ryan & Connell, 1989). SRQ-A (1989) evaluates the flexibility to stimulate, observe, prevent, persevere and/or adapt an individual behavior, attention, emotions, and cognitive strategies in reaction to direction from internal cues, environment, and peers influence. SRQ-A was developed after the SRQ for adults, being this version for children in late elementary to middle school. This version of the scale asks four main areas related to school behaviors: external regulation, introjected regulation, identified regulation, and intrinsic motivation. Questions are divided according to these 4 subcategories during the test. SRQ-A is responded on a Likert scale being 4 – Very true; 3- sort of true; 2- not very true; 1- not true at all. To calculate the scale it was needed to find the average for each subscale. If the researcher wants to know the overall score than needs to follow the formula that combines the subscale scores: 2 X intrinsic + identified – introjected – 2 X external. A higher score will indicate a higher level of self-regulation. Intrinsic Regulation has a good internal consistency with a cronbach's alpha = .91; identified regulation cronbach's alpha = .84; introjected regulation cronbach's alpha = .75; and external regulation cronbach's alpha = .68. The scale was validated by Ryan and Connell (1989). Authors reported extensive evidence of the scale's reliability and validity, demonstrating good discriminant validity and relate meaningfully to external criteria.

Attentional Measures: The Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991). WISC-III (1991) is an individual administered instrument that is designed to evaluate multiple aspects of a child's intellectual ability (Pearson Education, 2008). Two subtests will be utilized on the WISC-III: Coding and symbol search. Symbol Search is a supplementary performance subtest from WISC-III, as well as Coding. WISC-III subtests are useful and appropriate for a number of purposes. These include psycho-educational assessment as a part of

educational planning and placement and diagnostic assessment among school-aged children and research. Performance subtests (i.e. Coding and Symbol Search) can be scored independently and have been validated as subtests of the WISC-III (Wechsler, 1991) for quickly scanning and correctly sequencing simple visual stimuli.

The literature review and several major areas of evidence support the validity of the WISC-III. Since 1974 WISC-III has been providing evidence for the validity of the interpretations and the use of the scale. This scale is designed to measure an aggregate of cognitive abilities such as verbal comprehension, spatial reasoning, memory, etc., all of which contribute to what Wechsler called an individual's global capacity. The factor analytic evidence and correlations provided support for the construct validity of the instrument (Wechsler, 1991).

The researcher's primary interest is in intra-individual variation in executive control functioning of children across time in this study. The symbol search and coding subtests are not appropriate for making claims about general intellectual functioning. The standard administration of WISC-III is individualized however group administration modifications are allowable under administration guidelines.

An overview of the scoring of the symbol search and coding guidelines are:

Symbol Search (WISC-III subtest). There are two levels of this subtest, A and B. Both levels are included in a single booklet that is separate from the Record Form, and each level contains 45 items. We utilized form B according to age group. For each item, the child visually scans groups of symbols, a target group and a search group. The child indicates whether or not a target symbol appears in the search group by marking the appropriate box. Administration and scoring: The time limit for this subtest is 120 seconds. A child's score is the total number of correct responses minus the total number of incorrect responses. The examiner scores the

responses with the symbol search-scoring template. Symbol search B subtest has the purpose of evaluate the processing speed, visual-motor quickness, concentration, and persistence. The test-retest reliability for Symbol search was .76, which indicates a reasonable level of test-retest reliability (Wechsler, 1991).

Coding (WISC-III subtest). There are two levels of the subtest: coding A and coding B (according to age ranges); there is a time limit of 120 seconds to complete the subtest; and the symbol content of each level. The total number of items is 59 for coding A and 119 for coding B. Form B was utilized because of group age (8 years old and plus). A response is scored as correct even if the symbol is drawn imperfectly but is clearly identifiable as the keyed symbol. Coding subtest B evaluates visual-motor skills, processing speed, planning, social logical thinking and knowledge.

Administration and scoring: WISC-III retains two starting points, and the number of items with two trials is 2. Additionally only 2 WISC-III items have alternative arrangements that receive credit. The test-retest reliability for coding was .79, which indicates a reasonable level of test-retest reliability (Wechsler, 1991).

Demographics. A demographic questionnaire will include age, ethnicity, gender, and grade level. The demographic questionnaire will be provided to the participant in the beginning of the intervention.

Data Analysis

Data for this study was analyzed following the quantitative method. Data related to attention performance, self-regulation, and mindfulness skills were examined with preplanned repeated measures Analysis of variance with single group comparison on pre-post comparisons on standard age scores for two attentional performance measures (coding and symbol search).

Developmental comparison of group differences were enabled by including of a between factors variable (grade).

A number of quantitative data analytic approaches were used to fully address the research questions in this study. Repeated measures of variance were used to explore changes in self-regulation skills from both, parents (Barkley) and students (SRQ-A), across the intervention of this study. Repeated measures of variance was also used to explore changes in mindfulness (CAMM) levels in a within subjects model, as well to understand the differences in attentional performance measures (coding and symbol search) across phases. Finally, multivariate repeated measures analysis of variance was utilized to explore the impact of mindfulness based attention skills training (MBAST) intervention on students' performance on two standardized (age normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints.

CHAPTER IV: FINDINGS / RESULTS

Demographic profile of participants

Table 2 displays the demographic profile of 24 students recruited to participate in the study. Note: Some dropped out or some had incomplete data. A total of 24 students actively participated in the MBAST training in the Spring of 2015. All students and parents gave informed and assent forms. Of the 24 students, all completed both baseline and post-course measures, although three missed either the baseline or follow-up session measure from the parents' perception (Barkley). Third grade (N= 5), fourth (N = 6), fifth (N = 6), and sixth-grade (N = 7) students participated in this study.

Data for the 24 participants (45.8% females, 54.2% males) who completed measures at both assessment points were retained for analysis. Those who completed the study did not differ from non-completing participants on any of the demographics or other assessments collected at the baseline period. The average age of the 24 retained participants was 20.8% (8 years old), 33.3% (10 years old), 33.3% (11 years old), and 12.5% (12 years old) (*SD* = 1.3). The majority of our participants were Hispanic (75%), followed by Caucasian (8.3%), and Asian (4.2%).

All sets of quantitative data were set for analysis including: mindfulness (CAMM), self-regulation for children (SRQ-A) and parents (Barkley), and attentional performance measures, Coding and Symbol Search (WISC-III) pre-post tests. Coding and Symbol Search subtests did not have missing data and were processed intact. Parent reported self-regulation scores (Barkley) had some missing data (4.2%) during pre and post-test. Missing scores occurred due to parents not returning the questionnaire to researcher.

Table 2

Participants' demographics

	Grade			
	3rd Grade (8 years old)	*4th Grade (9/10 years old)*	*5th Grade (10-11 years old)*	*6th Grade (11/12 years old)*
Gender				
Female	2	3	2	4
Male	3	3	4	3
Ethnicity				
Hispanic	5	6	4	4
Caucasian	0	0	2	2
Asian	0	0	0	1
Total of students	5	6	6	7

Note: n = 24

Data analytic strategy for addressing four research questions and associated hypotheses

To explore our hypotheses a series of analysis were conducted on SPSS from parents and students responses to the assessments. The focused analyses were subjected to multivariate repeated measures analysis of variance (MANOVA) on the continuous performance measures (attentional measures) and to pre-post comparisons of self reported measure of self-regulation, Barkley, and CAMM scores. Research questions 1-3 focus pre-post comparisons of self-reported perceptual data while research question 4 addresses evaluation of changes in standardized performance on visual attention skills. Accordingly, the analytic strategy for research all research questions employed first a general multivariate approach followed by appropriate univariate focused comparisons as appropriate for Research questions 1-3; and repeated measures analysis on Research question 4.

Research question 1. What is the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on parent reports of their children difficulties with self-regulation behaviors (e.g. managing time, impulsive control) from third to sixth grade? Parents were asked to describe any difficulties their children experience with self-regulation over the past 6 months at the beginning of their participation in this study.

H_1: It was expected that parent scores on the Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012) would be significantly higher on the post MBAST intervention when compared to pre-intervention scores (pre-test).

To explore hypothesis 1 on parents reported students' self-regulation skills, parent's pre MBAST reports of students' self-regulation skills were compared to post-test measures collected at the end of the intervention (session 8). Scores on the Barkley reflect parent reports of child difficulties with self-regulation. Accordingly improvement in parent rated self-regulation is indicated when score decrease.

Table 3 displays the descriptive statistics for parents' reports of their children difficulties with self-regulation behaviors across grades. As seen in the table, overall scores on the assessment were fairly stable (averaging about 60) indicating a low percentile on the raw score and good executive functions skills. This result revealed no significant overall change in parent scores as a function of MBAST participation as predicted by hypothesis one (Wilk's $\lambda = .99$, $F(1, 13) = .127$, $p = .727$, $\eta^2 = .010$, with a negligible effect size). Therefore, the hypothesis one related to parent perceptions of student improvement cannot be supported.

Table 3

Parent report of children self-regulation skills pre MBAST and Post MBAST across grades

Grade	Pre		Post	
	M	SD	M	SD
3	73	30.01	70.25	70.26
4	56.6	33.04	60.76	36.78
5	47.2	26.08	46.66	32.13
6	75.66	9.87	69	.00
Overall	60.47	27.40	59.47	30.22

Note: DV = Dependent Variable, BB Total = Barkley baseline total, BP Total = Barkley Post-test total

Research question 2. What is the impact of an 8-session Mindfulness based attention skills training (MBAST) intervention on students self- reports of their intrinsic motivation and self-regulation beliefs related to academic (school related) behaviors (e.g. completing homework, maintaining focus during class work)? Students were asked about their motivation for classroom behaviors related to completion of their school work.

H_2: It was expected that student self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1989) would be significantly improved after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). Scores on the SRQ-A reflect student reports of their compliance with external demands and expectations to complete their schoolwork. Accordingly, student reports of increased interest and motivation for completing their work for self-motivated reasons are reflected on increases in SRQ-A scores at post-test. Analysis focused on evaluating the specific null hypothesis of no differences between pre-MBAST and post-MBAST self-reports of intrinsic motivation.

Table 4 shows student scores SRQ-A-IM at pre-MBAST intervention and post-MBAST across grades. As seen in the table 4, scores generally downward from pre-test to post-test. Although this result revealed a significant overall change, this was not a favorable or improving trend in pre-MBAST and post-MBAST rating self-regulation reports (M = 19 and M = 17; Wilk's □ = .589; F (1, 20) = 13.96, p = .001, □^{2} = .411. There was also no significant difference attributed to grade (Wilk's □ = .763; F (3, 7) = 13.9, p = .137, □^{2} = .237). Pre-MBAST and post-MBAST does not support hypothesis 2 expectations of the effectiveness of the MBAST training on student intrinsic motivation for classroom work. Students' self-regulation was not improved after treatment. The null hypothesis of no differences between pre-MBAST and post-MBAST student self-reported intrinsic motivation is not rejected.

Table 4

SRQ-IM Students scores at Pre-MBAST intervention and post across grades

Grade	Pre		Post	
	M	SD	M	SD
3	17.8	2.38	14.2	1.92
4	19.66	4.45	17	5.62
5	20.16	4.11	20.2	2.99
6	17.57	3.87	16	4.24
Overall	18.79	3.77	16.91	4.33

Note: DV = dependent variable, SRQ-PIM = self-regulation questionnaire - intrinsic motivation.

Research question 3. What is the impact of an 8-session Mindfulness based attention skills training (MBAST) intervention on students self- reported perceptions of Mindfulness attitudes and beliefs in children from 3rd to 6th grade? Children were asked to reflect upon their

awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention. The MBAST protocol utilizes didactic approaches to facilitate self-understanding through Mindfulness techniques.

H_3: It was expected that student self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the Children Acceptance Mindfulness Measure (CAMM, 2005) would be significantly improved after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). Analysis focused on evaluating the null hypothesis of no mean differences on CAMM scores between pre-MBAST and post-MBAST.

Table 5 shows CAMM mindfulness scores for pre-MBAST and post-MBAST across grades. As seen in table 5 CAMM scores were stable across pre-MBAST and post-MBAST indicated by a non-significant difference (Wilk's $\lambda = .99$, $F(1, 20) = .142$, $p = .71$, $\square^2 = .007$). In addition there was no significant effect of grade on the improvement of CAMM scores as a function of MBAST participation (Wilk's $\lambda = .81$, $F(3, 20) = .156$, $p = .229$, $\square^2 = .19$). These findings do not support the expectation of hypothesis 3. Accordingly the null hypothesis of no mean differences on CAMM scores between pre-MBAST and post-MBAST is not rejected.

Table 5

CAMM Mindfulness Scores for pre-MBAST and post-MBAST across grades

Grade	*Pre*		*Post*	
	M	*SD*	*M*	*SD*
3	52.8	5.02	53	6.59
4	49.5	9.15	58	15.59
5	52.66	9.62	51	9.44
6	53.28	7.8	49.57	14.28
Overall	52.08	7.8	52.75	12

Note: CAMM = Children Acceptance Mindfulness Measure

Research question 4. What is the impact of an 8-session Mindfulness based attention skills training (MBAST) intervention on students' performance on two standardized (age normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints? Self-regulation and direction (executive control) of attentional resources is needed on vigilance tasks that require quick and accurate decisions. Children were asked to complete two standardized timed 'matching to sample' performance assessments (WISC-III – coding and symbol search performance subscales) during each of the 8 MBAST intervention sessions. Each of the performance tasks assesses performance based on accuracy of response and latency (speed) of response.

H_4: It was expected that students' performance on WISC-III coding and symbol search subtasks would show continuous improvement across 8 sessions of the MBAST intervention. Scores on WISC-III visual attention subtasks coding and symbol search reflect the number of accurate matches each student completed in 120 seconds time span. Analyses focused on the evaluation of the null hypothesis (H_0) that there would be no statistical changes in the number of accurate decisions in 120 seconds across MBAST sessions for children grades 3 through 6. This

null hypothesis was evaluated separately for WISC-III coding and WISC-III symbol search subtasks.

Table 6 displays the mean number of accurate matches on WISC-III coding subtask for students in grades 3 through 6. Student performance on WISC-III coding accuracy improved by approximately 50%. Students improved their overall coding accuracy from $M = 33.67$ on pre-MBAST to $M = 52.33$ on session 8 of MBAST session (Wilk's $\lambda = .1$, F (7, 119) = 20.8, $p = .012$, $\square^2 = .551$, indicating a large effect size). In addition there was a significant interaction between grade and session (Wilk's $\lambda = .104$, F (21, 119) = 1.97, $p = .012$, $\square^2 = .258$, indicating medium effect size). Tamhane Post-Hoc comparisons ($p < .05$) confirmed that while 6rd graders were significantly more accurate than 3rd graders, both groups improved to the same extent. These results indicate a significant impact of MBAST on WISC-III coding accuracy, thus the null hypothesis 4 is rejected.

The null hypothesis related to MBAST impact on WISC-III symbol search. Table 7 displays the mean number of accurate matches on WISC-III symbol search subtask for students in grades 3 through 6. Student performance on WISC-III symbol search accuracy improved by approximately 40%, similar to the results of WISC-III coding presented above. Students improved their overall symbol search accuracy from $M = 22.04$ on pre-MBAST to $M = 31.86$ on session 8 of MBAST session (Wilk's $\lambda = .06$, F (7, 119) = 12.91, $p = .001$, $\square^2 = .432$). In addition there was a significant interaction between grade and session (Wilk's $\lambda = .887$, F (21, 119) = 1.67, $p = .04$, $\square^2 = .225$, indicating small effect size). Tamhane Post-Hoc comparisons ($p < .05$) confirmed that while 3rd graders were significantly less accurate than 4rd and 6th grade peers, however, both groups showed improvement in WISC-III symbol search accuracy scores. The statistically significant results indicate an impact of MBAST sessions on WISC-III coding

accuracy and WISC-III symbol search accuracy. Accordingly null hypothesis related to the impact of the MBAST on self-regulation visual attention skills are rejected.

Table 6

Coding Mean Scores Across Grades

	Students						
DV		Pre-test			Post-test		
	Grade	*N*	*M*	*SD*	*N*	*M*	*SD*
Coding	3	5	26.2	8.6	5	43.8	9.5
Accuracy	4	4	33	9.7	4	54.5	10.76
	5	6	34.16	7.86	6	51.17	14.38
	6	6	43.33	9.64	6	59.17	8.8
Coding CA Total		21	34.67	10.41	21	52.33	11.82

Note: Coding accuracy = Coding Correct Answers.

Table 7

Symbol Search Mean Scores Across Grades

	Students						
DV		Pre-test			Post-test		
	Grade	*N*	*M*	*SD*	*N*	*M*	*SD*
Symbol S.	3	5	18.2	2.04	5	21.2	5.63
Accuracy	4	4	20.5	2.51	4	34.5	4.2
	5	6	24.33	8.31	6	34.5	5.25
	6	6	24	3.09	6	36.33	8.16
Symbol S. CA Total		21	22.04	5.32	21	31.86	8.4

Note: Symbol S. accuracy = Symbol Search Correct Answers.

Summary

Summary of these analysis indicate there was a statistically significant improvement on students' intrinsically self-regulation (H_2) and on students' performance of two standardized (age normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints (H_4).

Participants in this study (n = 24) regarding H_1 presented no statistical significant results on parents' scores on the Barkley Deficits in Executive functioning Scale for children and Adolescents (BDEFS-CA; Barkley, 2012). H_2 revealed a significant overall change, although it was not a favorable or improving trend between pre-MBAST and post-MBAST rating on students' self-regulation self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1989). Results showed that students did not improve after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). H_3 presented no statistical differences regarding the impact of the 8-session Mindfulness based attention skills training (MBAST) intervention on students self- reported perceptions of Mindfulness attitudes and beliefs. Furthermore, H_4 indicated a positive impact of the 8-session Mindfulness based attention skills training (MBAST) intervention on students' performance on pre-MBAST and post-MBAST coding and symbol search. Although 3rd graders were significantly less accurate than 4rd and 6th grade students, both groups showed improvement in WISC-III symbol search accuracy scores. Student performance on WISC-III coding accuracy improved by approximately 50%, while symbol search improved 40%.

CHAPTER V: DISCUSSION AND CONCLUSIONS

This study explored the impact of attentional skills practice training on perceptions and self-regulation of attentional skills related to school performance of elementary school children. The goal was to provide an opportunity for children to practice self-regulation skills as part of a structured training protocol involving mindfulness and skilled practice in motivationally engaging cognitive tasks. This study employed a doubly multivariate design in which two measures of attention were assessed during each treatment session. Changes in performance on self-regulation and mindfulness skills on pre-MBAST and post-MBAST were hypothesized to reflect impact of the MBAST sessions, in addition to the repeated measures of attentional skills (coding and symbol search).

Results were expected to consist with the literature review. Children would become more mindful and capable of self-regulation, improving attention and impulse control through the use of mindfulness and gaming practices (Jha, et al., 2010). It was expected that results would find an improvement on the scoring over time.

SRQ-A subcategory intrinsic motivation showed no significant differences between pre-MBAST and post-MBAST tests. Reports from parents' perceptions did not show differences between pre-MBAST and post-MBAST sessions, although WISC-III coding and symbol search showed significant differences between pre-MBAST and post-MBAST sessions.

Interpretation of Findings

Self-Regulation. Research question 1 concerned the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on parent reports of their children's difficulties with self-regulation behaviors (e.g. managing time, impulsive control). According to our research, there were no differences on parent scores on the Barkley Deficits in Executive Functioning Scale for

Children and Adolescents (BDEFS-CA; Barkley, 2012) on the post MBAST intervention when compared to pre-intervention scores (pre-test). Although this is not supported by our research, Flook et al., (2010) found that parents and teachers saw a significant improvement in behavioral self-regulation at home and school of the students who received a mindfulness-based intervention when compared to a control group (Felver et al., 2013).

In our research question 2, the goal was to analyze the impact of an 8-session mindfulness based attention skills training (MBAST) intervention on students self-reports of their intrinsic motivation and self-regulation beliefs related to academic (school related) behaviors (e.g. completing homework, maintaining focus during class work). Students' results of self-reports on the Academic Self-Regulation Questionnaire (SRQ-A, 1999) were not higher after their participation on the MBAST intervention (post-test) when compared to pre-intervention assessments (pre-test). This hypothesis was not supported by previous research by Panoutsopoulos and Sampson (2012), who believed that teaching with technology can facilitate the achievement of the academic objectives, as well as increase motivation and positive attitudes in a school setting. Lerner, Dowling, and Anderson (2003) also believed that video games could facilitate positive youth development (Adachi & Willoughby, 2012) by maintaining adolescents' concentration, by following rules, and by being under a constant challenge**.** Larson (2000) believes that video games help to develop new skills including problem solving, adaptation skills, and organizational skills (Adachi & Willoughby, 2012). Intrinsic self-regulation can be promoted by the use of tools such as mindfulness. According to Tang, Ma, Wang, Fan, Feng, and Lu, (2007), mindfulness can promote a more deep focus on the breathing, helping to concentrate and maintain focus of attention, and increase aspects of EF (Jha et al., 2007; Zylowska et al., 2007). Studies of attentional subtracts with mindfulness activities found that with practice, conflict of attention could be fairly reduced, increasing the individual motivation (Tang et

al., 2007). In Wisner (2008), mindfulness meditation activities lead high school students to increase self-regulation and executive functions. Posner and Rothbart (2007) stated that mindfulness activities could be directly related to observed remediation of production deficiencies in executive function. Taylor and Mireault (2008) believed that mindfulness activities and social cognitive models of self-regulation are effective on the level of understanding and awareness of internal and external stimuli for effective self-control. Flook et al., (2010) also found neurophysiological evidence in the improvement of adults' executive functioning, including attention regulation (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2007; Flook et al., 2010) and metacognition (Flook et al., 2010) while practicing mindfulness. Flavell (1974) and Linehan (2014) believed that interventions involving the practice of focused attention during the present moment, and including engagement in a functional and inherently motivating context (such as in a game context), might be especially useful to facilitate changes in executive functioning by addressing both production and mediation deficiencies in skilled practice. Baummeister and Vohs (2007) found that youth that are able to control impulsiveness are most likely to succeed at school, and that using activities such as games can help children to improve self-regulation and cognition (Hardy & Scanlon, 2009). Hardy (2011) also found that computer-based programs can help children to improve attention and executive functions, and to better self-regulate in their daily lives.

Mindfulness. Research question 3 concerned the impact of an 8-session mindfulness-based attention skills training (MBAST) intervention on students self-reported perceptions of mindfulness attitudes and beliefs. Students' results of self-reported awareness and acceptance of feelings, reactions, and responses to typical life events before beginning the MBAST intervention on the Children Acceptance Mindfulness Measure (CAMM, 2005) were not statistically significant after their participation on the MBAST intervention (post-test) when compared to pre-intervention

assessments (pre-test). While our study showed no differences between pre-MBAST and post-MBAST, Chiesa and Erreti (2009) found that mindfulness can be used in the treatment of disorders, improve general health, and enhance cognitive functioning (Olendzki, 2010). In a Linehan (2014) study, mindfulness constructs applied directly to the children capacity for self-regulation, directing our attentional focus. Some researchers believe that distinct but interacting mechanisms contribute to how mindfulness works, including: attention regulation, body awareness, emotion regulation (including reappraisal, exposure, extinction, and reconsolidation), and change in self-perspective, although, in this study, we could not find such a significant difference between phases. Such components did not show what Taylor and Mireault (2008) found in their study: that components interact closely to constitute a process of enhanced self-regulation (Taylor & Mireault, 2008). Although, the different components might come into play to varying degrees within any specific moment during mindfulness meditation. Several meditation traditions believe the need to cultivate attentional self-regulation in early practices to see better results (Taylor & Mireault). Mindfulness skills appear to increase the ability to monitor both progress toward a desired goal and the urges that interfere with such progress (Taylor & Mireault, 2008). Taylor and Mireault (2008) believed that social cognitive models of self-regulation depend on an individual's mindfulness of internal and external stimuli for effective self-control; however, their study proved that a correlation does not exist between the two variables.

According to Van de Weijer-Bergsma et al., (2012), mindfulness activities and ADHD could also be positively correlated and improve externalizing problems, attention problems, and behavioral regulation and computerized attention test speed and false alarms. In a Flook et al., (2010),study, mindfulness practice in adults increased aspects of executive functioning (EF), including attentional regulation (Jha et al., 2007; Zylowska et al., 2007) and metacognition (Teasdale et al., 2002).

Attentional Skills. Research question 4 concerned the impact of an 8-session mindfulness-based attention skills training (MBAST) intervention on students' performance on two standardized (age-normed) measures of attentional skills requiring vigilance and rapid decision-making in the context of time constraints. Self-regulation and direction (executive control) of attentional resources is needed on vigilance tasks that require quick and accurate decisions. Students' performance on WISC-III coding and symbol search subtasks showed improvement across the 8 sessions of the MBAST intervention. Jaeggi et al., (2008) corroborates with our hypothesis when he found that mindfulness skills can increase traditional metrics of executive control such as increasing strategic time on task. In a Wisner (2008) study, high school students that were exposed to 10-minute meditation sessions during four days per week improved general behavior, as well as emotional strengths, overall relationships, and schoolwork. Meanwhile, the study concluded that cognitive benefits can result from school-based mindfulness training for youth, including the possibility to increase attention, concentration, and as a consequence, decrease anxiety and increase emotional and behavioral self-regulation, tolerance for frustration, and self-control.

Attention measurements previously studied by Deci et al., (2015) from first to third grade found that students who used electronic devices improved in attention measurements and attention scores. According to Napoli et al., (2005), students in the treatment group self-reported decreased test anxiety scores, increased selected visual attention, and had fewer teacher-rated problems in attention and social skills compared to controls.

Game activities can promote the application of interventions and programs that facilitate training of cognitive abilities, conduct behavior such as control of impulsivity, problem solving, self-regulation, and cognitive functioning (working memory) (Ke and Abras, 2013). Programs/

interventions that facilitate cognitive abilities and cognitive functions usually include ludic and interactive activities that target working behaviors in the school setting. Attention and engagement can be promoted when implemented in a fun way. Ke and Abras (2013) also found that educational games, when well designed or adapted, can promote engagement and learning for students; meanwhile, speeded challenge should be avoided to provide more cognitive processing time to students who have decreased understanding of "abstract meaning," poor retention of learned information, and language barriers (Rezaiyan et al, 2007; Ke & Abras, 2013). Gaming activities can promote attention and visual attention that could also be observed in the Green and Bavelier (2003) study, when students who played video games performed better in visual attention than non-players. Games have been showing to increase motivation in the academic setting, which has been evaluated as a fundamental tool for academic performance and success (Guimarães, 2004). Across sessions, mindfulness activities lead to increase strategic time on task (Jaeggi et al., 2008) and deliberate focused attention (Holmes et al., 2009). Brain training has also been shown to be useful on the treatment of attention deficit disorder (Blair & Diamond, 2008), visual processing (Draganski, 2006), and speed of processing (Ball et al., 2012).

The results of this study expand on previous research through the use of both mindfulness and attentional games. This research assists in clarifying that self-regulation and attention can improve with the use of such tools.

Limitations

There are several potential limitations of this study. The number of participants is small (n = 24) and nonprobabilistic, limiting the generalizability of external validity of the results. The lack of a control group for the mindfulness outcomes is a limitation for reliability of the findings.

Another threat to this study is the internal validity of the parents' perceptions. These types of measures are susceptible to bias by the teachers and guardians (Heppner et al., 2008). Additional limitations to internal validity existed in this study regarding the self-assessment. The SRQ-A and the CAMM are self-reported assessments, and these types of measures are susceptible to bias by the participants (Heppner, Wampold, & Kivlighan, 2008).

The coding and symbol search are also self-reported assessments, and these may not change very much in general and therefore may not be the most responsive to the training. The standard errors of measurement for Coding and Symbol Search provide an estimate of the amount of error in an individual's observed test score, being inversely related to the reliability coefficient. Although the reliability is high, there is the possibility of SE_M (Wechsler, 1991). Students' responses to assessments were assumed truthful, although it is possible that they gave a socially acceptable response, which could have inflated their scores. However, self-report assessments are the most popular method to collect data in the counseling field, since they can measure personal cognitions, emotions, and behaviors, and as such they still have an accepted format (Heppner et al., 2008).

Lastly, the researcher bias could have impacted the results as the primary investigator implemented the MBAST program and had predetermined expectations of students' outcomes.

Future Directions of Research

The counseling field would benefit from future research endeavors in mindfulness practices and training. Researchers are encouraged to replicate this future study, corroborate findings, and establish evidenced-based practices in school settings. Multivariate repeated measures of analysis of variance are well suited for counseling research, and this format is often recommended by research experts (Winer, Brown, & Michels, 1991).

Another suggestion for the replication of this study is to provide more sessions over a longer period, given that four weeks might be a short period. More research is needed on effective activities that teach children mindfulness and how to regulate attention. Although mindfulness has grown in the last decade, there is still a need for formal training (Kabat-Zinn, 1990). As a future recommendation, researchers should have a control and a treatment group and investigate the differences between the treatment and control group on participants outcomes.

Knowing the impact that the lack of attention and self-regulation can have on a child's development is fundamental to creating and implementing activities that promote the growth of these elements. Would be important to investigate the implications that this type of training might have on populations with different diagnosis (i.e. ADHD) related to attentional difficulties. Finally, more studies should be conducted to investigate the relationship between children who practice mindfulness and those who do not relating their academic achievement in the span of a year or in a longitudinal study.

Conclusion

Change is probably the word that best defines the type of rhythm of life our society lives in nowadays. There is a constant need to adapt our attention, intelligence, emotions, and behavior according to the different environments into which we are inserted, whether with family, at work, in a school environment, etc. Moreover, it's been found that executive functions have an important role in the development of fundamental capacities to develop social skills, academic success, decision-making, and problem-solving skills that we are faced with on the daily basis. Research has emphasized the importance of including activities that promote executive control of attentional skills and self-regulation in the development of academic curriculums. These curriculums could bring to light a group of techniques with empirical background that have been

proven effective. Such activities can be ludic and motivational, stories and narratives, games, organizational and planning, self-regulation, emotional knowledge, etc. These activities were all methodological supported with literature about the programs efficacy by the use of several techniques like interviews, tests and assessments, observations, etc., all measures to assure reliability and validity to the programs. Motivation is also a fundamental tool in the learning process. Students who are more motivated will engage more and maintain focus on tasks.

In conclusion, it is important to understand the urgency of research in this area, mainly related to executive functions of attention, self-regulation, and tools for diagnosis to help children improve their behavior. Executive control of attentional skills functioning is facilitated and maximized in performance contexts that are engaging and meaningful for individuals. If individuals are skillful in execution of attentional resources or cognitive tool, engaging elements of the task often support awareness, and ultimately utilization of a specific cognitive tool will improve performance (Flavell, 1987; Flook, et al., 2010). Thus, any new research in this area will help mental health professionals identify and provide better skills to improve the quality of a young individual’s life in an affective, social, and academic way.

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