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The Impact of Mindfulness Training on Hyperactive Behaviors Demonstrated by Elementary Age Children with a Diagnosis of Attention Deficit Hyperactivity Disorder

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ACCEPTANCE

This dissertation, THE IMPACT OF MINDFULNESS TRAINING ON HYPERACTIVE BEHAVIORS DEMONSTRATED BY ELEMENTARY-AGE CHILDREN WITH A DIAGNOSIS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER, by JESSICA ANN CARBONI, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Doctor of Philosophy in the College of Education, Georgia State University.

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ABSTRACT

THE IMPACT OF MINDFULNESS TRAINING ON HYPERACTIVE BEHAVIORS DEMONSTRATED BY ELEMENTARY-AGE CHILDREN WITH A DIAGNOSIS OF ATTENTION DEFECIT HYPERACTIVITY DISORDER
by

Jessica A. Carboni

Attention Deficit / Hyperactivity Disorder (ADHD) is one of the most prevalent childhood disorders in the United States. Although many children with an ADHD diagnosis are prescribed medication to control symptoms, behavioral concerns are still regularly noted in the classroom, home, and other settings. Therefore, school psychologists are often called upon to assist teachers and families with developing intervention procedures. The purpose of this research was to investigate the relationship between mindfulness training, the cognitive processes of attention regulation, and behavior of children who have been diagnosed with ADHD. This study utilized a multiple baseline across participant's design where each student was tracked over time following a baseline (pre-intervention) condition. Four 8-year-old male participants with a primary diagnosis of ADHD and a significant number of off-task classroom behaviors were included in this study. Teacher and parent ratings of the Behavior Assessment System for Children, Second Edition (BASC-2) and Behavior Rating Inventory of Executive Function (BRIEF) were completed pre- and posttest for each participant. The Reliable Change Index (RCI) was calculated to determine if the pre- to posttest change

scores on the BASC-2 and BRIEF exceeded what could be accounted for by measurement error alone. Results of the analyses revealed that mindfulness training was effective in increasing the number of on-task behaviors for participants. Parent and teacher ratings on the BRIEF suggest that mindfulness training impacted ratings on the Inhibit, Initiate, and Monitor scales. Parent and teacher ratings on the BASC-2 were analyzed and scores from the Attention Problems scale did not demonstrate significant change across raters and across participants. Significant change occurred on the Hyperactivity scale. Findings are discussed in relationship to the literature on mindfulness training for students with a diagnosis of ADHD. Implications for future research and practice are also suggested.

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ABBREVIATIONS

ADD	Attention Deficit Disorder
ADD/H	Attention Deficit Disorder / Hyperactive
ADD/WO	Attention Deficit Disorder / Without Hyperactivity
ADHD	Attention Deficit Hyperactivity Disorder
AET	Active Engaged Time
APA	American Psychological Association
ASEBA	Achenbach System of Empirically Based Assessment
BASC	Behavior Assessment System for Children
BOSS	Behavioral Observation of Students in Schools
BPT	Behavioral Parent Training
BRIEF	Behavior Rating Inventory of Executive Function
CD	Compact Disc
CTSR-R	Conners' Teacher Rating Scale- Revised
DSM	Diagnostic and Statistical Manual of Mental Disorders
EBD	Emotional and Behavior Disorder
EF	Executive Function
MBSR	Mindfulness-Based Stress Reduction
OFT-M	Off-task Motor
OFT-P	Off-task Passive

PET	Passive Engaged Time
PRS	Parent Rating Scale
RCI	Reliable Change Index
r_x	Coefficient alpha
SE_M	Standard Error of Measurement
SLD	Specific Learning Disability
S_x	Standard Deviation
TRS	Teacher Rating Scale
X_1	Pretest Score
X_2	Posttest Score
Y-OQ	Youth Outcome Questionnaire

Chapter 1

DOES MINDFULNESS INFLUENCE THE RELATIONSHIP BETWEEN EXECUTIVE FUNCTIONS AND SCHOOL PERFORMANCE IN CHILDREN WITH ATTENTION DEFICIT / HYPERACTIVITY DISORDER?

Attention Deficit / Hyperactivity Disorder (ADHD) is one of the most prevalent childhood disorders, impacting approximately 3-5% of the school-aged population (American Psychiatric Association, 1994). The high prevalence rate of ADHD has resulted in a wealth of literature devoted to studying this childhood disorder over the past decade. In particular, research has led to significant changes in nomenclature and as well as diagnostic and assessment practices in identifying children with ADHD. More recently, literature has been devoted to identifying the impact of various intervention procedures with this population. Although many children with an ADHD diagnosis are prescribed medication to control symptoms, behavioral concerns are still regularly noted in the classroom, home, and other settings. Therefore, school psychologists are often called upon to assist teachers and families with developing intervention procedures. The purpose of this paper is to identify trends in the behavioral management of ADHD and discuss a relatively new method of intervening through utilization of mindfulness-based therapy.

Review

Clinical interest in the symptoms associated with ADHD can be traced back to lectures given to the Royal Academy of Physicians by George Still (1902). In his lectures, Still described a group of children with deficits in "volitional inhibition" or defective moral regulation of behavior (Barkley, 1997a; Levy & Hay, 2001). Historically, a series of differing names has been used to describe what is currently referred to as ADHD. Examples include minimal brain dysfunction, minimal brain damage syndrome, as well as hyperkinetic reaction of childhood (Rowland, Lesesne, & Abramowitz, 2002). Early attempts to link brain dysfunction to attention deficits occurred following the encephalitis epidemic of 1917-1918 (Rowland et al., 2002). Survivors of this epidemic experienced a variety of difficulties including learning deficits and hyperactivity. Research has subsequently attempted to identify the specific etiology of ADHD, however, no singular case has been identified (Rowland et al., 2002). Thus it appears that ADHD can best be defined as a group of behavioral difficulties.

Specifically, problems with hyperactivity or hyperkinesias (i.e., motor excess) became the first hallmark sign of this disorder beginning in the early 1960s (Chess, 1960; Laufer & Denhoff, 1957). In fact, the second edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-II; American Psychiatric Association, 1968) labeled children with these behavioral excesses as having the Hyperkinetic Reaction of Childhood. However, with time, researchers stressed an equal if not greater role of poor sustained attention and impulse control as characteristics of the disorder as well (Barkley, 1997a; Douglas, 1972). Different perspectives of symptoms associated with ADHD began to emerge throughout the 1980s. For example, Douglas (1983) indicated that there

were four deficits involved in this disorder including (a) poorly maintained effort; (b) deficient arousal to meet situation-specific demands; (c) desire for immediate reinforcement; and d) difficulties with impulse control. At that time, the newly revised *Diagnostic and Statistical Manual of Mental Disorders*, *Third Edition* (DSM-III; American Psychiatric Association, 1980) reflected this new and emerging view.

The DSM-III identified severe deficits in a child's ability to attend, as opposed to the singularly required hyperactive symptoms, as central to diagnosis (Hoff, Doepke, & Landau, 2002). These subsequent changes in symptomology led to a reconceptualization of the diagnostic label given to children with this disorder. Thus this disorder became known as Attention Deficit Disorder (ADD). Two subtypes of ADD were identified which included ADD/H (with hyperactivity) and ADD/WO (without hyperactivity). Moreover, for children with significant attentional problems, it became unnecessary to present with both major (i.e., attention deficits) and minor (e.g., fidgety, can't sit still, etc.) symptoms in order to receive a diagnosis (Hoff et al., 2002).

Despite the growing recognition of the legitimacy of the ADD perspective delineated in the DSM-III, the publication of the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition Revised* in 1987 (DSM-III-R; American Psychiatric Association, 1987) brought further changes to the diagnostic criteria. Specifically, sub-typing of the disorder was no longer necessary. Instead, diagnoses were provided if a child presented with 8 or more symptoms in a 14 symptom list. In the context of this new perspective, a diagnosis could be provided without significant attentional deficits. Thus, ADD became an anachronistic label as of 1987 (Hoff et al., 2002) with ADHD becoming the contemporary term for diagnosis.

Due to the changes in conceptualization of ADHD with the DSM-III-R, the extensive heterogeneity of symptoms led to difficulties with diagnosis. Some researchers even began to question the legitimacy of ADHD labeling it as a catch-all diagnostic category (Weinberg & Brumback, 1992). Indeed, how children with ADHD are assessed and treated can vary widely. Therefore, the development of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* in 1994 (DSM-IV; American Psychiatric Association, 1994) returned to the subtyping approach from the DSM-III. The DSM-IV more closely approximates factor analytic findings (Kronenberger & Meyer, 2001) by splitting ADHD symptoms into two categories: inattentive and impulsive/hyperactive (Barkley, 1998). In addition, a combined subtype for those who are both inattentive and impulsive/hyperactive was also recognized.

Although there is heterogeneity of symptoms associated with children diagnosed with ADHD, certain features are frequently identified. One common feature is difficulty sustaining attention throughout lengthy, repetitive, or group-oriented tasks (Barkley, 1998; Frick & Lahey, 1991; Kronenberger & Meyer, 2001). Specifically, it appears that difficulty with sustained attention is primarily responsible for the lack of task completion that is frequently observed with this population. However, on tasks that are interesting, allow the child to shift focus frequently, allow freedom to choose an activity, or provide immediate reinforcement, children with ADHD do not demonstrate behavioral difficulties that are sufficiently different from their same-aged peers (Kronenberger & Meyer, 2001). Therefore, a child with ADHD may be able to adequately focus on a favorite television program at home, whereas he or she may demonstrate a lack of sufficient attention to tasks within the classroom setting.

In addition to difficulties with sustained attention, poor impulse control (Barkley, 1998; Kronenberger & Meyer, 2001; Raggi & Chronis, 2006) and disinhibition (Barkley 1997a) are core features of ADHD. Specifically, children with ADHD experience difficulty with goal setting, rush through schoolwork, make careless mistakes, and interrupt others. Impulsivity also impacts the child's ability to comply with rules, as they may often act without thinking about the potential consequences. These impulsive behaviors can be dangerous to the child and may provide an explanation as to the higher frequency of injury sustained by children with ADHD (American Psychiatric Association, 1994; Kronenberger & Meyer, 2001). Immediate and valued consequences (e.g., reinforcement and/or punishment) may play a part in decreasing impulsive behaviors (Barkley, 1998).

Overactivity is also prevalent in the ADHD population and can vary as a response to time, stress, or situational demands (Barkley, 1998). Overactive behaviors are particularly noticeable when a child is required to sit still or remain in the same place for an extended period of time (Kronenberger & Meyer, 2001). Children with ADHD who demonstrate these behaviors tend to fidget, stretch, change positions, make noises, play with items (e.g., pencils, scissors, etc.), and stand when sitting is required. All of these symptoms may contribute to an increased number of discipline referrals, negative teacher attention, and lower levels of successful task completion (Raggi & Chronis, 2006).

The ADHD features of inattention, impulsivity, and overactivity are believed to reflect general deficits in one or more domains of executive functioning (Barkley, 1997a; Kronenberger & Meyer, 2001; Pennington & Ozonoff, 1996; Slaats-Willemse, Swaab-Barneveld, de Sonneville, & Buitelaar, 2007). In particular, several authors hypothesized

that a weakness in response inhibition, working memory, or executive control could explain typical ADHD symptoms (Barkley, 1997a; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). This hypothesis is based upon observations of hyperactivity, distractibility, or impulsivity that individuals with prefrontal lesions demonstrate on measures of executive functioning (Fuster, 1997; Stuss & Benson, 1986).

For over a century researchers have known that the frontal lobes are involved in regulating motor movements in the successful performance of an action with a decisive element (Baddeley, Sala, Gray, Papagno, & Spinnler, 1997). It was only recently that it became apparent that the frontal lobes are in fact also involved in the control of cognitive processes. Evidence suggests that the frontal regions of the brain are involved with the deployment of the capacity to carry out processes such as memorizing, learning, or reasoning, that take place elsewhere in the brain (Baddeley et al., 1997). Therefore, the frontal lobes are thought to have a supervisory or "executive" (Baddeley et al., 1997) function.

Executive functioning refers to those capacities that enable a person to interact successfully within their environment. More specifically, they are a collection of cognitive abilities or "processes that are responsible for guiding, directing, and managing cognitive, emotional, or behavioral functions, particularly during active, novel problem solving" (Gioia, Isquith, Guy, & Kenworthy, 2000, p.1). Researchers have often used metaphors to describe the interdependent processes involved in executive function. One such metaphor depicts executive function as the conductor of a symphony (Brown, 2005). Regardless of how talented the musicians in a symphony orchestra are, they will likely not produce very good music if they do not have a conductor to choose the music, initiate

the playing, keep them on time, modulate the pace and volume of the piece, and so forth (Brown, 2006). Although each musician may be adequately able to play his or her instrument, the subtle and dynamic functioning of the orchestra is contingent upon the conductor coordinating and managing functions (Brown, 2006). Ultimately, this metaphor depicts what many researchers believe; that executive function refers to an umbrella construct that incorporates a number of interrelated operations.

Executive processes are conscious, effortful, and (thus far) poorly understood compared with the automatic, modular, nonexecutive processes for which there already exists a more extensive knowledge base (Phillips, 1997). Previous theorists have often criticized the construct of executive function as being poorly defined and excessively broad (Pennington & Ozonoff, 1996; Willcutt et al., 2005). The underlying concern is that it has become difficult to relate particular behaviors, which have become regarded as exemplars of executive function, to specific neuroanatomical areas (Rabbitt, 1997). In fact, the empirical basis for tests of frontal function is by no means as strong as many have supposed (Baddeley et al., 1997). Researchers have ascertained that modern neuropsychology has demonstrated only moderate success with the establishment of assessment procedures that can unequivocally be linked to executive functions (Tranel, Anderson, & Benton, 1994).

A common way to investigate executive functions is to administer a battery of executive function measures to patients with frontal lobe damage. This strategy has been followed by a number of researchers yielding somewhat contradictory results. One study utilized correlational methods in order to investigate common elements in tests conventionally used to measure executive deficits in a group of patients with head

injuries (Duncan, Johnson, Swales, & Freer, 1997). Findings from that study indicated low correlations among various frontal tests (i.e., Wisconsin Card Sorting Test) with each measure correlating as highly with nonfrontal tests (i.e., Comprehensive Assessment of Spoken Language) as they did with one another (Baddeley et al., 1997). In a separate study conducted with a group of patients who solely sustained a frontal lobe lesion, correlations among frontal tests were substantial (Della Sala, Gray, Spinnler, & Trivelli, 1998). Moreover, the frontal tests justified inclusion into a separate group through correlating more highly with one another than with nonfrontal tests (Della Sala et al., 1998).

Despite the commonality identified in the study conducted by Della Sala and colleagues (1998), problems with utilizing correlational approaches to study this construct persist. One such problem with this approach may be that the "frontal" test is at best an impure measure of executive functioning (Baddeley et al., 1997). That is, the distinction between "frontal" and "nonfrontal" tests may be a matter of degree, rather than a true dichotomous relationship (Baddeley et al., 1997). For example, Spinnler (1991) pointed out that it would be challenging to conduct an experiment that is solely sensitive to attentional processes and not to other functions such as language or perception. Although poor performance on tasks of executive function could arise for multiple reasons, they have nonetheless become the primary research tool for studying this construct.

Interestingly, a number of studies have found that children with ADHD tend to perform more poorly on measures of executive functioning than do the normal controls (Brown, 2006). The Willcutt group (2005) conducted a meta-analysis of 83 studies that

administered executive function measures to groups of children and adolescents with and without ADHD. Analysis of the studies indicated that children with this diagnosis demonstrated impairment on measures of response inhibition, vigilance, working memory, and planning (Brown, 2006). Although findings from this study indicate that ADHD is associated with weaknesses in executive function, such impairments are "neither necessary nor sufficient to cause all cases of ADHD" (Willcutt et al., 2005, p. 1343). What is clear from data on children and adolescents with ADHD is that, if an impairment in executive functions is defined as scoring low on tests of executive function, many but not a majority of those with ADHD would evidence a significant impairment (Brown, 2006). Therefore, additional models for conceptualizing the relationship between ADHD and executive functions must be considered and reviewed.

One of the most prominent models that has been associated with the study of the relationship between executive functions and ADHD was proposed by Barkley in 1997. He described his model as trying to build a case "toward a final verdict that ADHD is a developmental disorder of self-regulation" (Barkely, 1997a, p. x). His model is not based upon measures of executive function, but rather on a conceptual framework derived from Jacob Bronowski's work (Bronowski, 1977). Barkley argued that the ability to inhibit is the primordial executive function upon which all other executive functions develop (Brown, 2006). He provided evidence from various studies in which individuals with ADHD experience difficulty with motor inhibition tasks, continuous performance tasks (e.g., computerized and pencil and paper), and tasks which require shifting of mental sets (i.e., Wisconsin Card Sorting Test) to assist in proving his hypothesis. His theory holds that the satisfactory development of inhibition is essential for acceptable performance in

five other areas of executive function including working memory, internalization of speech, self-regulation, reconstitution, and motor control (Barkley, 1997a).

Although Barkley's model provided a way to conceptualize the relationship between ADHD and executive function, additional models of this relationship have been proposed in recent years. Brown's model (2006) was in many ways similar to Barkley's; however, it was derived from a different primary source. Brown completed intensive clinical interviews with individuals diagnosed with ADHD and their family members in order to develop a set of rating scales. Information obtained from the rating scales provided evidence that there are six clusters of cognitive functions within the executive function domain: activation, focus, effort, memory, emotion, and action.

The activation cluster refers to the organization, prioritization, and commencement of work (Brown, 2006). Children who demonstrate activation deficits often want to succeed at a task but experience difficulty with initiating the activity. This may be due in part to poor organization. For example, children who are poorly organized may become overwhelmed with a large assignment or task and may consequently experience difficulty beginning the activity (Gioia et al., 2000). Thus, the manner in which children are able to plan and organize their world as well as their belongings is important in being able to successfully complete tasks.

The second cluster of cognitive function described by Brown (2006) refers to the ability to focus, sustain, and shift attention to tasks. While difficulty with focusing and sustaining attention often leads to failure to complete tasks; deficits in the ability to shift attention may lead to repetitive or stereotypic behaviors in children. Such children often require consistent routines (Gioia et al., 2000). Changes in a normal routine may elicit

frequent inquiries about what will happen next or when the postponed event may occur. In some cases, children are described as having difficulty changing topics when discussing an area of interest or moving beyond a specific disappointment.

The effort cluster refers to an individual's ability to regulate alertness, sustain effort and process information at an appropriate rate. Children with deficits in this area often fail to monitor how their behavior impacts others. In addition to difficulty monitoring behavior, these children often fail to assess personal task performance to ensure appropriate goal attainment. Specifically, they are often noted to rush through work and make careless mistakes. This may be due in part to the speed with which the child performs a cognitive activity. Processing speed is a general characteristic which refers to encoding, transforming, and retrieving information from working memory (Conway, Cowan, Bunting, Therriault, & Minkoff, 2002). This means that the faster the rate of processing, the greater the amount of information that can be processed in one unit of time (Conway et al., 2002). Thus, if a child is slow to process information then he or she may make careless mistakes in an attempt to finish assignments at a rate similar to classroom peers.

The fourth cognitive cluster defined by Brown (2006) includes the ability to utilize working memory. The function of working memory is to sustain memory representations in the face of concurrent processing, distraction, and/or attention shifts (Baddeley & Hitch, 1974; Miyake & Shah, 1999). The core system thought to be involved in controlling this construct is the central executive (Bull & Johnston, 1997). This system offloads some short-term capabilities into "slave" (Baddeley, 1986) systems in order free up storage to perform more complex memory tasks. The slave systems

include three components, two of which specialize in the maintenance of speech-based, phonological information (the phonological loop) and one that includes maintenance of visual and spatial information (visuospatial sketchpad; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). Deficits in nonverbal working memory appear to result in forgetfulness, time management difficulties, and a reduction in the anticipation of future events (Mash & Barkley, 2003; Raggi & Chronis, 2006). These problems may manifest in ADHD as difficulty with completing and turning in homework assignments as well as difficulty with planning ahead in order to complete long-term projects.

Brown (2006) also described the ability to manage frustration and regulate emotions as functions involved in the emotion cluster. In particular, the ability to modulate emotional responses is important so that the child is able to successfully interact with the environment. Poor emotional control can be expressed as emotional explosiveness (Gioia et al., 2000) whereas frequent mood changes or angry outbursts may be demonstrated. Children with difficulty in this area may have overblown emotional responses to seemingly minor events, particularly within the classroom setting.

The sixth and final cognitive cluster includes monitoring and self-regulating actions. Although Brown (2006) presents this as the action cluster, these processes are frequently referred to in the literature as comprising the behavioral inhibition function (Barkley, 1997a; Burgess, 1997; Gioia et al., 2000). The ability to inhibit one's behavior, or not act on an impulse, is described by Barkley (1997a) as constituting the core deficit in ADHD, predominantly the Hyperactive-Impulsive type. Caregivers and teachers are often concerned about the lack of personal safety observed in children who do not inhibit impulses well. Such children frequently display high levels of physical activity,

inappropriate physical responses to others, a tendency to interrupt and disrupt group activities, and a failure to "look before they leap" (Gioia et al., 2000).

Although there are multiple models that have been developed in order to conceptualize the link between ADHD and executive functioning, the model proposed by Brown (2006) appears to be the most salient. Brown rejects the simplistic notion that executive functions can be accurately measured by existing neuropsychological tests of executive function. Instead his model views a person's ability to perform self-managed tasks of everyday life as a better measure of executive functioning ability. Although such a broadly conceptualized phenotype may compromise scientific efforts to identify the underlying endophenotypes in ADHD, this model more closely resembles the elegant and complex "messiness" of the brain's higher-order operations (Brown, 2006).

ADHD within the school setting

Specific deficits with executive functioning may have direct implications for the development of academic and behavioral problems in children with attention difficulties. These problems extend beyond off-task or disruptive behavior within the classroom to include academic problems such as failure to complete assignments, poor study skills, difficulty comprehending material, sloppy work, lower test grades, grade retention, and placement in special education (Riggs & Chronis, 2006). Globally approximately 70% of children with ADHD initially present due to learning difficulties (Miranda, Jarque, & Tarraga, 2006). In addition, since ADHD does not constitute a separate category of special education, three quarters of the students served under the emotional and behavior disorder category (EBD; Dery, Toupin, Pauze, & Verlaan, 2005), and close to one quarter

served under the specific learning disorder category (SLD; Forness & Kavale, 2001), also meet criteria for ADHD (Miranda et al., 2006).

Students with ADHD often fail at successfully completing classroom tasks that require a sufficient level of attention and active involvement. For example, these students will often make errors on easy tasks whereas they are capable of successfully completing more difficult ones. Frequent errors also are noted at the end of an activity as opposed to the beginning (Miranda et al., 2006). This may be due in part to a lowered motivation towards success often noted in this population. Students with ADHD frequently spend less time studying and impart a decreased effort for educational achievement (O'Neill & Douglas, 1991). In fact, studies show that as many as 30% of these students achieve below predicted ability levels (Frick & Lahey, 1991; Kamphaus & Frick, 1996).

Problems in behavior may be a primary contributor to lower achievement levels. Children with ADHD often manifest disruptive behaviors within the classroom (e.g., being out of their seat, interrupting class, making inappropriate noises, etc.). These behaviors can hinder the learning process and may ultimately lead to some degree of social rejection from peers. Over 50% of children with ADHD have been noted to experience social difficulties (Barkley, 1991). Despite talking more frequently, these children tend to listen and respond less to peers, which leads to unbalanced social interactions (Barkley, 1991). These social difficulties make it likely that children with ADHD will receive a high rate of negative feedback or experience negative interactions with others in their environment (Frick & Lahey, 1991). Thus, it is not surprising that many children with ADHD also have a poor self-concept as well as low self-esteem (Weiss, Hechtman, & Perlman, 1978) that often persists throughout adolescence and into

adulthood (Lambert, 1988). Therefore, assessing and treating the academic and social difficulties demonstrated by students with ADHD is a major goal in working with these children.

ADHD Treatment

There are a variety of treatment alternatives frequently implemented with this population. However, medication is currently the most well-known and widely utilized treatment for ADHD. According to Hoff and colleagues (2002) nearly 20 million prescriptions were written for the psychopharmacological treatment of ADHD during 2001. Such estimates are indicative of a six- to eight-fold increase from the 1990's. The psychostimulant medication that is often prescribed to treat ADHD has been shown to produce increased attention, reduced impulsivity, decreased overactivity, decreased restlessness, increased compliance, and improved overall classroom behavior (Anastopoulos, DuPaul, & Barkley, 1991; Barkley, Fischer, Newby, & Breen, 1988; Danforth, Barkley, & Stokes, 1991). Although medication has been noted to effectively improve behavior in 70-80% of children with ADHD (Kronenberger & Meyer, 2001), others experience an adverse impact (e.g., medication side effects) or no impact at all. Furthermore, it is unclear as to whether stimulant medication translates into long-term academic and behavioral improvement.

Therefore, researchers have identified a need for interventions that create additive effects beyond those already established with medication. In particular, a variety of therapist-directed behavior management plans have been developed for families dealing with ADHD (Kronenberger & Meyer, 2001). These plans focus on behavior training for parents in order to teach them how to manage their child's challenging behaviors.

Specifically, parents are trained to identify and manipulate the antecedents and consequences of their child's behavior through rewards (i.e., access to tangibles or activities) and consequences (i.e., planned ignoring, time out, etc.; Chronis, Chacko, Fabiano, Wymbs, & Pelham, 2004). Ultimately the main therapeutic objective is not to cure or eliminate ADHD, but to learn methods for coping and compensating for this ongoing disability (Anastopoulos et al., 1991).

Traditional behavioral parent training (BPT) often involves didactic instruction in which content is presented by the therapist in 8-12 individual therapy sessions (Chronis et al., 2004). Individual BPT provides for flexibility in terms of pace, content, and attention in order to address the idiosyncratic problems presented by the client. While individual BPT has a long, successful history as a treatment for children with ADHD (Pelham et al., 1998) variations of this approach have been developed in order to enhance effectiveness. In particular, the alternative group-based approach can be more cost-effective than individual BPT and it offers opportunities for social support with families in similar situations (Webster-Stratton, 1984). In addition to didactic instruction, group-based BPT programs often disseminate information through the use of videotape modeling. This provides for the relatively complicated BPT techniques to be illustrated visually, ultimately improving comprehension of the material and subsequent effective implementation (Chronis et al., 2004).

Because the DSM-IV definition of ADHD requires cross-situational impairment, virtually every child with this disorder will experience difficulties within the school environment. Specific deficits may be noted with regards to school behavior, social relationships, and with academic performance. For this reason, school-based

interventions are an important adjunct to BPT for families dealing with, or at-risk for ADHD (Chronis et al., 2004). In a study conducted by Barkley and colleagues (2000) they compared BPT alone, school-based treatment alone, and the combination of the two approaches. Findings indicated that the group that received a combination of the two treatments was the only one to demonstrate significant gains. Therefore, one can conclude that effective interventions for children with ADHD need to be implemented across settings in order to achieve maximum effectiveness (Chronis et al., 2004).

Although research suggests that children with this disorder may improve with a cross-situational approach to treatment, approximately 70-80% of children who receive mental health services do so solely within the school setting (Hoagwood, Burns, Kiser, Ringeisen, & Schoenwald, 2001). By delivering interventions through the school system, educators can address the key financial and structural barriers that often prevent children from receiving the necessary treatment. In addition, since schools are a frequent locus of pressure on the child to improve behavior (Kronenberger & Meyer, 2001), school-based interventions are an important part of the treatment for children with this disorder. Specifically, a large convincing evidence base exists for behavioral school interventions, which has resulted in their classification as "empirically validated treatments" for ADHD according to the American Psychological Association (APA; Raggi & Chronis, 2006). Behavioral interventions for students with ADHD include antecedent-based strategies, contingency management techniques, and self-management strategies (DuPaul & Weyandt, 2006).

Antecedent management techniques. Antecedent management techniques are one group of school-based techniques that involve manipulation of events or stimuli that

precede a target behavior in an effort to prevent the problematic behavior from occurring (DuPaul & Weyandt, 2006). The term "antecedent conditions" is often used to include setting and environmental design issues such as type of class (e.g., general-education, special education), structure of the setting (e.g., class rules), seating arrangements, and characteristics of the task (Abramowitz & O'Leary, 1991) that may elicit inattention, impulsivity, or hyperactivity. Research suggests that antecedents are of considerable importance in maintaining adequate levels of attention and, presumably, academic achievement (Abramowitz & O'Leary, 1991). Antecedent-based strategies may produce alternative, more appropriate behaviors (e.g., increased on-task behaviors) in children with ADHD.

Early work in the field of hyperactivity employed an antecedent management technique commonly referred to as stimulus reduction. This intervention involved buffering the child from extraneous stimuli through movement to a quiet room or a well-defined and often screened in area within the classroom (Morriss, 1996). Although frequently implemented, such techniques received little empirical support and have been found to be somewhat ineffective in treating ADHD (Abramowitz & O'Leary, 1991). Instead, a more viable alternative is seating modification. This strategy involves moving a child's seat to a place within the classroom that will afford more task-appropriate stimulation and offer less extraneous stimuli (Kronenberger & Meyer, 2001). Typical seating modification strategies often necessitate moving the child to the front of the room, closer to the teacher, and away from overly active peers. Whole class seating arrangements (e.g., sitting in rows) have been found to increase productivity and reduce off-task behaviors (Abramowitz & O'Leary, 1991).

Choice making is another antecedent-based strategy that allows the student to choose between two or more academic tasks. For example, if a student were to demonstrate disruptive classroom behaviors when asked to complete an independent mathematics assignment, that child would then be provided with a number of possible mathematics assignments from which to choose (DuPaul & Weyandt, 2006). The student would be expected to complete the chosen assignment within the allotted time period. Thus, the child is given the freedom to choose the task whereas the teacher retains control over the general nature of the assigned work. Effects of classroom-based choice making were examined and found to produce reliable and consistent increases in task engagement with reductions in disruptive behavior (DuPaul & Weyandt, 2006).

Another possible strategy is to modify task assignments in order to deter disruptive behaviors. Students with ADHD may engage in off-task and disruptive behaviors in order to avoid or escape challenging work, such as writing assignments (DuPaul & Weyandt, 2006). In such cases, the writing assignment can be modified through reducing the overall length or breaking the task down into subunits with a short break after each section (DuPaul & Stoner, 2003). Anecdotal reports indicate that this strategy is effective in decreasing off-task behavior. Other specific antecedent-based strategies include reducing classroom noise, allowing the child to self-pace on tasks, increasing task structure, and increasing stimulation of tasks through audio or visual components (Kronenberger & Meyer, 2001).

Contingency management. In addition to techniques that are directed towards manipulation of events or stimuli that precede the target behavior, school-based behavioral techniques may also emphasize modification of contingencies to alter

behavior (Kronenberger & Meyer, 2001). The application of contingencies involves manipulating events that occur following a target behavior in order to either increase appropriate behaviors or decrease problematic behaviors. Historically, the most common form of consequent-based strategy is teacher attention. Prior research suggests that a combination of praising appropriate behaviors while ignoring inappropriate behaviors may successfully reduce classroom disruptions (Madsen, Becker, & Thomas, 1968). Behaviors that are inappropriate but not dangerous, destructive, or disruptive may be ignored by the teacher (Kronenberger & Meyer, 2001), however some punishment has been found to add to the effectiveness of the praise-ignore plan (Abramowitz & O'Leary, 1991).

In instances of more severe problems, punishment techniques may be efficient in behavior cessation. Reprimands, for example, are found to be effective if they are administered in a brief, matter-of-fact, consistent, firm (Kronenberger & Meyer, 2001), private, and immediate manner (Abramowitz & O'Leary, 1991; DuPaul & Stoner, 1994). In addition to reprimands, time-out techniques may also be utilized in order to punish negative or inappropriate behavior within the school. Since time-out involves restricting the child from access to reinforcements (Kronenberger & Meyer, 2001), such techniques are often perceived as negative and produce the same impact as other forms of punishment. Time-out may take the form of restricting access to a favored activity or preventing the student from receiving a reinforcer that is being distributed to the entire class. Social time-out requires removing the child from the class, either by moving the child to a remote corner of the room or out into the hallway (Kronenberger & Meyer, 2001).

A token reinforcement program is another contingency-management technique that is commonly utilized in which tokens or points are awarded or removed based upon specified desirable or undesirable behaviors (Abramowitz & O'Leary, 1991). These tokens or points can then be exchanged at a later time for activities, objects, or privileges. Since a key deficit underlying many behaviors exhibited by children with ADHD has been noted to be impaired, delayed responding to events within the environment (Barkley, 1997b), immediate contingencies have been noted to positively enact behavior change (DuPaul & Weyandt, 2006). In fact, there exists a substantial history of empirical support for token reinforcement programs in reducing problematic behavior in children with ADHD (Ayllon, Layman, & Kandel, 1975; Robinson, Newby, & Ganzell, 1981).

Two variations of token reinforcement exist including home-school contingencies (i.e., daily report card) and response cost. Home-school contingencies consist of programs, which combine school and parent efforts in order to improve overall classroom behavior (Abramowitz & O'Leary, 1991). In this approach teachers typically complete a daily report card that indicates whether the child met behavior goals for the day. Parents are taught to utilize this feedback in order to implement home-based consequences contingent upon goal attainment in the school (Chronis et al, 2004). Furthermore, effects of the daily report card are enhanced when there are a limited number of goals, feedback is provided frequently, and parents are included in the planning process (DuPaul & Stoner, 2003; DuPaul & Weyandt, 2006).

Contingency strategies that consist purely of positive reinforcement have been found to be relatively ineffective in managing appropriate levels of social as well as academic behavior in children with ADHD (Pfiffner & O'Leary, 1993). Instead, research

has found that using mild forms of punishment immediately following inappropriate behaviors has been consistent in promoting behavior change in this population (Rosen, O'Leary, Joyce, Conway, & Pfiffner, 1984). Thus, using token reinforcement with a response cost procedure appears to be the most appropriate way to implement a successful token economy. In several cases, increased levels of on-task behavior, seatwork productivity, and academic accuracy of children with ADHD were found when a token reinforcement with a response cost procedure was utilized concurrently (DuPaul, Guevremont, & Barkley, 1992; DuPaul & Weyandt, 2006).

Although a token economy with a response-cost component has been proven to be a powerful behavior-change approach, this strategy is not without its drawbacks. First, children within the classroom may become jealous of the child with ADHD and misbehave in an attempt to obtain their own token economy or reward (Kronenberger & Meyer, 2001). Second, the parameters of good and bad behavior may be too stringent and the child might not be able to earn any points or the child may lose more points than are earned. Third, the token economy may only work within one setting and be unable to be generalized across settings. Fourth, teachers need to pay constant attention to the child's behavior in order to respond consistently. This may be difficult with a large number of students in the classroom. Finally, token reinforcements provide motivation for children through external rewards, which may not always be present to the child (Kronenberger & Meyer, 2001). Therefore, the student will need to learn how to develop intrinsic motivation in order to demonstrate appropriate behaviors. This can be accomplished through the use of self-management strategies.

Self-management strategies. Self-management strategies are interventions that are designed to increase self-control of behavior through individual implementation (DuPaul & Weyandt, 2006). Although the premise behind self-management interventions is that the child's problematic behavior is reflective of a skill deficit, the broad umbrella of such techniques encompasses a number of approaches. These approaches vary from applied behavior analysis procedures that emphasize contingency management to cognitive-behavioral approaches that are designed specifically to teach children various meditational strategies (Ervin, Bankert, & DuPaul, 1996; Shapiro & Cole, 1994). Generally speaking, contingency-based approaches target the consequences of behavior, whereas cognitive-based approaches target antecedents of behavior (Shapiro & Cole, 1994).

Self-management interventions that emphasize the contingency management approach often include self-monitoring, self-reinforcement, and self-evaluation (Purdie, Hattie, & Carroll, 2002; Reid, Trout, & Schartz, 2005). These techniques typically require the child to set individual goals for on-task behavior or task completion, self-monitor those goals, and self-administer rewards once the task has been successfully completed (Raggi & Chronis, 2006). Often times these strategies are taught at the cessation of token reinforcement programs in order to promote skills maintenance. The premise of this approach is that positive behavior change will be maintained despite reduction in teacher feedback or other forms of external reinforcement (DuPaul & Weyandt, 2006).

On the other hand, cognitive-based self-management interventions are designed to teach children to think differently about a situation prior to acting (Shapiro & Cole,

1994). The central assumption is that a child's behavior is the result of how events are perceived within that child's environment. Common cognitive-based approaches include self-instruction, stress inoculation training, and social problem-solving training (Shapiro & Cole, 1994). The impetus for this focus stems in large part from the landmark work by Meichenbaum and Goodman (1971). They taught children who demonstrated behavior deficits to use overt, and eventually covert, speech to guide actions (Abikoff, 1985; Shapiro & Cole, 1994). Similar self-instruction training models often include repeating instructions, describing the task, verbalizing how to attempt the task, thinking about consequences of the approach, deciding how to proceed, performing the task, reflecting on the performance, and self-evaluation (Abramowitz & O'Leary, 1991). Stress inoculation training and social problem solving training use the aforementioned tactics to manage anger, anxiety, and social situations.

Results of cognitive-based interventions for children with ADHD have been somewhat disappointing in that short-term gains have not been maintained and cognitive behavioral procedures have not produced additive effects when combined with stimulant medication (Bloomquist, August, & Ostrander, 1991). The limited success of such procedures cannot be attributed to the narrow scope of delivery alone. With few exceptions (e.g., Bugental, Collins, Collins, & Chaney, 1978), cognitive training interventions for children with ADHD have not paid attention to individual differences (Abikoff, 1985). Individualized assessment and training are required in order to provide for acquisition and internalization of necessary skills.

Mindfulness interventions. The limitations identified with traditional cognitive-based interventions have led researchers to begin examining basic assumptions underlying this approach. When basic assumptions and models begin to be questioned, the discipline enters into a creative but slightly disorienting time when new formulations emerge and complete with older ones without broad agreement about the value of these new approaches (Hayes, 2004). In fact, such a transformation has occurred over the last fifteen years as the so-called third-generation behavioral and cognitive therapies have been introduced and implemented (Hayes, 2004). These methods differ from traditional cognitive behavior therapy models in that treatment of private events (e.g., internal experiences such as thoughts, feelings, and physical-body sensations) are identified as a necessary part of the intervention (Hayes & Greco, 2008). Instead of targeting and attempting to alter the content, frequency, and form of thoughts and feelings directly, acceptance and mindfulness-based therapies seek to change the function of internal phenomena so as to reduce their impact (Hayes & Greco, 2008).

Although the third-wave behavior therapies represent some of the most recent therapeutic approaches delineated in the literature, concepts of mindfulness and acceptance are not recent (O'Brien, Larson, & Murrell, 2008). Mindfulness-based psychological interventions have largely been drawn from the 2,500-year-old Buddhist insight meditation techniques (Chambers, Lo, & Allen, 2008; Siegel, Germer, & Olendzki, 2009). Such techniques facilitate insight into the nature of the mind through the development of mindful awareness of psychological responses that occur within the present moment (Hart, 1987). While some concentration practices aim to empty the mind of all thought, this is not the aim of mindfulness (Siegel et al., 2009). Instead,

mindfulness practice involves training the mind to be aware at all times of what we are doing and what we are thinking.

As mindfulness is adopted by Western psychotherapy and migrates away from its ancient roots, its meaning is expanding and changing (Siegel et al., 2009). As a result, consensus on an operational definition of mindfulness has yet to emerge. Most mindfulness practices, however, can be conceptualized as techniques for training attention (Burke, 2009; Semple & Lee, 2008). Moreover, a number of definitions found in the literature suggest that regulating attention is a central component of mindfulness. Most often, mindfulness has been described as "bringing one's complete attention to the present experience on a moment-to-moment basis" (Marlatt & Kristeller, 1999, p. 68) and as "paying attention in a particular way: on purpose in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p.4). Mindfulness is a specific type of attention that incorporates the qualities of intentionality, present focus, and nonjudgmental acceptance (Semple & Lee, 2008). In mindfulness practice, attention is consciously directed towards something specific, be it internal (e.g., thoughts, emotions) or external via sense perceptions (Semple & Lee, 2008).

Developing an operational definition of mindfulness is essential not only for the development of valid instruments in which to study the nature of this construct, but to investigate the psychological processes involved in mindfulness training (Baer, Smith, Hopkins, Krietenmeyer, & Toney, 2006). Several current descriptions of mindfulness are suggestive of a multidimensional nature (Baer et al., 2006). Dimidjian and Linehan (2003) conceptualize mindfulness as having six elements including three related to what one does when being mindful (observing, describing, participating) and three that are

related to how one does it (nonjudgmentally, one-mindfully, and effectively). On the other hand Brown and Ryan (2004) suggest that mindfulness consists of a single factor. They describe that factor as attention to and awareness of what is taking place in the present. Their argument is that while acceptance is an important aspect of mindfulness it is subsumed within the ability to pay attention to the present (Baer et al., 2006).

In an attempt to examine the facet structure of mindfulness, Baer and colleagues (2006) administered five recently developed mindfulness questionnaires to two large samples of undergraduate psychology students. Factor analyses for the combined pool of items from the questionnaires were suggestive of five clear facets of mindfulness (Baer et al., 2006). The first facet included nonreactivity to inner experience. This idea incorporates information pertaining to individual perception of reactivity towards feelings and emotions (e.g., I perceive my feelings without having to react to them). Observing and attending to sensations or perceptions through thoughts and feelings was the second facet identified. This idea relates to the ability of the individual to attend to his or her surroundings, feelings, and emotions (e.g., I notice how my emotions express themselves through my body; Baer et al., 2006). The third facet, acting with awareness, pertains to the ability to focus on what is happening in the present (e.g., I find myself preoccupied with the future or the past). Describing feelings is the fourth facet, which relates to an individual's ability to put beliefs, opinions, expectations, and perceptions into words (e.g., I can describe how I feel in the moment). Finally, nonjudging of inner experience pertains to an individual's ability to avoid judging perceptions or emotions no matter how irrational or inappropriate (e.g., I criticize myself for having inappropriate emotions; Baer et al., 2006).

Mindfulness and Mindlessness

Mindfulness may be easiest to understand by examining its opposite state, mindlessness (Siegel et al., 2009). Even causal self-evaluation reveals that we spend most of our time lost in memories from the past and fantasies of the future. We are often on "autopilot," whereas our mind and body are in different places. For example, bagel-cutting accidents are the leading cause of Sunday morning emergency room visits in New York (Siegel et al., 2009). While interacting with family members or friends, most people are so distracted by interpersonal interactions that they are cutting bagels automatically without guidance from a conscious mind. The pervasive mindlessness of everyday life is striking. When we are able to reflect honestly, we are able to notice that we are rushing through, or trying to fast forward much of our life experience (Siegel et al., 2009).

Given that attention is at the core of mindfulness practice (Zylowska, Smalley, & Schwartz, 2009), can it be rationalized that ADHD is likely a disorder of mindlessness? A few studies have directly investigated the relationship between mindfulness practices and the quality of attention with adult subjects (Semple & Lee, 2008; Valentine & Sweet, 1999). A study conducted by Jha and colleagues (2007) compared a group of participants in a Mindfulness-Based Stress Reduction program (MBSR; Kabat-Zinn, 1994) to a group participating in a mindfulness retreat. Results indicated that participants in the MBSR program improved orienting, while the retreat participants improved receptive attentional skills. A separate study explored the relationship between mindfulness and attention-related behavior problems. Following an 8-week MBSR program, improvements were noted in self-reported ADHD symptoms for participants (Zylowska et al., 2008). Moreover, clinical reports suggest that mindfulness techniques may be effective with

school-aged children as well. Rani and Rao (1996) evaluated a small group of children (ages 9-11) who practiced meditation regularly. They found that the meditation group demonstrated a greater attention-regulation capacity than the control group (Semple, 2010).

As typical in early years of therapy research, there has been little evaluation of mindfulness therapies with children (Semple & Lee, 2008). From one point of view, mindfulness and youth are closely linked (O'Brien et al., 2008). In Buddhism, there is a concept of "beginner's mind" (O'Brien et al, 2008, p.17). Beginners tend to be more enthusiastic about learning and more receptive to new ideas. Youth are beginners in life's journey, and the therapist who adopts a beginner's mind, gains a window into the mind of a child (Goodman, 2005). Mindfulness-based therapy may initially be thought to be too complex or beyond understanding of children. However, by the age of eight, children have the ability to apply knowledge of language and use symbols to represent objects (Hayes & Greco, 2008). Piaget noted that children of this age are entering the concrete operational stage of development. Therefore, they are developing the ability to think abstractly and make rational judgments about concrete or observable phenomena (Piaget, 1952). Between the ages of nine and 15, thinking becomes more abstract and by 16 to 18, hypothesizing and deductive reasoning is developed (Hayes & Greco, 2008). Therefore, throughout these early years, the ability for youth to understand the complex ideas related to mindfulness emerges (O'Brien et al., 2008).

Although limited, evidence for a relationship between mindfulness and attention in children appears promising. Given the multiple attention/cognitive impairments in ADHD, mindful awareness training can either be identified as a remediation

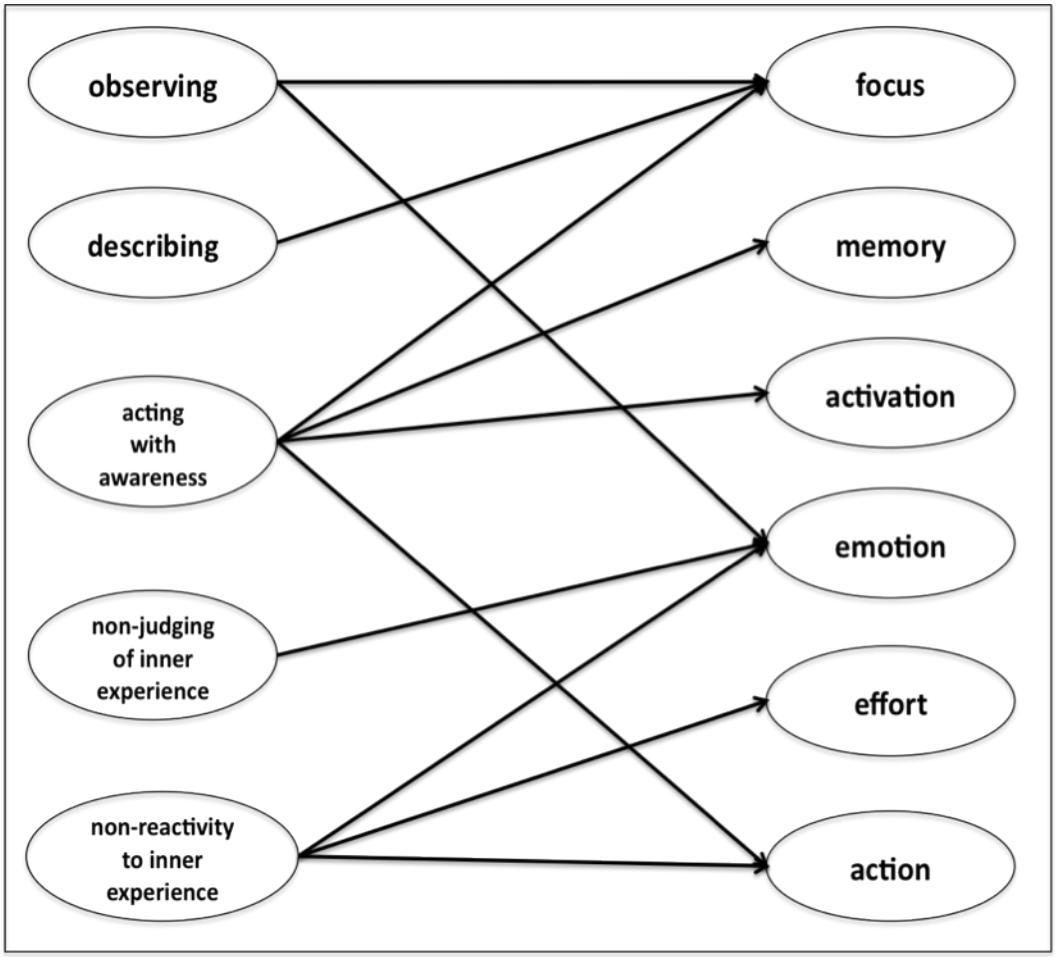
(compensatory) or rehabilitation (reversal) approach to this condition (Zylowska et al., 2009). The diverse processes involved in mindfulness practice are likely to repeatedly engage executive function (focus, emotion, memory, action, activation, and effort; Brown, 2006) which may lead to a strengthening of these abilities as well as changes in self-regulatory skills (Zylowska et al., 2009). In formal practice (sitting or walking meditation) attention is engaged through the following steps: 1) bringing attention to an "attentional anchor" (breath) through observation or description; 2) noting that distractions occur and letting go of those distractions by acting with awareness and not judging the experience; 3) refocusing attention back to the "attentional anchor" though nonreactivity to one's inner experience (Baer et al., 2006; Zylowska et al., 2009).

As noted, executive functions appear to be critical in carrying out this process as detailed in Figure 1. Specifically, the first step, bringing attention to an "attentional anchor" requires the individual to observe or attend to his thoughts (Baer et al., 2006). This action engages the executive functions of focus and emotion where the individual needs to focus on the "attention anchor" while letting go of unwanted emotion. The act of describing or labeling this action with words may help children to focus and allow this process to become more concrete. The second step, noting that distractions occur and letting go of those distractions by acting with awareness activates the executive functions of focus, memory, activation, and action. The individual needs to attend to the distraction, remember what he or she was supposed to be focusing on, initiate the process of refocusing, and actually refocus on the activity. While these processes are taking place, the individual must remember to not judge the experience of becoming distracted by regulating emotions. Finally, the third step of focusing attention back to the "attentional

anchor" occurs though nonreactivity to one's inner experience. To do this the executive functions of emotion, effort, and action must be activated. In order to not react to the inner experience, the individual must control his emotions, sustain effort, and actively focus on the "attentional anchor."

Figure 1

Facets of mindfulness and executive functions



Mindful awareness in daily life (informal practice) in which the individual checks his attention throughout the duration of the day may engage the same attentional networks as formal practice but, may also offer opportunities to generalize from the setting where the practice may be introduced (Zylowska et al., 2009). Since ADHD is a

complex trait that arises in childhood and likely continues throughout the lifespan, it is important to develop interventions that assist individuals with this disorder in adapting to their surroundings. As children spend a majority of their waking hours within the school environment, developing school-based interventions is a necessity. Mindfulness interventions are relatively new and generally unstudied with this population. However, mindfulness practice is likely to engage executive functions potentially leading to strengthening of these abilities and subsequent improved attentional capabilities. Researchers are just beginning to explore the feasibility, acceptability, and effectiveness of this approach with children (Semple, Lee, Rosa, & Miller, 2010).

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Chapter 2

THE IMPACT OF MINDFULNESS TRAINING ON HYPERACTIVE BEHAVIORS DEMONSTRATED BY ELEMENTARY-AGE CHILDREN WITH A DIAGNOSIS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER

Problems with attention to classroom instruction are among the most common difficulties demonstrated by school-aged children within the United States (DuPaul, Stoner, & O'Reilly, 2002). In fact, approximately 16% of elementary-aged children display some level of inattention or poor concentration to classroom tasks (Wolraich, Hannah, Baumgaertel, & Feurer, 1998). Attention problems are frequently associated with behavioral difficulties such as disorganization, high activity levels, and aggressive behaviors. While a small amount of diffuse activity and short attention span are not uncommon for school-aged students, problems are identified when such behaviors are so disruptive that they result in academic or social difficulties for the child. Significant levels of problematic inattentive or hyperactive behaviors may lead to a diagnosis of Attention Deficit / Hyperactivity Disorder (ADHD).

One of the most prevalent issues confronting professionals working with children who present with symptoms of ADHD involves confusion over the ever-changing diagnostic labels used to signify this disorder (e.g., ADD, ADHD, etc; Hoff, Doepke, & Landau, 2002). A likely explanation for these changes in nomenclature involves the improved understanding of the disorder resulting from the significant amount of research on ADHD completed in recent years. Historically, ADHD has been depicted by a variety of diagnostic labels, with each one emphasizing differences in hallmark symptoms and

loci of the problem (Hoff et al., 2002). The most recent major revision of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* published in 1994 (DSM-IV; American Psychiatric Association, 1994) divided ADHD into two groups: inattention and hyperactivity-impulsivity.

The inattention subtype of ADHD consists of symptoms reflecting lack of attention to details, difficulty sustaining attention, failure to listen, organizational problems, forgetfulness, and failure to complete activities (Kronenberger & Meyer, 2001). The hyperactivity-impulsivity subtype includes excessive behaviors such as difficulty remaining seated in the classroom, frequent talking, difficulty with turn taking, squirming or fidgeting, and inappropriate vocalizations. In order to receive a diagnosis of ADHD, children must meet either of the six inattention symptoms or six hyperactivity-impulsivity symptoms across two or more settings (e.g., home and school). Individuals who meet both the inattention and hyperactivity-impulsivity criteria are coded as being the combined type. While the current diagnostic classification of ADHD focuses on the behavioral deficits typical of the disorder, it fails to take into account the cognitive deficits (i.e., executive function) that are often associated with ADHD (Barkley, 1997).

Specifically, a number of researchers have suggested that the ADHD features of inattention, impulsivity, and overactivity reflect a general deficit in one or more domains of executive functioning (Barkley, 1997; Kronenberger & Meyer, 2001; Pennington & Ozonoff, 1996; Slaats-Willemse, Swaab-Barneveld, de Sonneville, & Buitelaar, 2007). Executive function (EF) is a term that refers to those capacities that enable a person to interact successfully within his or her environment. In short, EFs represent “an umbrella construct that includes a collection of interrelated functions that are responsible for

purposeful, goal-directed, problem-solving behavior" (Gioia, Isquith, Guy, & Kenworthy, 2000, p.1).

While there is currently no widespread agreement on a comprehensive EF model, multiple studies have provided evidence regarding the number of self-regulatory skills that fall within the EF domain (Anderson, 2008). For example, Barkley attributes all symptoms to a single phenomenon known as behavioral disinhibition. More recent investigations using latent variable analysis have found that inhibition, cognitive flexibility, and working memory are all separate but related dimensions of executive functioning (Lehto, Juujärvi, Kooistra, & Pulkkinen, 2003). Moreover, a number of factor analytic studies have identified additional dimensions of this construct including speed of information processing, planning, and problem solving (Levin et al., 1991).

Although there are a number of models that have been developed in order to conceptualize the link between ADHD and executive functioning, the model proposed by Brown (2006) appears to be the most salient. Brown's model rejects the simplistic notion that executive functions can be accurately measured by existing neuropsychological tests of executive function. Instead his model views a person's ability to perform the self-managed tasks of everyday life as a better measure of executive function ability. Although such a broadly conceptualized phenotype may comprise scientific efforts to identify the underlying endophenotypes in ADHD, this model more closely resembles the elegant and complex "messiness" of the brain's higher-order operations (Brown, 2006).

Specific deficits with executive functioning may have direct implications for the development of academic and behavioral problems in children with attention difficulties. These problems extend beyond off-task or disruptive behavior within the classroom to

include academic problems such as failure to complete assignments, poor study skills, difficulty comprehending material, and lower test grades (Raggi & Chronis, 2006). Given the magnitude of the academic as well as the social problems of children with ADHD, and the importance that school has on their development, it is necessary to define and plan educational services that respond to their specific needs (Miranda, Jarque, & Tárraga, 2006).

The most widely utilized treatment for children who have been diagnosed with ADHD is psychostimulant medication. Although medication has been noted to effectively improve behavior in 70-80% of children with ADHD (Kronenberger & Meyer, 2001), others experience an adverse impact (e.g., medication side effects) or no impact at all. Therefore, researchers have identified a need for interventions that create additive effects beyond those already established with medication. Behavioral interventions, especially antecedent-based strategies and contingency-management techniques (e.g., token economy) are frequently utilized with children with hyperactivity (Whalen & Hender, 1991). In addition, cognitive-behavioral interventions have been associated with minimal behavior change, particularly those treatment modalities that utilize self-instruction (Abikoff, 1991).

The limitations identified with traditional cognitive-based interventions have led researchers to begin examining basic assumptions underlying this approach. Over the past fifteen years, a number of so-called “third-wave” behavioral and cognitive therapies have been developed (Hayes, 2004). These third-wave techniques focus on eliciting behavior change by changing the context of thoughts rather than the content (O’Brien, Larson, & Murrell, 2008). Mindfulness techniques, acceptance, cognitive diffusion, dialectics, and

examination of values are often incorporated into the third-wave approaches (Hayes, Masuda, Bissett, Luoma, & Guererro, 2004). The goal of such techniques is not to change problematic thoughts but to accept them as private experiences and not literal truths (O'Brien et al., 2008).

Though the third-wave therapies represent some of the most recent therapeutic approaches, the concept of mindfulness or acceptance, which serves as one of the foundational components, is not recent (O'Brien et al., 2008). Prior to being incorporated into the mainstream Western healthcare community, mindfulness and acceptance were practiced by Buddhists for over 2500 years (Kabat-Zinn, 2003). As mindfulness moves away from its ancient roots, its meaning is expanding and changing. Therefore, a consensus on an operational definition has yet to emerge. Most frequently, mindfulness has been described as "bringing one's complete attention to the present experience on a moment-to-moment basis" (Marlatt & Kristeller, 1999, p. 68) and as "paying attention in a particular way: on purpose in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p. 4).

Developing an operational definition of mindfulness is essential not only for the development of valid instruments in which to study the nature of this construct, but to investigate the psychological processes involved in mindfulness training (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Several current descriptions of mindfulness are suggestive of a multidimensional nature (Baer et al., 2006). Dimidjian and Linehan (2003) conceptualize mindfulness as having six elements including three related to what one does when being mindful (observing, describing, participating) and three that are related to how one does it (nonjudgmentally, one-mindfully, and effectively). On the

other hand, Brown and Ryan (2004) suggest that mindfulness consists of a single factor. Meanwhile, Baer and colleagues (2006) identified five clear facets of mindfulness including nonreactivity to inner experience, observing, describing, acting with awareness, and nonjudging of inner experience.

There has been little research that has directly examined the relationship between mindfulness practice and attention. Jha and colleagues (2007) compared a group of participants in a Mindfulness-Based Stress Reduction program (MBSR; Kabat-Zinn, 1994) to a group participating in a mindfulness retreat. Results indicated that participants in the MBSR program improved orienting, while the retreat participants improved receptive attentional skills. A separate study explored the relationship between mindfulness and attention problems. Following an 8-week MBSR program, improvements were noted in self-reported ADHD symptoms (Zylowska et al., 2008). Finally, Rani and Rao (1996) evaluated a group of children (ages 9-11) who meditated regularly. They found the group that meditated regularly demonstrated greater attention regulation capacity then the control group (Semple, 2010). Although limited, evidence suggests a relationship between mindfulness and attention, which justifies further investigation (Semple, Lee, Rosa, & Miller, 2010).

As typical in early years of therapy research, there has been little evaluation of mindfulness therapies with children (Semple & Lee, 2008). From one point of view, mindfulness and youth are closely linked (O'Brien, Larson, & Murrell, 2008). In Buddhism, there is a concept of "beginner's mind" (O'Brien et al, 2008, p.17). Beginners tend to be more enthusiastic about learning and more receptive to new ideas. Youth are beginners in life's journey, and the therapist who adopts a beginner's mind, gains a

window into the mind of a child (Goodman, 2005). Mindfulness-based therapy may initially be thought to be too complex or beyond understanding of children. However, by the age of eight, children have the ability to apply knowledge of language and use symbols to represent objects (Hayes & Greco, 2008). Piaget noted that children of this age are entering the concrete operational stage of development. Therefore, they are developing the ability to think abstractly and make rational judgments about concrete or observable phenomena (Piaget, 1952). Between the ages of nine and 15, thinking becomes more abstract and by 16 to 18, hypothesizing and deductive reasoning is developed (Hayes & Greco, 2008). Therefore, throughout these early years, the ability for youth to understand the complex ideas related to mindfulness emerges (O'Brien et al., 2008).

The purpose of the present study was to investigate the relationship among mindfulness training, the cognitive processes of attention regulation, and the behavior of children who have been diagnosed with ADHD. The following research questions were addressed. Does mindfulness training for children with ADHD result in an increase of on-task behaviors in the general education classroom? Does mindfulness training improve executive functions in children with a diagnosis of ADHD? Specifically, does improvement occur on the inhibit, initiate, or monitor scales of the Behavior Rating Inventory of Executive Function (BRIEF)? Does mindfulness training decrease hyperactive or inattentive behaviors demonstrated within the classroom? Will improvement be noted on the attention problems and hyperactivity scales of the Behavior Assessment System for Children, Second Edition (BASC-2)?

Method

Participants

Four eight-year-old male participants with a primary *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994) diagnosis of ADHD were included in this study. The racial make-up of the participants was three White participants and one African American participant. All of the participants spoke English. The research team solicited volunteers through the Student Support Team (SST) at one elementary school in a suburban school district located within a major metropolitan area in the southeastern United States. Each parent of a child referred to the SST received a letter describing the SST process. The letter stated that in addition to the interventions developed through the traditional SST process, a mindfulness-based intervention would be offered to children with a current diagnosis of ADHD. Parents were made aware that regardless of whether they provided consent for participation in the mindfulness-based intervention their child would still receive SST services.

In addition to being identified as having an ADHD diagnosis, participants included in the study met the following inclusionary criteria (a) served in the general education classroom, (b) 2011 Cognitive Abilities Test (CogAT) score of 85 or above, (c) behavioral symptoms controlled with stimulant medication, (d) regular school attendance defined as fewer than 5 school days missed during the 2009-2010 school year, (e) parental consent to participate, and (f) student assent to participate. See Table 1 for summary of participant characteristics.

Table 1

Participant Characteristics

Characteristic	Students			
	Sam	John	Al	Bob
Age	8 years, 3 months	8 years, 8 months	8 years, 9 months	8 years, 6 months
Ethnicity	White	White	White	African American
Primary Language	English	English	English	English
Medication	30 mg Adderall XR; once daily	30 mg Adderall XR; once daily	15 mg Adderall; twice daily	36 mg Concerta; once dailly
Placement	Full-day General Education Classroom	Full-day General Education Classroom	Full-day General Education Classroom	Full-day General Education Classroom
CogAT score	106	101	97	105
Attendence	No absences	3 absences	1 absence	No absences

Instruments

Parents and teachers of participants were asked to complete two different norm-referenced diagnostic rating scales, before and after the intervention. One rating scale was designed to assess severity of problematic behavior in children and young adults. The other rating scale was administered in order to assess executive function behaviors across settings. These measures are frequently utilized in school, clinical, and research settings. In addition to rating scales, students were assessed through observations. An observation coding form was utilized for conducting systematic observations within the classroom.

Behavior rating scales. The Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004) was administered in order to assess the

behavioral adjustment of participants in the study. Of relevance to this particular study are the Parent Rating Scale (PRS) and the Teacher Rating Scale (TRS) as parent and teacher ratings were obtained and analyzed. The BASC-2 is a multidimensional and multimethod tool since it measures numerous behavior and personality characteristics through report-based measures. Sixteen primary measurement areas are identified on the parent and teacher rating scale including: activities of daily living, adaptability, aggression, anxiety, attention problems, atypicality, conduct disorder, depression, functional communication, hyperactivity, leadership, learning problems, social skills, somatization, study skills, and withdrawal. On the clinical scales, T scores from 60-69 fall within the At-Risk range whereas T scores 70 and above fall within the clinically significant range. On the adaptive scales, the At-Risk range is from 31 through 40 (Reynolds & Kamphaus, 2004). The clinically significant range is 30 and below.

The BASC-2 was normed using a sample from the general population as well as a clinical sample (e.g., individuals with a diagnosis of ADHD, speech impairment, learning disabilities, etc.). In the sample from the general population 4,800 parent scales and 4,650 teacher scales were obtained. The clinical sample had a total of 5,281 reports across the parent, teacher, and self-report scales. Internal consistency (Cronbach's alpha) was .90 for composite scales and .80 for individual scales across all forms. Test-retest reliabilities yielded average correlations between .80 and .89 for composite scores and between .70 and .80 for individual scale scores. Interrater reliability was obtained for the teacher and parent reports. Median reliabilities from composite scores ranged from .57-.74, and median reliabilities ranged from .53-.65 across individual scales for the teacher sample. The parent sample had median reliabilities for the composite scores and individual scales

in the .70s.

Several validation studies evaluated the similarity of the BASC-2 to other related behavioral assessment tools. The BASC-2 teacher form was compared to the following: the Achenbach System of Empirically Based Assessment Caregiver-Teacher Report Form (ASEBA), Conners' Teacher Rating Scale- Revised (CTSR-R), and the previous version of the Behavior Assessment System for Children (BASC). In general, correlations between subscales were high (.70s to .89) when they addressed similar content. The parent rating scale was compared with the following behavioral measures: the ASEBA Child Behavior Checklist for Ages 1-5, the Conners' Parent Rating Scale-Revised, the Behavior Rating Inventory of Executive Functioning (BRIEF), and the BASC. Generally, the BASC-2 demonstrated strong correlations with the first three scales (.70-.89), and in the .90s with the previous BASC.

Executive function measures. The Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000) was administered in order to assess executive function behaviors in the home and school environments. The BRIEF is designed for use with a broad range of children, 5 to 18 years, including clinical populations. The parent and teacher forms of the BRIEF were utilized in this study and contain eight scales that measure different aspects of executive functioning including: inhibit, shift, emotional control, initiate, working memory, plan/organize, organization of materials, and monitor. On the BRIEF T scores of 65 and above signify clinically significant scores.

The BRIEF normative group was designed to approximate the United States population in terms of gender, socioeconomic status (SES), ethnicity, age, and geographical population density. The normative data were obtained through public and

private school recruitment in urban, suburban, and rural Maryland. A total of 1,419 parent respondents and 720 teacher raters were obtained. Reliability studies indicate high internal consistency, ranging from .80 to .98. The interrater reliability correlations between parent and teacher raters were moderate (r = .32) for the normative group. Within the parent normative subsample (n=54), the mean test-retest correlation across the clinical scales was .81. The test-retest correlations were strongest for the clinical scales on the teacher form (*r* = .87). Strong correlations were noted on several BRIEF and BASC scales. The behavioral regulation index scale on the parent BRIEF correlates strongly with the aggression (*r* = .76) and hyperactivity (*r* = .63) scales on the parent rating form of the BASC. Additionally, most of the BRIEF teacher scales correlated strongly with BASC aggression (*r* = .49-.84), conduct problems (*r* = .52-.80), hyperactivity (*r* = .47-.81), and attention problems (*r* = .47-.65) on the teacher form.

Observation form. The Behavioral Observation of Students in Schools (BOSS; Shapiro, 2004a) form was utilized for conducting systematic observations within the classroom. The BOSS coding sheets permit up to 30 minutes of observation. Each minute is divided into four intervals of 15 seconds each. At the top of the BOSS-coding sheet, the observer can include the subject's identifying information, the instructional setting, and the subject matter being observed. The BOSS divides academic engagement into two subcategories: active- or passive-engaged time. "At the beginning of each cued interval" (Shapiro, 1994a, p. 99), the observer looks at the targeted student; determines whether the student is on-task; and, if so, whether the on-task behavior is an active or passive form of engagement. When the student is not engaged in academic behavior, three possible categories of off-task behavior are coded including off-task motor (OFT-M), off-task

verbal (OFT-V), and off-task passive (OFT-P).

Setting

District. The potential participants for this study were selected from one elementary school in a suburban school district located within a major metropolitan area in the southeastern United States. Census bureau population estimates in 2010 for the county was 131,936 with a median household income of $60,565. The district served approximately 23,455 students in grades pre-kindergarten through twelve in 2010. The overall student population within the district was 66% White, 22.6% Black, 6.4% Hispanic, and 5% other. The elementary school where the participants were selected from serves 851 students. The racial makeup of the elementary school is 51% White, 30% Black, 10% Hispanic, and 8% other. All schools within the county made Adequate Yearly Progress (AYP) in 2008-2009.

Measurement

A trained observer completed direct observation of the dependent variables for a period of 15-minutes using an audiocassette that was cued for the appropriate intervals. As each 15-second interval began (momentary time sampling), the participant was scored for the presence or absence of active-engaged time (AET) or passive-engaged time (PET; Shapiro, 2004b). During the remainder of the time interval, off-task behaviors were scored as they occurred (partial-interval time sampling). Thus, if an event of interest (e.g., OFT-M, OFT-V, or OFT-P) was observed to occur at any time within the 15-second interval, the interval was scored as an occurrence of the event (Kennedy, 2005). If the same event occurred multiple times during one interval it was only recorded once. If more than one event of interest occurred during the intervention (e.g., OFT-M and OFT-

V), then each event would be recorded once. If the event of interest (e.g., OFT-M) is not observed then it was scored as a nonoccurrence of the event (Kennedy, 2005).

Observation sessions were conducted once every other day (i.e., Monday, Wednesday, and Friday) for a total of three per week throughout the duration of the study. The observations took place during the academic area in which the behaviors occurred most frequently. This was discussed with each participant's general-education teacher prior to beginning the intervention. Additionally, observations took place during the same time period for each observation session throughout the duration of the intervention. The BOSS form was utilized as a means of data collection.

Operational definitions. The following behaviors are identified and tracked on the BOSS form: academic engagement (i.e., AET and PET) and academic nonengagement (i.e., OFT-M, OFT-V, and OFT-P).

The BOSS divides academic engagement into two subcategories: active or passive engaged time (Shapiro, 2004b). In either case, the target student is determined to be on-task. AET is defined as those times when the student is actively attending to the assigned class work (Shapiro, 2004b). Examples of AET include: writing, reading aloud, raising a hand, asking the teacher a question, and working with a peer to complete assigned material. Nonexamples of AET include talking about nonacademic work, walking around the room, calling out when raising a hand is required, and tapping a pencil on the desk.

PET is defined as those times when the student is passively attending to assigned work (Shapiro, 2004b). Examples of PET include, attending to a lecture, looking at a worksheet, reading assigned materials silently, looking at the blackboard during teacher instruction, and listening to another student answer a question. Nonexamples of PET

include looking around the classroom aimlessly, reading unassigned material, and staring out the window.

When a student is not engaged in academic behavior, there are three possible categories of off-task behavior that are coded on the BOSS form: OFT-M, OFT-V, and OFT-P (Shapiro, 2004b). These behaviors are recorded using a partial interval observation method. If any of the three behaviors occur at any point during the interval, a mark is made in the appropriate box (Shapiro, 2004b). If during an interval a student fidgets in his seat and calls out an answer, a mark would be placed in the OFT-M and OFT-V categories (Shapiro, 2004a).

Off-task motor (OFT-M) is defined as any instance of motor activity that is not directly related to an academic assignment. Examples of OFT-M include any out-of-seat behavior whereas the student is not sitting in the seat, aimlessly flipping pages of a book, manipulating objects not related to the task (e.g., playing with a paper clip, twirling a pencil, folding paper, etc.), drawing or writing when it is not related to an academic task, turning around in one's seat when facing forward is required, physically touching another student, and fidgeting in one's seat (i.e., engaging in repetitive motor movements for at least 3 consecutive seconds; Shapiro, 2004b). Nonexamples include passing a paper to another student when asked by the teacher, coloring a worksheet when assigned, and swinging feet while working on assigned material.

Off-task verbal behaviors (OFT-V) are defined as any audible verbalizations that are not permitted within the classroom and are not related to an assigned academic task (Shapiro, 2004). Examples include, making any inappropriate audible sound (e.g., whistling, burping, singing quietly, etc.), talking to another student about nonacademic

tasks, making inappropriate comments or remarks, and calling out an answer. Nonexamples of OFT-V are laughing at a joke told by the teacher, talking with a student about assigned work during a cooperative learning experience, and calling out an answer when permitted by the teacher (Shapiro, 2004b).

Off-task passive (OFT-P) is defined as those times when a student is passively not attending to assigned academic activity for a period of at least 3 consecutive seconds (Shapiro, 2004b). Examples of OFT-P include looking around the room, staring out the window, passively listening to other students talk about nontask-related topics. Nonexamples include quietly reading an assigned book and passively listening to another student talk about academic topics during a cooperative learning experience (Shapiro, 2004b).

While the BOSS form was utilized as intended throughout the intervention, only the frequency of on-task behaviors was analyzed and discussed in this study.

Interobserver agreement. Interobserver agreement was calculated for 30% of the sessions using point-by-point agreement by comparing data collected by the primary data collector, and data collected by a trained teaching assistant during agreement checks. The following formula was used. First, the number of intervals with agreements was divided by the number of agreements plus disagreements. Then the total was multiplied by 100%. Both data collectors utilized the BOSS form during observation sessions and compared those data collected. Across all participants interobserver agreement was 93% with a range of 89-95%.

Procedure

Experimental designs. To address research question one this study utilized a multiple baseline across participant's design where each participant was tracked over time following a baseline (pre-intervention) condition. Each participant was observed during a time of the day in which he was experiencing the most difficulty staying on-task. The time period for the observations remained the same throughout the duration of the study. Data were collected through utilization of the BOSS form. The academic engagement subcategories (i.e., AET and PET) were combined into a measure of on-task behavior and graphed in order to track student performance. Once a stable pattern of on-task performance was established for each participant's baseline, then the intervention (treatment) was introduced to one of the participants. Stability was noted to occur when each data point fell within fifty percent on either side of the mean. The other participants stayed in the baseline phase and continued to be monitored. Treatment was continued unchanged with the first participant while the behavior of participants in baseline continued to be tracked without any treatment. Decision rules were implemented in order to allow each participant to be entered into the treatment phase. Each subsequent participant entered the intervention phase once the participant in the previous tier achieved a 10% improvement over baseline for 2 out of 3 sessions or received 6 treatment sessions. This process was repeated until the intervention was applied to all students. In addition, once the each participant entered into the intervention, he continued receiving the treatment until the final participant finished the study. The final participant to enter the study received fewer treatment sessions than participant's one, two, and three. Participant one received the greatest number of intervention sessions. Therefore, the intervention was implemented in each case, but at somewhat different (staggered) times.

Research questions two and three were addressed using a pre- and posttest design where the Reliable Change Index (RCI) was calculated to determine if statistically significant improvements in behavioral adjustment and executive functions improved over time following the intervention.

Baseline. During the baseline phase, on-task and off-task behaviors were observed and data were collected through utilization of the BOSS form. Once the percentage of on-task behaviors was determined to be stable for each participant, the intervention (treatment) was introduced to the student with the greatest percentage of problematic behaviors. This student was entered into the intervention first as his pattern of behaviors was the most problematic during the baseline phase. The other students remained in the baseline phase until the participant in the previous tier achieved a 10% improvement over baseline for 2 out of 3 sessions. Since cognitive-behavior therapy (CBT) is a brief approach to counseling (Capuzzi & Gross, 2007), most treatment programs range from 5-20 sessions. According to research (The Children's Center for OCD and Anxiety, 2011), children typically show a response to cognitive-behavior treatment in four to six sessions. Therefore, an additional decision rule was that if the subject did not make progress following 6 treatments, the next subject was added into the treatment phase. This continued until all participants received a minimum of 10 treatment sessions including the introduction and termination sessions.

Intervention: Mindfulness training. When sharing mindfulness with children, it is important to make appropriate developmental adaptations. Children have a less refined attentional capacity than do adults (Siegler, 1991). Therefore, children generally benefit from shorter and more frequent therapy sessions. The Mindfulness-Based Stress

Reduction (MBSR) course for children teaches mindfulness strategies over eight sessions (Saltzman & Goldin, 2008). Sessions last from 45-90 minutes depending on group size and are offered weekly. Conversely, the intervention implemented in this study incorporated one-on-one training and sessions lasted from 30-45 minutes twice per week. The independent variable implemented during the intervention phase was mindfulness training. The dependent variable for research question one was the percentage of on-task behaviors. The dependent variable for research question two was the change on the Inhibit, Initiate, and Monitor scales on the BRIEF. The dependent variable for research question three was the change in the Attention Problems and Hyperactivity scales on the BASC-2.

During the training phase, an interventionist with training in mindfulness, as well as extensive experience working with children, met individually with each participant for 30-45 minutes twice a week. Each participant received a treatment session during the time of day in which the off-task behaviors occurred most frequently. Thus, the session time corresponded with the time of observation during the baseline phase. During the intervention phase, observations following the introduction session were coded as data from the intervention phase of the study. Thus, on the graph, the first intervention data point is from the first session following the introduction of the intervention. See Appendix A for an overview of the mindfulness training sessions.

Introduction. An introduction was provided for each participant prior to the first training session. During the introductory session ground rules were delineated and the concept of mindfulness was introduced. Participant assent was obtained and any questions were answered at that time.

Session 1. The participant was told that each session begins with a moment of silence designed to aid in relaxation and focusing. After a moment of silence, the first session began with an introduction to the *Pay Attention Mindfulness* compact disc (CD) that was utilized during each meeting. The following script was used when the CD was introduced for the first time:

> "We will be listening to the CD where the man named Dr. Goleman will be leading us through (an) experience (with) training our minds to pay attention as our bodies also relax. We will be sitting still in our chairs and noticing what we are thinking and feeling each moment. He is going to tell us about using our breath to help us focus our attention" (Lantieri & Goleman, 2008, p. 91).

After the introduction, the mindfulness CD was played. The duration of the track from the CD was 7 minutes and 50 seconds. A discussion followed in which the participant's comments or insights were solicited and discussed. Finally, the participant was given the opportunity to practice mindfulness through utilization of the Kids Mandala Coloring Set by Monique Mandali. Mandalas are geometric or symbolic patterns, usually in the form of a circle. Coloring these circles fosters the focused attention of mindfulness (Lantieri & Goleman, 2008).

Session 2. In the second session the participants were again asked to listen to the mindfulness CD following a moment of silence. A mindful eating exercise was introduced where the participant was asked to mindfully eat an apple slice. While sitting silently with eyes closed, the participant was instructed to take one bite. The following script was followed:

> "Take one bite, paying attention to what is happening in your mouth, noticing the taste. Don't rush; take one bite at a time, noticing how the taste changes, how your teeth and tongue work…See if you can notice the urge to swallow, and then feel the swallow as the food moves down your throat…After you have swallowed, when you are ready, take another bite. Take your time. Be curious about your experience. Before you open your eyes, notice how your body, mind, and heart feel now, in this moment" (Saltzman & Goldin, 2008, p. 147).

A discussion about the mindful eating practice followed the exercise in which comments about expectations and preferences were explored.

Session 3. In the third session the participants listened to the mindfulness CD following a moment of silence. The seaweed practice was then introduced. This practice requires the participant to pretend that he is a strand of seaweed anchored to the ocean floor. The participants were then told that "initially we are in a strong current, making big rapid movements. Gradually the current decreases, and our movements become smaller and smaller until there is very gentle swaying and then stillness" (Saltzman & Goldin, 2008, p. 149). Throughout the seaweed practice the participant is reminded to be aware of his or her physical sensations, thoughts, and feelings (Saltzman & Goldin, 2008). A discussion took place following this exercise.

Session 4. The fourth session started by listening to the mindfulness CD following a moment of silence. A reflection journal was then utilized whereas the participant was asked to draw or write about the experience of listening to the CD. A discussion then took place where the interventionist discussed how each person might have a different experience when listening to the CD. The idea of perception was also

discussed. These ideas were then related to what takes place within the participant's classroom.

Session 5. The fifth session started by listening to the mindfulness CD following a moment of silence. The participant was then asked to explore his thoughts and feelings associated with various experiences. Feelings practice involves becoming aware of and naming the current feeling state, and acknowledging that feelings may have ordinary names like angry, happy, and sad, or more unusual names like fiery or empty (Saltzman & Goldin, 2008). This exercise is designed to help the participant become more comfortable with identifying and expressing his or her emotions. After noting the feelings, the participant was then asked to notice where the feelings are experienced in the body (e.g., sitting in the chest, stirring in the belly, etc.; Saltzman & Goldin, 2008).

Session 6. The sixth session started by listening to the mindfulness CD following a moment of silence. The thought parade exercise was then introduced. This exercise requires the participant to sit in a chair and anchor his attention to breathing. The participant is then instructed to watch his thoughts go by as if watching a parade. The participant "may notice that some thoughts are loud and brightly dressed, while others are shy and lurk in the background" (Saltzman & Goldin, 2008, p. 45). When participants notice that they are marching with the parade (i.e., lost in thought), they are encouraged to return to the sidewalk (Saltzman & Goldin, 2008). A discussion followed this exercise.

Session 7. The seventh session started by listening to the mindfulness CD following a moment of silence. The jewel/treasure exercise was introduced to the participants. This exercise requires the participants to select a stone and then lie on the floor while placing the stone on their belly button. They are then invited to feel the stone

move up with the in-breath and down with the out-breath (Saltzman & Goldin, 2008). They were instructed to pay attention to how it feels to rest their attention on the breath and the quiet place between the breaths. A discussion took place following this exercise.

Session 8. The eighth session started by listening to the mindfulness CD following a moment of silence. In this session the participant was asked to discuss what he has learned from participating in this training and how he can generalize what was learned to improve off-task behaviors in the classroom.

Termination. The interventionist indicated that the training was complete and reiterated that ongoing support was available. A discussion about how the participant could continue to practice mindfulness took place.

Follow-up. Two weeks following cessation of treatment sessions for all subjects, one observation was conducted per week for the period of two weeks for a total of 2 observations. These observations helped to determine long-term outcomes.

Procedural fidelity. Procedural fidelity data were collected by a trained special education teacher at the school where the intervention took place for 20% of the sessions using a behavior checklist (See Appendix B). Fidelity was calculated by dividing the total number of interventionist behaviors observed during the session by the total number of interventionist behaviors expected multiplied by 100%. Mean procedural fidelity was 96% with a range of 94-100%.

Analysis

To address research question one, a visual inspection of a graphic presentation of the results was conducted in order to determine whether a functional relationship has been established. In general, level, trend, and variability were used to describe patterns

within each phase of the study (Kennedy, 2005). The level refers to the mean performance during each phase of the study (i.e., baseline or intervention). The trend references the rate of increase or decrease of the best-fit straight line for the dependent variable within the phase (i.e., slope; Horner et al., 2005). There are two elements that are evaluated simultaneously for the trend: slope and magnitude (Kennedy, 2005). The trend was quantitatively estimated in this study using the least-squares regression technique. Variability is the degree to which performance fluctuates around the mean during each phase. Variability is typically referred to as being high, medium, or low and is a largely qualitative term. Data points that are close to the best-fit straight line indicate low variability whereas data points that are scattered widely around the best-fit straight line indicate high variability (Kennedy, 2005).

In addition, between-phase patterns were inspected. The first pattern occurring between phases is referred to as immediacy of effect. This can be defined as how quickly change is produced following a phase change (Kennedy, 2005). Similar to slope and variability, qualitative descriptors, such as rapid or slow, are used to describe immediacy of effect (Kennedy, 2005). A slow immediacy of effect would be identified if no initial change in the pattern of data were identified following implementation of the intervention. Conversely, a rapid immediacy of effect is noted when the pattern of data is quickly changed following the intervention. The second between-phase pattern is referred to as overlap. Overlap means the percentage or degree to which data in adjacent phases share similar quantitative values (Kennedy, 2005).

In order to address research questions two and three the Reliable Change Index (RCI) was also calculated. The RCI is calculated in order to determine if the pretest to

posttest change scores on the BASC-2 and BRIEF exceeded what would be expected on the basis of measurement error (Christensen & Mendoza, 1986). Jacobson and colleagues (1984) proposed the use of a reliable change index where

$$RCI = X_2 - X_1 \,/\, SE_M$$

and

RCI = reliable change

X_1 = pretest score

X_2 = posttest score

SE_M = Standard error of measurement

According to Jacobson et al. (1984), if the RCI is equal to or greater than ±1.96 one could expect a change of that magnitude to occur by chance approximately 5 times out of 100 (Christensen & Mendoza, 1986). Therefore, the difference would be considered statistically significant. The RCI values for the various forms of the BASC-2 and BRIEF were calculated for this study based upon the psychometric information provided in the respective scoring manuals (Gioia et al., 2000; Reynolds & Kamphaus, 2004). The RCI calculations varied as a function of age and gender for each measure (separate forms are used for youth of varying age categories and gender).

The SE_M is a "statistical index that estimates the amount of error in a single score" (Suter, 2006, p. 247). The SE_M was not provided in the BRIEF manual and had to be calculated using the following formula where

$$SE_M = Sx \sqrt{(1-r_x)}$$

and

SE_M = Standard error of measurement

S_x = Standard Deviation

r_x = coefficient alpha

Results

A multiple baseline across participant's design was utilized where each student was tracked over time following a baseline (pre-intervention) condition. Once the percentage of on-task behaviors was determined to be stable for each participant, the intervention (treatment) was introduced to the student with greatest variability in on-task behaviors. The other students remained in the baseline phase until the pre-treatment data were stable for the first student and an improvement of 10% from the average percentage of on-task behaviors identified in the baseline phase was attained for 2 out of 3 days. Additionally, if the subject did not make progress following 6 treatments, then the next subject was added into the treatment phase. Although this decision rule was included as an attempt to enter all subjects into the intervention in a timely manner, all subjects responded to treatment and this rule was ultimately not needed. This continued until all participants received a minimum of 10 treatment sessions including the introduction and termination sessions.

Participant 1: Sam

During baseline, the mean percentage of intervals of on-task behavior for Sam was 40.76% (range, 27 to 56%). Data were considered stable (i.e., 50% on either side of the mean) and no outliers were identified. High variability was noted to occur during the baseline phase where the data-points were scattered widely around the best-fit straight line. The trend line was calculated using the least squares regression technique. The trend

line for the baseline phase was Y' = 42.3 + -.14 (X) with a low magnitude and flat slope identified. Following 21 baseline observations Sam was entered into the intervention as he demonstrated the highest percentage of problematic behavior. A rapid immediacy of effect was noted, as there was an initial change in the pattern of behavior following introduction of the intervention. Following three intervention sessions (observation 24), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the baseline range of 27-56%. Therefore, Sam's behavior improved beyond the highest point in baseline following three intervention sessions. However, a slight decline occurred and the percentage of intervals of on-task behavior decreased to baseline levels. Sixty-two percent of the data points overlap and there was a 29% improvement from baseline to intervention. During the intervention phase, there was medium variability, with a mean of 52.77% (range, 41 to 60%) and a flat slope with low magnitude. The calculated trend line was Y'= 51.65 + -.07 (X).

Two weeks following cessation of treatment sessions for all subjects, follow-up data was collected. One observation was conducted per week for the period of two weeks for a total of 2 observations. The intervention mean for Sam was 52% and the final observation during the intervention indicated that the percentage of intervals of on-task behavior was 50%. Observation one during follow-up data collection indicated that the percentage of intervals of on-task behavior was also 50%. Observation two indicated a slight decline in percentage of intervals of on-task behavior with an observation of 48%.

Statistically significant pre-post changes were evaluated through calculation of the RCI on the BASC-2 PRS and TRS as well as on the BRIEF parent and teacher rating scales. Sam's parent and teacher completed BASC-2 rating scales in October 2010 and

again in May 2011. For the BASC-2 PRS Hyperactivity scale the RCI value was -3.8 indicating that a statistically significant decrease in hyperactive behaviors occurred within the home environment. Additionally, pretest ratings indicated that clinically significant hyperactive behaviors were demonstrated in the home. However, following the intervention, parent ratings fell to the At-Risk range. The BASC-2 PRS Attention Problems scale RCI value was -1.38. Although there was a decrease in inattentive behaviors, there was not a statistically significant change. Teacher ratings on the BASC-2 Hyperactivity and Attention Problem scales indicate that a statistically significant change did not take place with scores being .45 and 0, respectively.

Sam's parent and teacher completed the BRIEF-rating scales in October 2010 and again in May 2011. Parent ratings indicate a significant change in scores from pre- to posttest on the Inhibit scale (RCI = -8.20). Parent ratings of Sam's ability to resist or not act on an impulse improved significantly during the course of the intervention. However, ratings still indicate that this is an area of concern as scores were clinically significant pre- and posttest. Conversely, teacher ratings pre- and posttest on the Inhibit scale did not indicate a statistically significant change (RCI = -.71). Parent and teacher ratings did not indicate statistically significant improvement on the Monitor scale (parent RCI = -.76; teacher RCI = -1.70). Finally, parent and teacher ratings were not significant for an improvement in Sam's ability to initiate a task or activity (Initiate scale parent RCI = 1.38; teacher RCI = -1.63).

Participant 2: John

During the baseline for John, there was medium variability, with a mean of 45% (range, 32 to 58%). Data were considered stable (i.e., 50% on either side of the mean)

and no outliers were identified. The trend line calculated for the baseline phase was Y' = 45.75 + -.06 (X) with a flat slope and low magnitude. Following implementation of the intervention, there was a slow immediacy of effect. However, there was an upward trend in the data and little variability. Following 17 intervention sessions (observation 41), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the baseline range of 32-58%. Therefore, John's behavior improved beyond the highest point in baseline following 17 intervention sessions. There was a 29% improvement in on-task behaviors from baseline to intervention with a 73% overlap in data points. During the intervention phase, the calculated mean was 58.25% (range, 40 to 72%) and a positive slope with medium magnitude was identified. The calculated trend line was Y'= 40.71 + 1.21 (X).

Two follow-up observations were also completed for John. The intervention mean for John was 58% and the final observation during the intervention indicated that the percentage of intervals of on-task behavior was 68%. Observation one during follow-up data collection indicated that the percentage of intervals of on-task behavior was 58%. Observation two indicated a slight decline in percentage of intervals of on-task behavior with an observation of 55%.

John's parents and teacher completed the BASC-2 rating scale in October 2010 and again in May 2011. The BASC-2 PRS was analyzed (see Table 2) and the RCI value was calculated for pre-post changes on the Hyperactivity and Attention Problems scales. The RCI value for the Hyperactivity scale was -5.5, which indicates a statistically significant decrease in hyperactive behaviors within the home. Specifically, scores decreased from clinical significance (T scores 70 and above) to non-significant levels

(below 60). Conversely, a significant change in hyperactive behaviors in the classroom was not indicated through teacher ratings (RCI = .45). Parent (RCI = -1.66) and teacher (RCI = -.45) ratings did not identify a significant change on the Attention Problems scale. Therefore, attention problems continue to be a concern for John across settings.

John's parents and teacher completed the BRIEF-rating scales in October 2010 and again in May 2011. Ratings for the Inhibit, Initiate, and Monitor scales were analyzed pre- and posttest to determine if a statistically significant change occurred. Parent ratings (see Table 3) indicated that John improved significantly in his ability to inhibit his behavior at home (RCI = -2.98). However, no change was noted with regards to the Initiate or Monitor scales based upon parent ratings. Teacher ratings (see Table 4) noted significant improvement in John's ability to inhibit, initiate, and monitor the impact of his behavior on others within the classroom RCI values are -4.29, -3.27, and -3.40, respectively. In addition, on the Inhibit and Monitor scales, pretest scores were clinically significant, whereas posttest scores indicated that the aforementioned behaviors were no longer at-risk.

Participant 3: Al

During the baseline for Al, there was medium variability, with a mean of 46% (range, 34 to 59%). Data were considered stable (i.e., 50% on either side of the mean) and no outliers were identified. The trend line calculated for the baseline phase was Y' = 46.19 + -.012 (X) with a flat slope and low magnitude. Following implementation of the intervention, there was a rapid immediacy of effect, as there was an initial change in the pattern of behavior. Also, there was an upward trend in the data and little variability. Following 15 intervention sessions (observation 45), the percentage of intervals of on-

task behavior increased to 62%. Sixty two percent falls above the baseline range of 34-59%. Therefore, Al's behavior improved beyond the highest point in baseline following 15 intervention sessions. However, a slight decline occurred and the percentage of intervals of on-task behavior decreased to baseline levels. By intervention session 19 (observation 49), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the aforementioned baseline range. At this point, Al's behavior improved beyond the highest point in baseline and stayed there for the remainder of the intervention. There was a 17% improvement in on-task behaviors from baseline to intervention with a 79% overlap in data points. During the intervention phase, the calculated mean was 54% (range, 45 to 62%) and a positive slope with low magnitude was identified. The calculated trend line was Y'= 47.49 + .55 (X).

Two follow-up observations were also completed for Al. The intervention mean for Al was 54% and the final observation during the intervention indicated that the percentage of intervals of on-task behavior was 60%. Observation one and two during follow-up data collection indicated that the percentage of intervals of on-task behavior were both 52%.

Al's parents and teacher completed the BASC-2 rating scale in November 2010 and again in June 2011. The BASC-2 PRS (see Table 2) was analyzed and the RCI value was calculated for pre-post changes on the Hyperactivity and Attention Problems scales. The RCI value for the Hyperactivity scale was -.83, which indicates that a statistically significant change did not occur. Although the change in parent ratings on the Attention Problems scale also was not significant (RCI = -.27); scores indicated that Al was demonstrating clinically significant inattentive behaviors prior to the intervention.

However, following the intervention, scores fell to the At-Risk range. A significant decrease in hyperactive behaviors (RCI = -2.72) and attention problems (RCI = -5.45) were noted in the classroom through teacher ratings (see Table 2). Teacher pretest ratings on the Attention Problems scale fell within the clinically significant range. Conversely, posttest scores were at-risk.

Al's parents and teacher also completed a BRIEF rating scale in November 2010 and again in June 2011. Ratings for the Inhibit, Initiate, and Monitor scales were analyzed pre- and posttest to determine if a statistically significant change occurred. Parent ratings (see Table 3) were significant for a positive change on the Inhibit (RCI = -2.98) and Initiate (RCI = -5.55) scales within the home environment. Conversely, no change was noted through parent ratings for the Monitor scale (RCI = 0). In the classroom, changes in teacher ratings (see Table 4) were significant for the Monitor (RCI = -7.95) scale indicating that Al demonstrated improved functioning in this area. Conversely, a significant change in pre- and posttest ratings was not found on the Inhibit (RCI = .71) or Initiate (RCI = -1.64) scales.

Participant 4: Bob

During the baseline for Bob, there was medium variability in on-task behaviors, with a mean of 54.8% (range, 47 to 69%). Data were considered stable (i.e., 50% on either side of the mean) and no outliers were identified. The trend line calculated for the baseline phase was Y' = 56.4 + -.08 (X) with a flat slope and low magnitude. Following implementation of the intervention, there was a rapid immediacy of effect, as there was an initial change in the pattern of behavior. There was an upward trend in the data with medium variability. Following four intervention sessions (observation 43), the percentage

of intervals of on-task behavior increased to 75%. Seventy-five percent falls above the baseline range of 47-69%. Therefore, Bob's behavior improved beyond the highest point in baseline following four intervention sessions. However, a slight decline in on-task behaviors occurred and Bob's percentage of intervals of on-task behavior returned to baseline levels. There was a 23% improvement in on-task behaviors from baseline to intervention with a 65% overlap in data points. During the intervention phase, the calculated mean was 67.3% (range, 59 to 82%) and a flat slope with low magnitude was identified. The calculated trend line was Y'= 67.87 + -.07 (X).

Two follow-up observations were also completed for Bob. The intervention mean for Bob was 67% and the final observation during the intervention indicated that the percentage of intervals of on-task behavior was 68%. Observation one and two during follow-up data collection indicated that the percentage of intervals of on-task behavior were 64% and 58%, respectively.

Bob's parent and teacher completed the BASC-2 rating scale in October 2010 and again in May 2011. The BASC-2 PRS (see Table 2) was analyzed and the RCI value was calculated for pre-post changes on the Hyperactivity and Attention Problems scales. Parent ratings of the RCI value for the Hyperactivity scale was -3.05, which indicates that a statistically significant change occurred. Parent rating on the Attention Problems scale was not significant (RCI = -1.38). However, pretest scores fell within the clinically significant range, whereas posttest scores were at-risk. Similarly, teacher ratings (see Table 2) indicated a significant improvement in hyperactive behaviors following the intervention (RCI = -7.27). However, the Attention Problems scale (RCI = -.45) was not

significant. Again, pretest scores were clinically significant whereas posttest scores were at-risk.

Bob's parent and teacher also completed a BRIEF rating scale in October 2010 and again in May 2011. Ratings for the Inhibit, Initiate, and Monitor scales were analyzed pre- and posttest to determine if a statistically significant change occurred. Parent ratings (see Table 3) demonstrated a statistically significant positive change on the Inhibit (RCI = -7.46) and Monitor (RCI = -3.05) scales within the home environment. On the Monitor scale pretest ratings were clinically significant. Posttest ratings were no longer significant as improvement in Bob's ability to monitor his behavior were noted. In the classroom, the change in teacher ratings (see Table 4) was also significant for the Inhibit (RCI = -5.71) and Monitor (RCI = -7.39) scales indicating that Bob demonstrated improved functioning in these areas. Again, scores on the Monitor scale were clinically significant during pretest ratings and not significant on posttest ratings, which indicate an overall improvement in his ability to monitor his behavior. Conversely, a significant change in pre- and posttest ratings was not found on the Initiate scale across parent (RCI = -1.38) or teacher (RCI = 0) ratings.

The RCI based upon parent and teacher ratings on the BASC-2 is presented in Table 2. The RCI based upon parent ratings on the BRIEF is presented in Table 3 and the RCI based upon teacher ratings on the BRIEF is presented in Table 4. The percentage of intervals of time on-task for all participants is presented in Figure 2.

Table 2

RCI Based Upon Parent and Teacher Ratings on the BASC-2

Measure		Student T-scores			
		Sam	John	Al	Bob
BASC-2 PRS Hyperactivity scale					
	Pretest	83	71	75	87
	Posttest	69	51	72	76
	RCI	-3.8	-5.5	-.83	-3.05
BASC-2 PRS Attention Problems scale					
	Pretest	77	56	70	72
	Posttest	72	50	69	67
	RCI	-1.38	-1.66	-.27	-1.38
BASC-2 TRS Hyperactivity scale					
	Pretest	85	70	89	88
	Posttest	86	71	83	72
	RCI	.45	.45	-2.72	-7.27
BASC-2 TRS Attention Problems scale					
	Pretest	68	69	74	70
	Posttest	68	68	62	69
	RCI	0	-.45	-5.45	-.45

Table 3

RCI Based Upon Parent Ratings on the BRIEF

Measure		Student T-scores			
		Sam	John	Al	Bob
BRIEF Parent Inhibit Scale					
	Pretest	82	60	73	75
	Posttest	71	56	69	65
	RCI	-8.20	-2.98	-2.98	-7.46
BRIEF Parent Initiate Scale					
	Pretest	63	49	58	64
	Posttest	65	49	50	62
	RCI	1.38	0	-5.55	-1.38
BRIEF Parent Monitor Scale					
	Pretest	69	51	66	65
	Posttest	68	51	66	61
	RCI	-.76	0	0	-3.05

Table 4

RCI Based Upon Teacher Ratings on the BRIEF

Measure		Student T-scores			
		Sam	John	Al	Bob
BRIEF Teacher Inhibit Scale					
	Pretest	70	66	72	80
	Posttest	69	60	73	72
	RCI	-.71	-4.29	.71	-5.71
BRIEF Teacher Initiate Scale					
	Pretest	67	63	60	61
	Posttest	65	59	58	61
	RCI	-1.63	-3.27	-1.64	0
BRIEF Teacher Monitor Scale					
	Pretest	68	65	74	65
	Posttest	65	59	60	52
	RCI	-1.70	-3.40	-7.95	-7.39

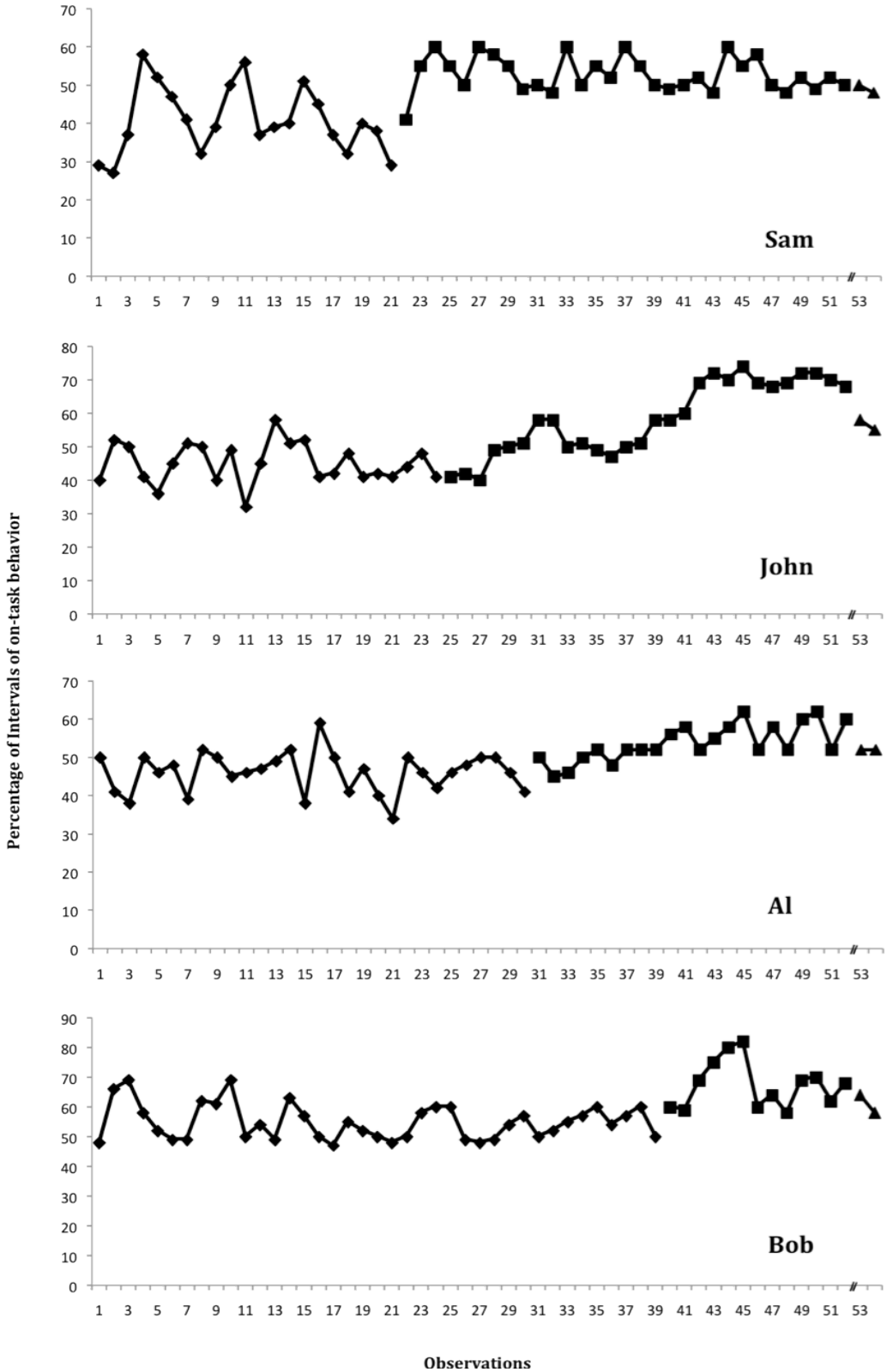

Figure 2. Percentage of time on-task per participant during the baseline and intervention phases.

Social validity. To assess teacher views of the quality and practicality of the intervention, a survey (See Appendix C) was completed at the cessation of the intervention. The survey consisted of a Likert-type scale with five items. The teacher responded to statements ranging from the appropriateness of the frequency of the intervention to the likelihood of the intervention working for other students in the future. Each of the four teachers strongly agreed that the intervention was appropriate for their student and that they would be open to having a future student receive mindfulness training. Two of the teachers agreed that the frequency of the intervention was appropriate where the other two reported that the intervention would be more appropriate if administered once per week instead of twice weekly. Three teachers agreed that there was a decrease in the number of off-task behaviors demonstrated by their student and that there was behavior improvement. One teacher did not see a difference in number of off-task behaviors; however, she strongly agreed that the student's overall behavior improved.

Following the termination session of the intervention each participant was asked what he liked and did not like about the intervention. All four participants indicated that they enjoyed the intervention stating, "it was fun" and "I want to do this again next year." Specifically, they liked working with the interventionist with one student stating, "You are my favorite teacher." Two students felt that they were getting in trouble less frequently in class and that other students wanted to play with them more at recess. One student enjoyed the intervention but wished that he did not have to leave class. He said "I feel like the other kids are looking at me when you come to get me to teach me mindfulness."

Although each participant indicated a positive experience participating in the intervention, there appeared to be a general lack of understanding of the purpose of mindfulness training. For example, one participant stated, "I like being mindful, but how is this going to help me not get in trouble in class?" Another student stated, "Being mindful was fun. Now I can tell my teacher that mindfulness is hard for me because I have problems with attention. So I shouldn't get yelled at in class."

Discussion

There has been little research that has directly examined the relationship between mindfulness practice and attention, especially in young children. The customized mindfulness training approach for this study incorporated a mindfulness curriculum (Lantieri & Goleman, 2008) that included, at varying depths, three of the four components of "training the mind" (Singh, Lancioni, Wahler, Winton, & Singh, 2008, p. 660). These components include a personal mediation practice based on concentration or contemplative mediation exercises, behavioral practices, cognitive strategies, and empathic strategies (Singh et al., 2010). The training utilized in this study focused on personal meditation practice, behavioral practices, and rudimentary cognitive strategies. This study sought to demonstrate a functional relation between mindfulness training and the increase in on-task behaviors in the general education classroom for children with ADHD. In addition, positive changes in the cognitive processes of attention regulation were measured.

The first research question sought to explore whether mindfulness training for children with ADHD resulted in an increase of percentage of intervals of on-task

behavior in the general education classroom. Graphic analysis indicated that mindfulness training was effective in increasing the percentage of intervals of on-task behavior for participants. Sam demonstrated highest percentage of problematic behaviors during the baseline phase with the mean percentage of intervals of on-task behaviors being 40%. Following three intervention sessions (observation 24), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the baseline range of 27-56%. Therefore, Sam's behavior improved beyond the highest point in baseline following three intervention sessions. However, a slight decline occurred and the percentage of intervals of on-task behavior decreased to baseline levels. Although the percentage of intervals of on-task behaviors subsequently returned to baseline levels, the variability in on-task behaviors decreased following introduction of the intervention. Thus, Sam demonstrated improved functioning in on-task behaviors with decreased variability.

John and Al also demonstrated an improvement of on-task behaviors following introduction of the mindfulness training intervention. Once the mindfulness training was implemented for John, a slow immediacy of effect was observed. Following 17 intervention sessions (observation 41), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the baseline range of 32-58%. Therefore, John's behavior improved beyond the highest point in baseline following 17 intervention sessions. For Al, a rapid immediacy of effect occurred following the intervention. Following 15 intervention sessions (observation 45), the percentage of intervals of on-task behavior increased to 62%. Sixty two percent falls above the baseline range of 34-59%. Therefore, Al's behavior improved beyond the highest point in baseline following 15 intervention sessions. However, a slight decline occurred and Al's on-task behavior

decreased to baseline levels. By intervention session 19 (observation 49), the percentage of intervals of on-task behavior increased to 60%. Sixty percent falls above the aforementioned baseline range. At this point, Al's behavior improved beyond the highest point in baseline and stayed there for the remainder of the intervention. It is important to note that ten intervention sessions were developed as part of the customized mindfulness training approach for this study. Since it took John and Al approximately twice the intended number of sessions to see improvement in on-task behavior above baseline levels, it may be beneficial and necessary to increase the number of sessions intended for the intervention. In addition, this information indicates that positive and lasting behavior changes in on-task and/or mindfulness behaviors take time and it may not immediately occur.

Bob was the final participant to enter into the intervention. Therefore, he received the fewest number of intervention sessions. Bob received the introduction, eight intervention sessions, and the termination session. He did not receive any of the additional sessions that the other participants received. Following four intervention sessions (observation 43), the percentage of intervals of on-task behavior increased to 75%. Seventy-five percent falls above the baseline range of 47-69%. Therefore, Bob's behavior improved beyond the highest point in baseline following four intervention sessions. However, a slight decline in on-task behaviors occurred and Bob's percentage of intervals of on-task behavior returned to baseline levels. Since it took John and Al greater than fifteen sessions to demonstrate behavior change, we might infer that it would have been beneficial to provide Bob with the intervention for a longer period of time. Overall, some level of positive change was noted to occur across participants. Due to the

nature of school-based research, it is difficult to ascertain whether a true functional relation was established. However, the results of this study are suggestive of a functional relation.

The purpose of the second research question was to determine if mindfulness training would improve executive functions in children with a diagnosis of ADHD. Neurocognitive findings suggest that mindfulness may improve conflict attention and set shifting in ADHD (Zylowska et al., 2007). This type of attention is thought to play a role in the development of the inhibition and self-regulation executive functions (Rueda, Posner, & Rothbart, 2004). Therefore, the RCI was calculated for the Inhibit, Initiate, and Monitor scales of the BRIEF. Parent and teacher ratings on the BRIEF were analyzed in order to determine whether a statistically significant change (RCI $>\pm 1.96$) occurred. Parent ratings indicate that statistically significant improvement in the ability to inhibit behavior was noted across participants. Parent ratings also indicated statistically significant improvement on the Initiate and Monitor scales for Al and Bob, respectively. Additionally, parent rating's of Bob's ability to monitor his behavior were clinically significant (T score of 65) during pretest ratings and not significant (T score of 61) following the posttest.

Teacher ratings on the BRIEF were also analyzed across participants. Ratings of Sam's executive functioning did not change significantly from pre- to posttest. Conversely, the RCI score for John was statistically significant for the Inhibit, Initiate, and Monitor scales. On the Inhibit and Monitor scales, ratings of Johns functioning during the pretest indicated clinical significance (T score above 65) whereas posttest ratings indicate that his functioning in the aforementioned areas were no longer clinically

significant. The RCI value on the Monitor scale for Al and Bob were statistically significant and a clinically significant decrease also occurred for both participants. Finally, the RCI value for teacher ratings on the Inhibit scale for Bob was statistically significant. Due to the changes identified in pre- and posttest ratings, it appears that the BRIEF may be an effective outcome measure for mindfulness-based intervention studies.

Finally, the purpose of the third research question was to determine if mindfulness training would decrease hyperactive or inattentive behaviors demonstrated within the classroom and at home. Specifically, the RCI was calculated for the Attention Problems and Hyperactivity scales on the BASC-2. Parent and teacher ratings on the BASC-2 were analyzed in order to determine whether a statistically significant change (RCI $>\pm 1.96$) occurred. The RCI values obtained through parent and teacher ratings on the Attention Problems scale were not statistically significant for Sam, John, or Bob. While the RCI value obtained through parent ratings on the Attention Problems scale for Al were not significant, analysis of the T scores indicated that his behavior improved from clinically significant levels (T score 70 and above) to At-Risk levels (T score 60-69) from pre- to posttest. Teacher ratings indicated that Al demonstrated a statistically significant improvement in attention problems with a clinically significant decrease in inattentive behaviors. Parent ratings indicated a statistically significant improvement in hyperactive behaviors for Sam, John, and Bob. Additionally, Sam's posttest scores fell to the At-Risk range and John's scores went from being clinically significant to not being significant. Finally, teacher ratings from the Hyperactivity scale indicated a statistically significant decrease in behaviors for Al and Bob. Although ratings noted some decrease in hyperactive behaviors, significant changes in pre- and posttest ratings on the Attention

Problems scale were generally not identified. This may be due to the more overt nature of hyperactive behaviors and the fact that these behaviors may be easier to observe. Additionally, the BASC-2 may not be as sensitive to change as other measures and another behavior rating scale may have been more appropriate to administer. One possible measure might be the Youth Outcome Questionnaire (Y-OQ), which was developed to assess the occurrence of observed behavior change (McClendon et al., 2011).

Limitations of the Research

During baseline observations students were unaware that data was being collected on their percentage of time on-task. Parents consent was obtained, however students did not give assent until they were entered into the intervention. Additionally, once students became knowledgeable about the intervention, they also became aware that they were being observed during the observation sessions. This may have confounded the data because knowledge can change behavior. It may be beneficial for future studies to obtain student assent prior to the baseline observations so that the behavior change following the intervention could only be attributed to the training sessions and not the participant knowledge of observations.

Although each participant included in this study was reportedly prescribed and taking stimulant medication daily; it is difficult to ascertain whether this was actually occurring. Some of the variability noted in percentage of intervals of on-task behavior for participants could be attributed to missing a dosage of medication. Prior to the intervention parents were asked to indicate what medication the participants were currently administered. As the intervention took place over several months, it is possible

that medication type or dosage could have changed without the knowledge of the interventionist.

Implications for Further Research

The utilization of single subject design methodology in mindfulness research is important in that it provides direct evidence of improved functioning through observation. In addition, single subject research tends to be more rigorous and intense than other designs. This study provides evidence for a new way to collect evidence and document support for the utility of mindfulness as a school-based intervention. Further replications of this study may wish to utilize a single subject design with different student populations (e.g., students with aggressive behaviors, females, etc.).

Additionally, determining why some students' on-task behavior improves above baseline levels while others do not requires further examination. In this study, it is possible that participants may have demonstrated a higher percentage of on-task behaviors if they were able to complete more training sessions over a longer period of time. In addition, incorporating a parent or teacher training component may have provided participants with a greater ability to generalize what was learned in training to other settings. A number of previous mindfulness-based studies have incorporated parent and/or teacher training components into interventions and have produced promising results.

It may have also been beneficial for this study to be implemented in a group setting. A group format allows for children to share experiences as well as discuss thoughts and feelings. In addition, individual training is not often realistic or easily implemented within the school. High educational standards make it difficult for children

to miss classroom instruction. Therefore, implementing this intervention in a group setting before or after school would limit the time students missed vital classroom instruction.

Finally, this study is unique in that it seeks to provide evidence for the utility of mindfulness training in improving attention regulation skills in young children. A majority of mindfulness-based research has been conducted with adults and adolescents. Studies that incorporate younger children typically involve a less rigorous training component than the current study. Additionally, the current study was designed to evaluate the effectiveness with eight-year-old students. Children of this age are only just beginning to develop abstract reasoning skills. While positive results were noted, it may be beneficial to replicate this study with children ages nine to ten when the ability to understand abstract concepts is more fully developed. It is possible that the intervention may have more impact with older children.

Conclusions

Results from this study add to a growing body of research demonstrating the utility of mindfulness training for children with ADHD. Specifically, this study is unique in that it incorporated a rigorous design methodology with a mindfulness-training component for young children in a school-based setting. Importantly, findings from this study suggest that mindfulness training may help increase in on-task behaviors in male children with ADHD. Further research is needed to help solidify this relationship and provide further explanation for its existence.

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APPENDIXES

APPENDIX A

Overview of Eight Session Mindfulness-Based Course for Children ages 8-11

	Intentions	**Class Agenda**
Introduction	Establish Ground Rules Introduce program to students Construct taught: attention / awareness	-Introduce the study and obtain assent from the child -Discuss rationale for participating in mindfulness training -Discuss course structure and meeting time -Answer questions
Session 1	Offer an experience of Mindfulness Construct taught: attention / awareness	-Moment of silence -Introduce CD (Track 4; Lantieri & Goleman, 2008) -Listen to the CD -Discuss how the CD made them feel -Practice using the Kids Mandala Coloring Set by Monique Mandali
Session 2	Offer an experience of Mindfulness Explore experience with practice Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Mindfulness eating practice -Discussion
Session 3	Offer an experience of mindfulness Continue to explore the experience with practice Attend to the body Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Seaweed Practice -Discussion
Session 4	Offer an experience of mindfulness Explore perceptions Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Exercises to explore perception - how do we view ourselves and each other? -Discussion

Session 5	Offer an experience of mindfulness Develop emotional fluency, or the ability to be aware of feelings without resisting or indulging them Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Explore thoughts and feelings associated with unpleasant experience -Discussion / Feelings Practice
Session 6	Offer an experience of mindfulness Develop the capacity to respond rather than to react Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Thought parade exercise -Discussion
Session 7	Offer an experience of mindfulness Examine how our attention is in the past or future Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Jewel/treasure exercise -Discussion
Session 8	Offer an experience of mindfulness Choose if and how you will use mindfulness in your life Construct taught: attention / awareness	-Moment of silence -Listen to CD (Track 4; Lantieri & Goleman, 2008) -Making the practice your own -Discussion
Termination	Reiterate that interventionist is available for ongoing support	-Moment of silence -Have the subject make a commitment as to how he or she will continue practicing mindfulness

APPENDIX B

Procedural Fidelity

Teacher Name: _____

Student Name: _____

Date: _____

	Date	Date	Date	Date
Moment of Silence				
Listen to CD				
Activity Completed				
Discussion took place				
Questions Answered				

Key

+ = Yes the activity took place

Blank = No the activity did not take place

N/A = Not applicable

APPENDIX C

Social Validity

Teacher Name: _____

Student Name: _____

Date: _____

Scale: 1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree

1. Mindfulness training was an appropriate intervention for my student

1 2 3 4

2. I would use mindfulness training as an intervention for another student.

1 2 3 4

3. The frequency of the intervention was appropriate.

1 2 3 4

4. The student demonstrated a decreased number of off-task behaviors.

1 2 3 4

5. The student's behaviors improved following the intervention.

1 2 3 4

Additional comments:

_____

_____