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entitled

The Effect of Mindfulness Practice on an Adolescent Diagnosed with Autism Spectrum Disorder and Anxiety: A Pilot Study

by

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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Master of Arts Degree in Foundations of Education:

Research and Measurement

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The University of Toledo

December 2016
An Abstract of

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The intent of this pilot study was to examine the effect of mindfulness practice on an adolescent diagnosed with Autism Spectrum Disorder (ASD) and anxiety, who engages in stereotypic pacing. An individual who engages in a stereotypy, often does so due to experiencing anxiety. Although engaging in a stereotypy often results in a decrease in anxiety, it is not regarded as appropriate in most situations such as school or work. The stereotypic behavior can last from minutes to hours, interfering with life quality. Specifically, this study focused on the frequency and duration of episodes of pacing. Behavior was examined between the hours of 4:00 p.m. and midnight in the adolescent’s home. The intervention of mindfulness practice, facilitated by the parent, occurred at 9:00 p.m., 5 days a week. The researcher hypothesized that practicing mindfulness in 20-minute sessions every day, would decrease the frequency and duration of pacing. The intervention yielded moderately positive results. Suggested future research is to implement a longer intervention with the eventual goal of incorporating mindfulness practice into a classroom setting.

Keywords: ASD, anxiety, stereotypy, mindfulness, intervention, classroom
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List of Abbreviations

ADDM .................Autism Developmental Disabilities Monitoring
ADHD ..................Attention Deficit Hyperactivity Disorder
ASD ....................Autism Spectrum Disorder
CAMM ..................The Child Acceptance and Mindful Measure
CDC ....................Centers for Disease Control and Prevention
DASS 21 .................Depression, Anxiety, and Stress Scale-21
DPT .....................Deep pressure therapy
DSM .....................Diagnostic Statistical Manual
FFMQ ....................Five Facet Mindfulness Questionnaire
ID ........................Intellectual Disability
IM-P .....................Interpersonal Mindfulness in Parenting Scale
IRB .....................Institutional Review Board
IU ........................Intolerance of Uncertainty
KIMS .....................Kentucky Inventory of Mindfulness Scale
MAAS .....................The Mindful Attention Awareness Scale
MAAS-A .................The Mindful Attention Awareness Scale-Adolescent
MBCT ....................Mindfulness-Based Cognitive Therapy
MBSR ....................Mindfulness-Based Stress Reduction
MiSP .....................Mindfulness in School Program
OCD .....................Obsessive Compulsive Behavior
RRB .....................Restricted Repetitive Behavior
SI..........................Sensory Integration
Chapter One

Introduction

Overview

What was once thought of as rare, autism spectrum disorder (ASD) is now estimated to occur in every 1 of 68 children (Centers for Disease Control and Prevention [CDC], 2016). According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013), symptoms of ASD include social impairment, speech/communication deficits, repetitive behaviors, and restricted interests. Some individuals also present with attention deficit and hyperactivity disorder (ADHD) and obsessive-compulsive disorder (OCD), as well as intellectual impairment, and possibly aggressive behaviors. The most common comorbid disorder, however, is anxiety (Reaven, Washington, Moody, Stern, Hepburn, & Blakeley-Smith, 2015). Sarah Hendrickx, a woman who has autism and represents the National Autistic Society, goes so far as to say that anxiety is a symptom of autism and not a separate disorder (National Autism Society, 2014). Sally Thibault, a mother of a child with ASD and author and keynote speaker for many organizations that promote autism awareness, discusses anxiety as manifesting in fight, flight, or freeze (Thibault, 2012). For instance, if a child diagnosed with ASD is experiencing too much noise in the classroom, or is not given enough time to answer questions, he or she may become anxious. Some children may cope with their anxiety by becoming aggressive or by not paying attention, which impedes their ability to learn. Based on this researcher’s personal observations, teachers often misjudge the impetus for their behavior, and reprimand these students, creating embarrassment and shame.
One technique that has been shown beneficial in decreasing anxiety is mindfulness training. Jon Kabat-Zinn, the creator of such training, called Mindfulness-Based Stress Reduction (MBSR), defines mindfulness as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (2012, p. 7). Mindfulness training entails learning how to live in the present moment while being conscious of thoughts and emotions, and regarding such in a nonjudgmental manner. During mindfulness training, participants focus on the breath, and by doing so, learn how to clear the mind, which results in a decrease in anxiety.

Teaching mindfulness to students with disabilities is a growing trend in the United States, suggesting that there is a belief that these students would benefit from practicing stress reducing techniques, such as mindfulness, to lessen their anxiety and curb maladaptive behaviors. Thus, in the past decade, mindfulness instructors (e.g., Kinder Associates, 2014) have been teaching students to regulate their minds using mindfulness techniques, and special education teachers stated that their students exhibited less disruptive behavior when practicing mindfulness (Garey, 2016). However, few empirical studies have been completed whereby researchers have studied the effect of mindfulness practice on children with ASD and anxiety in any specific setting (e.g., child’s home), let alone the classroom. Most researchers who have examined mindfulness practice and anxiety have either focused on adults with ASD or parents of children with ASD (Hwang, Kearney, Klieve, Lang, & Roberts, 2015; Spek, Van Ham, & Nyklicek, 2013). Thus, studying the potential benefits that mindfulness practice may have on adolescents with ASD and anxiety is under-researched.
Purpose of Study

The purpose of this study was to determine how practicing mindfulness affected the frequencies and durations of stereotypic pacing exhibited by an adolescent who was diagnosed with ASD and anxiety. The specific setting chosen for the study was the adolescent’s home.

Research Questions

1. How does practicing mindfulness influence an adolescent’s frequency of pacing?
2. How does practicing mindfulness influence the duration of each pacing episode?

Research Hypothesis

The researcher hypothesized that an adolescent diagnosed with ASD and anxiety disorder, who practiced mindfulness once each evening for a 20-minute session, would demonstrate significantly fewer occurrences of pacing while at home. Further, the duration of pacing episodes would significantly decrease.

Significance of Study

Examining the effect of mindfulness practice on an adolescent diagnosed with ASD and anxiety in a setting where the child is the most comfortable (i.e., home) seems to be the first logical step in the process of integrating mindfulness in the child’s everyday life and other settings. If shown effective in a home environment, mindfulness practice could then be attempted in the classroom with several important benefits to the student, such as higher grades, better attendance, a sense of community, and improved self-esteem. Special education teachers could facilitate mindfulness training to their
students with ASD and anxiety to lessen their anxiety and their repetitive behaviors. When students experience less anxiety, they are able to more actively engage in learning, and allow others to do so as well. Teachers would have greater opportunities to foster a supportive learning environment, if students are more engaged and less disruptive to themselves and others. Furthermore, families of students who receive mindfulness training would benefit from their child’s greater sense of awareness which may positively influence familial communication.

**Definition of Key Terms**

Anxiety: a nervous disorder characterized by a state of excessive uneasiness and apprehension, typically accompanied by panic attacks, recurring intrusive thoughts, or concerns (American Psychological Association, 2016).

Asperger’s Syndrome: disorder characterized by impaired social interactions and a restricted range of interests and/or repetitive behaviors. Motor development may be delayed, leading to clumsiness or uncoordinated motor movements. Individuals *do not* have significant delays or difficulties in language or cognitive development. (also defined as “high functioning” autism) (www.autism-society.org).

Autism Spectrum Disorder: disorder characterized by difficulties in social interaction, verbal and nonverbal communication, and repetitive behaviors (www.autismspeaks.org).

Comorbidity: two or more disorders occurring in the same person (Degenhardt, Hall, & Lynskey, 2016).
Compulsive Behavior: performing an act persistently and repetitively without it necessarily leading to an actual reward or pleasure (National Institute of Mental Health, 2016).

Diagnostic Statistical Manual: a classification system that provides a common language and standard criteria for mental disorders (Kinderman, 2013).

Executive Function: higher order brain processes that regulate and control behavior (Pellicano, 2012).

Mindfulness: “Mindfulness is awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally…It’s about knowing what is on your mind” (Kabat-Zinn, 2016).

Mindfulness-Based Stress Reduction: systematic patient-centered educational approach to teaching people how to live in the present moment via meditation practice (Kabat-Zinn, 2014).

Restricted Repetitive Behaviors: a broader term which encompasses stereotypy as a sub-type, these are behaviors that are governed by an anxiously obsessive desire for the maintenance of sameness that nobody but the child himself may disrupt on rare occasions. Examples include lining up objects and preoccupation with an interest (www.iancommunity.org).

Sensory Integration: refers to the integration and interpretation of sensory stimulation from the environment by the brain (Hatch-Rasmussen, 2016).

Stereotypy: self-stimulatory behavior that refers to repetitive body movements or repetitive movement of objects. Examples include rocking back and forth and pacing (Edelson, 2016).
Chapter Two

Review of the Literature

History of Autism

Two physicians of the twentieth century are most credited for describing traits and behaviors observed in autism: Leo Kanner and Hans Asperger. In his seminal 1943 paper, Leo Kanner was the first to describe infantile autism. His paper included his observations of 11 children (8 boys and 3 girls) between the ages of 2 and 8 years, as well as observations and anecdotes written by the children’s parents. In this paper, Kanner described his very first subject with whom he worked in 1938, known as ‘Donald T.’ Per his parents’ report, Donald learned the entire alphabet, backward and forward, and could count to 100 by the time he was two. In his second year, Donald became obsessed, and even maniacal, with spinning blocks and pans (Kanner, 1943). Donald’s father described him at age four as displaying “an abstraction of mind which made him perfectly oblivious to everything about him, [appearing] to be always thinking and thinking, and to get his attention almost requires one to break down a mental barrier between his inner consciousness and the outside world” (Kanner, 1943, p. 218).

Another child whom Kanner studied was a six-year-old boy named ‘Alfred L.’ The following was reported by his mother:

He is called a lone wolf. He prefers to play alone and avoids groups of children at play. He does not pay much attention to adults except when demanding stories. He avoids competition. He reads simple stories to himself. He is very fearful of being hurt, talks a great deal about the use of the electric chair. He is thrown into a panic when anyone accidentally covers his face. (Kanner, 1943, p. 234)
Here is yet one more example, this time of the five-year-old ‘Paul G.,’ observed by Kanner:

He behaved as if people as such did not matter or even exist. It made no difference whether one spoke to him in a friendly or a harsh way. He never looked up at people’s faces. When he had any dealings with persons at all, he treated them, or rather parts of them, as if they were objects. (p. 228)

When analyzing the parents’ and Kanner’s anecdotes and evaluations of all the children, it can be noted that many of the children’s traits and behaviors are described with similar phrases such as “marked obsessiveness,” “excellent rote memory,” “rigid daily routine,” “sameness of environment,” “self-absorbed,” “annoyed by interference,” “over-attachment to the world of objects,” “failure to develop the usual amount of social awareness,” and “prefers to play alone.” Kanner succinctly incorporated these observations when he stated: “The child’s behavior is governed by an anxiously obsessive desire for the maintenance of sameness that nobody but the child himself may disrupt on rare occasions” (Kanner, 1943, p. 245). Kanner’s description of what he called “autism” was recognized as a diagnosis in 1980 and thus included in the DSM-III (Barahona-Correa & Felipe, 2015). The above listed phrases are still considered descriptors of autism today.

While Kanner was conducting his observations in the United States, a psychiatrist named Hans Asperger was conducting similar observations in Austria. It is controversial as to whether they knew that they were simultaneously describing behaviors and traits of a population that had largely been ignored up to that point (Frith, 1991). Some researchers have curiously questioned if either plagiarized the work of the other, given
both even utilized the same descriptive name “autistic” – a word borrowed from Eugen Bleuler, a Swiss psychiatrist who designated this word to describe the loss of contact that a person with schizophrenia has with the world around him (Frith, 1991; Lyons & Fitzgerald, 2007). However, others argued that plagiarism was highly unlikely (Lyons & Fitzgerald, 2007). They published their work a year apart – Kanner in 1943 and Asperger in 1944. While Kanner’s work was widely read, Asperger’s work was much ignored, most likely because it was only published in German and thus attracted a smaller audience. According to Neumarker (2003):

Kanner had published in English which led to many publications about Kanner’s infantile autism after World War II, whereas Asperger wrote in German, so Asperger’s syndrome was hardly acknowledged outside the German-speaking countries. It was some 40 years before the syndrome – described by Asperger on four boys aged 7 to 11 years – was included in the widely used classification systems, ICD-10 (1992) and DSM-IV (1994). (p. 207)

Asperger’s paper has only been translated into English in 1991 by Uta Frith, a neuroscientist and the first researcher to recognize autism as a brain disorder and not the result of detached mothering, as Kanner had suggested (Duarte, Bordin, Yazigi, & Mooney, 2005). In analyzing both Kanner’s and Asperger’s work, Frith concluded that there was enough overlap of traits and behaviors, and that what is now known as Asperger’s Syndrome (4th ed.; DSM-IV; American Psychiatric Association, 1994) was really a particular type of autism and not mutually exclusive from Kanner’s description. However, there were some notable differences. All of Kanner’s children experienced a delay in acquiring language, and three children never learned to speak at all. Further, per
reports of his participants’ parents, none of their children ever pointed to objects of interest nor demonstrated a desire to share their world, (e.g., toys). On the other hand, children observed by Asperger tended to speak fluently by age five. They demonstrated “clever-sounding language, invented words, and generally spoke more like grown-ups than children” (Frith, 1991, p. 10). According to Frith, Asperger was the first “to report oddities of non-verbal communication: eye gaze, gestures, posture, voice quality, prosody, and word choice” (p. 10). Regarding relationships, these children sought out interactions with peers as they matured. However, deeper, more committed, relationships proved to be challenging. As adults, they were aware of relationships, but could not understand how to function in them. Noting that these children were keen observers of human behavior, Asperger believed “it may be possible for the Asperger person to learn social routines so well that he or she may strike others as merely eccentric” (Frith, 1991, p. 22). Thus, they could learn to interact by rote but could not progress beyond a superficial level.

Nearly forty years after Hans Asperger published his findings, a psychiatrist named Lorna Wing (1981) studied his work and used his descriptions as a guide when analyzing 34 of her own cases. In doing so, she organized behaviors and traits into five categories. They are as follows:

1. Speech: Speech develops typically but tone is pedantic and discussions can be lengthy, centered around one favorite topic; sometimes the same word is repeated several times; subtle jokes are hard to understand.
2. Nonverbal communication: Little facial expression is conveyed, except when extremely emotional; nonverbal signs are difficult to interpret; a face may be stared at to determine meaning.

3. Social interaction: “Lack of ability to understand and use rules governing social behaviour. These rules are unwritten and unstated, complex, constantly changing, and affect speech, gesture, posture, movement, eye contact, choice of clothing, proximity to others and may other aspects of behaviour” (Wing, 1981, p. 116).

4. Repetitive activities and resistance to change: Attraction to spinning objects and pleasure from spinning self; attachment to objects, a dislike of unfamiliarity.

5. Motor coordination: Gross motor skills are clumsy and uncoordinated; stereotyped movements of body and limbs are presented.

As previously mentioned, Kanner and Asperger are credited with being the first pioneers to describe autistic traits. It is important to note, however, that a Russian child psychiatrist named Grunya Efimovna Sukhareva published a detailed description of autistic traits in 1926. This is nearly two decades before Kanner and Asperger published their findings. Interestingly, she also denoted the word “autistic” in describing these traits. Even more notable is that her descriptions and classification system closely resembled the current classification system in *the Diagnostic Manual of Psychiatric Disorders-5* (*DSM-5*; American Psychiatric Association, 2013) and more so than those of Kanner and Asperger. According to Manouilenko and Bejerot (2015), “Sukhareva presented structured, elegant and detailed descriptions of the children that
were also vivid enough to give the reader the sense of being able to recognize each one of them in the street, or at least in a classroom” (p. 2). Truly ahead of her time, Sukhareva’s children were “admitted to a therapeutic school, and received both social and motor skills training during woodwork, painting and gymnastics classes. This specific training facilitated their progression into an ordinary school” (p. 3).

**DSM-5: Current Description and Criteria**

The most recent description of ASD in the *DSM-5* abandons previous subtypes and instead organizes this neurodevelopmental disorder into two core observable symptoms: impaired social interaction and ability to communicate, and restricted, repetitive, and stereotyped behaviors and interests, across multiple contexts (American Psychiatric Association, 2013). In the past *DSM* editions, impaired social interaction and impaired ability to communicate were considered separate diagnostic factors. So often, however, these impairments are observable in conjunction with one another. For example, an individual may have difficulty maintaining relationships due to problems with engaging in reciprocal conversations. The individual may find it difficult to find interest in another’s ideas, and his or her lack of appropriate eye contact and facial expression convey this. In order to maintain a relationship with another individual, one needs to organize and make sense of several incoming cues, and children with autism typically have difficulty processing simultaneous multiple cues (Cunningham & Schreibman, 2008).

The second core symptom – stereotypies, otherwise called *restricted, repetitive, and stereotyped behaviors* (RRBs) – is more unique in its category in that these behaviors may be observed in nonsocial situations, and in situations that may be absent of both
verbal and nonverbal communication (although not always). Some examples of these behaviors include preoccupation with smelling objects, perseverating on a topic, rocking back and forth, pacing, and lining up objects (American Psychological Association, 2013). A significant portion of this paper will demonstrate an examination of one particular RRB, namely stereotypic pacing.

**Prevalence of Autism Spectrum Disorder**

As indicated earlier, according to the 2016 data collected by the Centers for Disease Control and Prevention (CDC)’s Autism and Developmental Disabilities Monitoring (ADDM) Network, about 1 in 68 children has been identified with ASD (Centers for Disease Control and Prevention [CDC], 2016). According to ADDM’s 2016 report:

1. Almost half of children identified with ASD have average or above average intellectual ability compared to a decade ago, when a third of children identified with ASD had average or above average intellectual ability.
2. ASD occurs among all racial, ethnic, and socioeconomic groups. However, White children are still more likely to be identified with ASD than Black or Hispanic children.
3. Boys are almost 5 times more likely to be identified with ASD than girls.

Most children with ASD are diagnosed after age 4, even though ASD can be diagnosed as early as age 2.

Although these data are based on 8-year-old children living in 11 communities and by no means does this represent the entire population of children in the United States, these
findings are concerning. The ADDM tirelessly encourages other communities across the United States to become partners in conducting research and tracking data (CDC, 2016).

**Comorbidity: Anxiety**

Anxiety is one of the most common psychiatric disorders diagnosed in children, and may be defined as a “future-oriented mood state associated with preparation for possible, upcoming negative events,” which may include fear or “an alarm response to present or imminent danger (real or perceived)” (Craske, Rauch, Ursano, Prenoveau, Pine, & Zinbarg, 2009). The *DSM-5* recognizes seven subtypes of anxiety, namely: generalized anxiety disorder, social anxiety disorder, panic disorder, specific phobia, separation anxiety, selective mutism, and agoraphobia (Creswell, Waite, & Cooper, 2014).

Anxiety disorders are common co-occurring problems among children and adolescents with ASD and several studies have noted that anxiety disorders are considered a significant complication in clinically treating these children (Hofvander et al., 2009; White et al., 2010). Estimates of prevalence of comorbidity are anywhere between 40 and 55% (De Bruin, Ferdinand, Meester, De Nijs, & Verheij, 2007; Stratis & Lecavalier, 2013; Wigham, Rodgers, South, McConachie, & Freeston, 2015; Lai & Baron-Cohen, 2015). Most common anxiety subtypes are social anxiety disorder (13-29%) and generalized anxiety disorder (13-22%) (Lai, Lombardo, & Baron-Cohen, 2014).

In their studies, Williams, Leader, Mannion, and Chen (2015), found that age positively predicted levels of anxiety. They found that children with ASD experienced greater anxiety levels as they matured. In contrast, neurotypically developing children
experienced the opposite developmental pattern, experiencing lower levels of anxiety as they became older. This is perhaps due to the fact that as children with ASD mature, they “may start to define themselves by evaluating their characteristics and skills at a later developmental stage than their typically developing peers” (Williams et al., 2015, p. 38).

Other studies provided similar evidence. In Wigham et al.’s (2015) examination of the relationship between intolerance of uncertainty (IU) and anxiety, they discovered that the greater the level of IU, the greater a child’s level of anxiety. As argued by Wing (1981), as a child matures, he is better able to recognize feelings toward uncertainty, and this “painful awareness of handicap and difference from other people” results in greater anxiety (p. 118).

One of the most common ways that children with ASD demonstrate their high anxiety levels is by engaging in restrictive and repetitive behaviors (RRBs) (Stratis & Lecavalier, 2013; Wigham et al., 2015; Williams et al., 2015). Kanner (1943) suggested that the “features of the autistic syndrome, for example insistence on sameness, were related to anxiety” (as cited in Hofvander et al., 2009, p. 7).

Stratis and Lecavalier (2013) studied the effects of cognitive behavioral therapy on both anxiety and ritualistic and sameness behavior. They found that “anxiety symptoms were positively associated with the presence of ritualistic and sameness behavior” (p. 765). In other words, anxiety encouraged and maintained ritualistic and sameness behaviors. They also discovered that the higher a child’s cognitive ability, the higher the levels of anxiety; the higher the levels of anxiety, the more likely the child would engage in ritualistic and sameness behaviors. The higher functioning child was more aware of his environment and his emotional reaction to this environment. Authors,
such as Russell, Mataix-Cols, Anson, and Murphy (2005) have described patients with ASD as “vulnerable to stress because of a restricted repertoire of appropriate coping mechanisms” (as cited in Hofvander, et al., 2009, p. 7). Wigham et al.’s (2015) found that children with ASD engaged in repetitive motor behaviors due to experiencing a mediating factor of uncertainty; specifically, they found that “sensory under responsiveness and sensory over responsiveness were significantly associated with repetitive motor and insistence on sameness behaviours, and the relationships significantly mediated by IU and anxiety” (p. 943). These findings support those of Rodgers, Glod, Connolly, & McConachie (2012) and Lidstone et al. (2014), in that greater anxiety motivates children with ASD to insist on sameness in order to lessen that anxiety. In other words, RRBs are maintained in order to avoid situations that trigger anxiety. According to Wigham et al., “heightened levels of IU make children anxious and one strategy to manage anxiety is [engaging in] RRBs in order to exert some control over the environment and make the world more predictable” (2015, p. 950).

**Stereotypy**

Stereotypy is a term that includes involuntary self-soothing activities. It is another term for the aforementioned “RRBs,” and in this paper, the terms will be used interchangeably. The *DSM-IV* defines stereotypies as a “repetitive and nonfunctional behavior lasting 4 or more weeks” (American Psychiatric Association, 1994). The manual also emphasizes that “the behavior interferes with normal activity or it may lead to self injury” (Ghanizadeh, 2010, p. 150). Stereotypic behavior is very common and easily observed in children diagnosed with ASD, and even infants with autism show stereotypic behavior (Ghanizadeh, 2010). On the conservative side, Ghanizadeh (2010),
estimated that 44% of children with autism have at least one subtype of stereotypy. In a study conducted by Campbell, Locascio, Choroco, Spencer, Malone, Kafantaris, & Overall (1990), 99.5% of 224 children diagnosed with autism presented with at least mild motor stereotypy.

Stereotypies may be classified into three categories: a form of common behaviors, such as rocking, head banging, finger tapping, and hair twisting; and two forms of atypical behaviors, including head nodding and hand and arm flapping/waving (Singer, 2009). Some RRBs involve self-directed behaviors such as picking skin and covering ears while others involve rhythmic and patterned movements such as pacing, rocking, and arm flapping (Singer, 2009). These movements may last from “seconds to minutes, appear multiple times a day, and are associated with periods of engrossment, excitement, stress, fatigue, or boredom” (Singer, 2009, p. 77). According to Ghanizadeh (2010), “motor stereotypies are suppressible, repetitive, rhythmic, coordinated, purposeless, fixed, and nonfunctional pattern of movements” (p. 149). Another definition comes from Crutchfield, Mason, Chambers, Wills, and Mason (2015) who wrote: “Stereotypy is heterogeneous, and encompasses a variety of motor and vocal behavior including: brisk arm movements, rigid or odd walking postures, toe-walking, body rocking, non-communicative vocal repetitions, and head shaking” (p. 1146). Yet another definition is made by Bodfish, Symons, Parker, & Lewis (2000) who noted that stereotypic behaviors in individuals with ASD could vary in their occurrence, frequency, and severity.

Restricted, repetitive behaviors were once considered to be a single category of behavior, but growing evidence has illuminated a structure of organization within RRBs
(Lam, Bodfish, & Piven, 2008). As cited in Lam et al. (2008), the *DSM IV* (American Psychiatric Association, 1994), states that the criteria for RRB can be met by a person exhibiting at least one of the following: (a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus; (b) apparently inflexible adherence to specific, nonfunctional routines or rituals; (c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting or complex whole-body movements); or (d) persistent preoccupation with parts of objects (p. 1193).

Engaging in stereotypic behaviors can interfere with many aspects of a person’s life. Parents worry that their child’s RRBs will cause social disruptions and attract stigmatization (Singer, 2009). Such behaviors could interfere with their child’s livelihood, such as in maintaining employment, because, for example, RRBs can interfere with an individual’s ability to complete tasks in a thorough and timely manner. RRBs can also impede social and professional relationships (Crutchfield et al., 2015; Cunningham & Schreibman, 2008; Rapp & Vollmer, 2005; Durand & Carr, 1987) and may even incite bullying (Schroeder, Cappadocia, Bebko, Pepler, & Weissind, 2014). Further, in Koegel and Covert’s 1972 study, they indicated that “while not physically harmful, research has demonstrated such behaviors to negatively impact on academic engagement and learning” (as cited in Lydon, Healy, Mulhern, & Hughes, 2015). Overall, RRBs are self-stimulatory behaviors that are resistant to social consequences, and are difficult to change (Cunningham & Schreibman, 2008).

**Functions of stereotypy.** There are numerous antecedents that may trigger children with ASD to engage in stereotypy. Some examples include “excitement,
stimulation, stress, anxiety, boredom, fatigue, sensory isolation, or social demands” (Ghanizadeh, 2010, p. 150). Each of these affects an individual with ASD’s sensory threshold of physiological under-arousal or over-arousal. According to Liss, Saulnier, Fein, & Kinsbourne (2006), individuals engage in stereotypy to either induce a sensory experience or to subdue feelings of overstimulation (as cited in Joosten & Bundy, 2010, p.367). Early theories proposed by Hutt and Hutt (1968) suggested that “individuals with autism experienced physiological hyper-arousal, including excessive sympathetic activity and elevated physiological arousal, which led to many abnormal behaviors associated with ASD, including withdrawal, increased behavioral reactivity, and engagement in stereotyped behavior in an attempt to block external stimulation” (as cited in Lydon et al., 2015, p. 678). Wieseler, Hanson, Camberlain, and Thompson (1985) reiterated these findings, noting relationships between stereotypic behaviors and processing sensation (as cited in Joosten & Bundy, 2010). Along this same vein, recent studies by Ben-Sasson et al., (2007) have provided evidence that stereotypic behaviors are often motivated by the goal of reducing anxiety (as cited in Joosten & Bundy, 2010). It has been proposed by Sugarman, Garrison, and Williford (2014) that all of these stereotypic behaviors are a response to impairments in autonomic regulation and that “stereotypy is an attempt to reduce high levels of physiological arousal and to restore homeostasis” (as cited in Lydon et al., 2015, p. 678). In line with a homeostasis theory, Dunn (1999) proposed a sensory processing model to explain abnormal sensory processing. He proposed that “individuals respond to sensation based on sensory thresholds (high or low) and that they respond passively or actively (i.e., in accord with expectations of the threshold, or in a way to
counteract the threshold and ‘normalise’ the system)” (as cited in Joosten & Bundy, 2010, p. 367).

*Sensory Processing and Anxiety.* To examine how ineffective sensory processing might contribute to the anxiety and repetitive behaviors of children with autism, Joosten and Bundy (2010) evaluated the motivational levels of engagement in stereotypic behaviors by children with intellectual disability (ID) alone, as well as those with both intellectual disability and ASD, for the purpose of alleviating anxiety caused by an overstimulating environment. They found that those children with both ASD and ID were more motivated than those with ID alone, to engage in stereotypic behavior in order to reduce anxiety. These results led them to conclude that one of the key explanations for the manifestation of anxiety in children with ASD may be their lower threshold to sensation. The RRBs that result as a response to uncomfortable feelings of anxiety is evidence of how such children cope with this discomfort and intrinsically steer their bodies back to a state of balance (Joosten & Bundy, 2010). Engagement in stereotypic behavior may thus be a means of calming the self (Bauer, Quas, & Boyce, 2002).

Several studies have shown that individuals with ASD often struggle with sensory processing dysfunction which includes hyper- and hypo-sensitivity as well as sensory overload (Leekam, Nieto, Libby, Wing, & Gould, 2007; Rogers, Hepburn, Wehner, 2003; Rogers & Ozonoff, 2005). Individuals with ASD process detail with such pedantic intensity, that they may be greatly challenged in filtering out sensory information from the environment (Chen, Rodgers, & McConachie, 2009). In Chen et al.’s (2009) study, the researchers hypothesized the following: “(a) children with ASD with sensory processing abnormalities would show a greater degree of restricted and repetitive
behaviours; and (b) children with ASD with a greater degree of repetitive behaviour and sensory symptoms will show a detail-focused cognitive style” (p. 636). They did, in fact, find a significant relationship between sensory processing dysfunction, particularly with tactile, visual, and auditory hyper-sensitivity, and exhibiting RRBs (Chen et al., 2009).

As discussed in studies similar to the ones conducted by Rodgers et al. (2012) and Lidstone et al (2014), children’s anxiety leads them to engage in RRBs, with the goal of controlling the predictability of their environment (as cited in Wigham et al., 2015). Wigham et al. (2015) noted that several researchers (e.g., Turner, 1999; Baker, Lane, Angley, & Young, 2008) had determined that RRBs might be utilized to self soothe, reduce stimulation, or create stimulation, if the sensory threshold was too low (as cited in Wigham et al., 2015).

Managing stereotypy. According to Singer (2000), “evidenced-based therapy for the suppression of motor stereotypies is generally lacking, and the response of stereotypic movements to medications is largely inconsistent” (p. 80). Review of the literature revealed that most strategies are behaviorally based (Ghanizadeh, 2010). The following discussion details examined strategies for influencing the intensity and frequency of RRBs, which include sensory integration, Kata technique, self-monitoring, and mindfulness.

Sensory Integration. It is not uncommon that children with ASD also experience sensory integration difficulties. According to sensory integration (SI) theory, many symptoms of autism are “caused by an inability to integrate and adaptively respond to sensory input” (Moore, Cividini-Motta, Clark, & Aheam, 2015). Children with ASD and stereotypic behaviors are frequently referred to an occupational therapist, who will most
likely integrate what is known as a “sensory diet” into their patients’ daily routines. Sensory diets integrate prescribed sensory experiences such as brushing and deep-pressure therapy (DPT), which are suggested to modify the brain-body connection. In a sensory diet, brushing and DPT consists of using special brushes and joint compression techniques to apply deep pressure to the skin and joints (Bundy, Lane, & Murray, 2002; Wilbarger & Wilbarger, 1991). Hatch-Ramussen (1995) stated the following:

These different types of input cause a release of neuro-chemicals that can last up to two hours, depending on the type of input and intensity. A sensory diet is designed to keep a flow of these neuro-chemicals steady in the brain throughout the day for improved learning. (p. 7)

Although a sensory diet is a popular form of therapy sought out by parents for their children with ASD, Moore et al. (2015) found that “neither the sensory diet alone, brushing and deep pressure alone, nor both treatments combined were effective interventions for stereotypy” (p. 95). Likewise, Sniezyk and Zane (2015) reached the same conclusion after implementing a sensory diet of vestibular swinging and deep pressure for three children with autism. Their results did not provide evidence of a causal relationship between sensory integration and improvement in behavior.

While sensory integration has yielded inconsistent results, there are interventions that have proven to be more successful, two of which are the Kata technique and self-monitoring. These are discussed next.

*Kata Technique.* “Kata” is a Japanese word meaning “form.” The Kata technique involves practicing choreographed patterns of movements to the extent that the movements become reflexive, enabling the performer to fluidly execute blocking moves
in a situation necessitating self-defense (Bahrami, Movahedi, Marandi, & Abedi, 2012). According to Pitetti, Rendoff, Grover, & Beets (2007), the positive effects of exercise-based intervention programs for managing stereotypy in children with ASD have garnered significant attention in the past 30 years. Studies have demonstrated significant improvements in their social and academic skills, sensory integration, stress reduction, and attention, as well as in several others areas (Bahrami et al., 2012).

In a systematic review of the effects of physical exercise on children with ASD, Lang, Koegel, Ashbaugh, Regester, Ence, and Smith (2010) discussed the model of disordered behavior, which proposes that a child who is not effectively processing sensory stimulation will engage in self-stimulation in order to restore homeostasis. This premise is not unlike the one that underlies the sensory integration theory; however, with the Kata technique, the intervention involves the child’s active involvement, whereas the sensory diet is passively received.

In Bahrami et al.'s (2012) study, the researchers found that participation in Kata techniques decreased baseline stereotypic behaviors “by a mean of 42.54 % across participants [and] that after 30 days of no practice, stereotypy in the exercise group remained significantly decreased compared to pre-intervention time” (p. 1190). Such a significant decrease may be related to the fact that the Kata techniques engage similar muscular movements to those that are utilized in the stereotypic movements. Bahrami et al. (2012) suggested that since similar body movements were engaged in both, the exercise might have achieved the desired state of homeostasis, taking the place of the stereotypic behavior. In their review, Lang et al. (2012) suggested much the same:
If such a relationship between physical exercises and stereotypic behaviors does exist, then improvements in exercise-based stereotypy interventions might be possible by matching the type of exercise chosen to the topography of the stereotypy. For example, if a participant’s stereotypy involves arm flapping then an exercise or physical activity that also involves arm motion might more closely match the putative reinforcing properties than exercise that does not involve the arms. (as sited in Bahrami et al., 2012, p. 1190)

**Self-Monitoring.** Self-monitoring is a strategy that involves pinpointing a behavior requiring modification and assessing and recording that behavior for further analysis. According to Koegel and Koegel (1990), self-monitoring has been successfully utilized by children with ASD to modify social behaviors, such as initiating and maintaining conversations. Examining the effect of self-monitoring in schools, they found evidence to support that self-monitoring could be maintained “without the direct supervision and implementation of the instructor and could be adapted and adjusted to the needs of the student and the environment” (as cited in Crutchfield et al., 2015, p. 1147).

Some studies, (e.g., Ganz, Heath, Davis, & Vannest, 2013; Koegel & Koegel, 1990) have demonstrated that self-monitoring can assist children with ASD in managing their stereotypic behaviors (as cited in Crutchfield et al., 2015). Encouraged by these findings, Crutchfield et al. (2015) developed an in-school intervention whereby adolescents with ASD utilized mobile technology as a prompt and monitoring device for tracking their stereotypic behaviors. This intervention was based on a mobile application created by Wills and Mason (2014), which they named *I-Connect*, and utilized for the purpose of improving academic engagement. The device enables students to customize
prompts so that they may structure a personalized monitoring system. Their responses are automatically uploaded to an on-line database that the teacher can access and monitor. Crutchfield et al. (2015) cited the following benefits to using the device: the device is accepted by students and easy to use, it is not distracting to other students in the classroom, and it does not require multiple materials such as timers and paper/pencil checklists. The researchers concluded that the “use of the I-Connect self-monitoring system resulted in a steady decrease in the target behavior across time, whereas absence of I-Connect yielded a steady increase in the target behavior across time” (p. 1152).

**Mindfulness-Based Stress Reduction**

Finally, a strategy called mindfulness has been attempted. According to the Pali-English dictionary (Sati, 1999), the English word “mindfulness” translates to the Pali word “sati,” which literally means “memory.” However, unlike memory of the past, mindfulness refers to memory of the present (as cited in Hwang and Kearney, 2014, p. 497). To be mindful, one observes present thoughts and feelings as events in the mind, “without over-identifying with them and without reacting to them in an automatic, habitual pattern of reactivity” (Bishop et al., 2004, p. 232). When engaging in objective, dispassionate self-awareness, one can create a “space” between perceiving an event and responding to that perception (Bishop et al., 2004). Thus, mindfulness encourages reflexive rather than reactive responses.

In 1979, Jon Kabat-Zinn developed an intervention, called Mindfulness-Based Stress Reduction (MBSR) and offered it through an outpatient stress reduction clinic at the University of Massachusetts Medical Center. He opened the clinic to serve patients who were not responding to traditional medical care with the hope that if successful, the
clinic could serve as a model to hospitals and clinics throughout the country. According to Kabat-Zinn (2011), “MBSR is grounded altogether in a non-fixing orientation and approach. It is less about curing and more about healing” (2011, p. 292).

Mindfulness practice is grounded in Eastern philosophy, particularly Buddhism. In fact, the word “Buddha” means “one who has awakened” and mindfulness is akin to waking up to the present moment (Kabat-Zinn, 2011, p. 283). Kabat-Zinn strove to preserve the tenets of mindfulness origins, but was also particular about operationalizing mindfulness in secular vernacular, as he believed practicing awareness is universal, and not just a Buddhist concept (Kabat-Zinn, 2003). He wanted the practice to be taken seriously in the medical community as a legitimate strategy for healing:

The intervention needed to be free of the cultural, religious, and ideological factors associated with the Buddhist origins of mindfulness, because the objective was not to teach Buddhism or even “to make great meditators” out of people, but to offer an environment within which to experiment with a range of novel and potentially effective methods for facing, exploring, and relieving suffering at the levels of both body and mind, and understanding the potential power inherent in the mind/body connection itself in doing so. (2003, p. 149)

Kabat-Zinn operationalized mindfulness as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (p. 145). Each moment may elicit many opinions, many judgments. The goal is to refrain from reacting and evaluating any of these thoughts, other than recognizing them as pleasant, unpleasant, or neutral. While paying attention to the present moment, the practitioner also pays attention to the breath.
Bishop et al. (2004) described mindfulness as sustaining attention on the breath, keeping “attention anchored in current experience so that thoughts, feelings, and sensations can be detected as they arise in the stream of consciousness” (p. 232).

Focusing on the breath is not easy and requires much practice. Kabat-Zinn (2015) stated the following:

The challenge is actually just experiencing one breath in and one breath out. And that means not thinking about the breath or patting ourselves on the back for how wonderfully we breathe or anything like that. It’s just the direct knowing of breathing.” (p. 27)

To reiterate this sense of challenge, Bishop et al. (2004) noted: “Mindfulness approaches are not considered relaxation or mood management techniques [but] rather a form of mental training to reduce cognitive vulnerability to reactive modes of mind that might otherwise heighten stress and emotional distress” (p. 231).

Not denying that practicing mindfulness demands time and patience, Kabat-Zinn (2003) also encouraged the practitioner to think of mindfulness as an invitation. He wrote:

From the outset of practice, we are reminded that mindfulness is not about getting anywhere else or fixing anything. Rather, it is an invitation to allow oneself to be where one already is and to know the inner and outer landscape of the direct experience in each moment. This implies waking up to the full spectrum of our experience in the present moment, which, as we engage in mindfulness practice, we rapidly discover is severely edited and often distorted through the routinized, habitual, and unexamined activity of our thoughts and emotions, often involving
significant alienation from direct experience of the sensory world and the body.

(p. 148)

Kabat-Zinn recognized that in accepting this invitation, there would be challenging times when one practiced awareness in the midst of pain. It is not always easy to maintain presence of mind in the wake of pain, and often, the mind’s automatic response is to suppress, at least in part, such feelings. In response to this, Kabat-Zinn (2015) proposed that the awareness of pain was not the experience of pain. In fact, he argued that awareness transformed pain. Kabat-Zinn explained: “If you move into pure awareness in the midst of pain, even for the tiniest moment, your relationship with your pain is going to shift right in that very moment” (p. 1219). Being aware promotes transcendence of the weight experienced by the pain.

**Mindfulness in Schools**

In recent years, there has been a developing interest in incorporating mindfulness techniques into the daily school routine (Garrison Institute, 2005; Semple, Reid, & Miller, 2005; Huppert & Johnson, 2010; Bennett & Dorjee, 2016). One reason for this stems from contemplative study of educational reformers and their ideas. In 1933, John Dewey criticized that the chief aim of schools was “to establish mechanical habit and instill uniformity of conduct” (as cited in Ritchhart & Perkins, 2000, p. 28). He argued that energy and stimulation, which are vital components for learning, were ignored (as cited in Ritchhart & Perkins, 2000). In 1970, Charles Silberman claimed that mindlessness was “what [was] mostly wrong with schools and college” (as cited in Ritchhart & Perkins, 2000, p. 28). Educational reform is necessarily in constant motion,
and reexamination of past and current theory and practice has led to a courtship between mindfulness and the classroom.

**Mindfulness and executive function.** One tenet of mindfulness is that such practice results in more enhanced executive (cognitive) functions such as working memory, attention, and focus. It logically follows that a more attentive mind is better equipped to learn new things. As cited in the Garrison Institute (2005), the Center for Mindfulness at the University of Massachusetts Medical School "believes that students, teachers and other members of the school community can benefit from mindfulness and other contemplative techniques in an effort to become more focused and less distracted, more responsive and less reactive, more calm and less stressed" (p. 7). Several studies have provided preliminary evidence that mindfulness can enhance metacognition and executive functioning (e.g., Flook et al., 2010). Meiklejohn et al. (2012) suggested that consistent mindfulness practice could result in improved attentional and emotional self-regulation and cognitive flexibility in areas such as working memory, attention, and academic skills.

Huppert and Johnson (2010) examined mindfulness practice and well-being, and found that those who practiced it found a “sense of autonomy or self-determination, through the increased ability to make choices” (p. 265). They argued that “increased choice [could] lead to a greater sense of self-efficacy, while competence could be increased through the training of attention regulation” (p. 265). Yet another study, by Semple, Lee, Rosa, and Miller (2009), found that those adolescents who had participated in a mindfulness program when compared to those who had not, had significant reductions in parent-rated attention problems (as cited in Meiklejohn et al., 2012).
Mindfulness and anxiety. Another critical reason for incorporating mindfulness into the classroom is the acknowledgment that students and teachers are under increased pressure to perform well; such pressure may hinder them to perform at their top levels. Researchers continue to examine self-reports of high stress in conjunction with research regarding the effects of stress on brain development and the relationship between psychological wellness and academic success. According to the National Scientific Council on the Developing Child (2007), “excessive stress damages the architecture of the developing brain leading to vulnerability to lifelong problems in learning, behavior, and overall health” (as cited in Meiklejohn et al., 2012, p. 296).

Along that same vein, Meiklejohn et al. (2012) have stated that “significant and/or sustained childhood stress are likely to [have an] impact on well-being, general functioning, and factors specific to learning, such as executive function and working memory” (p. 296). When a child reacts to a situation with increased anxiety, and judges the anxiety as being a bad thing, the fear response will “create new, dysfunctional neuronal pathways that only sensitize the brain to, and intensify anxiety reactions” (Bostic, Nevarez, Potter, Prince, Benningfield, & Aguirre, 2015, p. 246).

Undoubtedly, all children will experience stress during the school day at one point or another. Therefore, there is a strong argument for implementing a mindfulness program in school. It is not uncommon for school-aged children to anticipate future events, such as exams and competitions. Mindfulness practice “allows students to relate to their internal and external experiences in ways that are present-centered, objective, and responsive, rather than in ways that are past or future-focused, subjective, or reactive” (Meiklejohn et al., 2012, p. 296). They learn how to stay with the body and focus on the
in-breath and out-breath, which helps build resistance to ruminating thoughts (Shonin, Van Gordon, & Griffiths, 2014; Bennett & Dorjee, 2016). According to Bostic et al. (2015), if children are able to stay with the present moment and acknowledge unpleasant sensations, this will assist them in uncovering the source of their anxiety.

In a study by Semple et al. (2005), they examined elementary children who exhibited observable anxious behaviors. They hypothesized that children would be interested in participating in a 6-week mindfulness training and that their symptoms of anxiety would decrease, as measured by clinical observations, teacher ratings, and self reports. Before the beginning of each session, children wrote down their most pressing worry for that day on a paper, and then threw the paper in a Worry Warts Wastebasket, as a way to distance themselves from anxious cognitions (Semple et al., 2005). Mindfulness sessions began and ended with 3-minute seated breath meditations. Many sessions included walking exercises that “can develop one’s kinesthetic senses and sense of physical self in regulation to the world” (p. 382). Other sessions included mindful hearing, whereby children mindfully listened to bells “to try to find the space where the bell sound ends and the silence begins” (p. 388). Upon the close of each session, children were given the opportunity to reclaim their worries from the basket. No child ever chose to do so (Semple et al., 2005).

One of the main goals of the sessions was to assist children in becoming more aware of their environment. Notably, all of the children unequivocally believed that they were completely aware of their surroundings until one of the therapists asked the children to identify the color of the flowers near the entrance of their school. None of the children knew. The more the children practiced mindfulness, the more they realized just how
much they had not noticed in their environment. They became aware of being unaware (Semple et al., 2005).

As is often the case when uncovering repressed feelings for the first time, the sessions proved to elicit strong emotional reactions. Take for example, Semple et al.’s (2005) description of James, who became adept at masking his anxiety by channeling his anxious feelings into disrupting class instead. The following anecdote described James during his first session:

In that first session, James rarely sat still or stopped talking. He claimed that he couldn’t sit up, that it wasn’t comfortable. Lying down, he put the floor mat over his head. His behavior was disruptive to the other children, who were attending and appeared to be concentrating on the exercises. James and Caleb vied with each other to see who could be the most disruptive as they played off each other’s silliness. Near the end of the session, James became upset and cried, apparently in response to being repeatedly told to stop talking. At that point Jessica said to him, “I can see that you’re not feeling well, James, do you want to talk about it?” He said, “I feel better when I keep it all inside.” (p. 388)

As the session continued, James began to cry and said he did not feel well. The next day, before the beginning of the session, one of the therapists took him aside and explained that “the purpose of the program was to learn how to look inward and find the quiet place we all carry inside ourselves so that we might be happier and less worried about things” (p. 388). James replied, “At the first session, I didn’t understand what was expected of me, but now that I understand what the class is about, I’m looking forward to being
there” (p. 388). For a young elementary-aged child, this insight regarding the relationship between expectations and acceptance of reality is quite exceptional.

Upon completion of the 6-week program, each child had improved in one or more of the following areas: academic functioning, internalizing problems, and/or externalizing problems. Most children commented that they enjoyed participating in the sessions. Based on these positive results, the researchers concluded that mindfulness training as part of a school program is an effective intervention for decreasing children’s anxiety levels. They noted two potential benefits of their intervention as opposed to those offered by alternative therapies outside of school: One, it is more cost-effective than individualized clinic-based treatments, and two, children claimed they enjoyed taking some responsibility for their own improvement (Semple et al., 2005).

In a study by Bennet and Dorjee (2016), they examined the feasibility of implementing mindfulness practice as an after school program for adolescents. The impetus for their study was that the United Kingdom Department of Education (2004) reported that psychological health issues, such as anxiety and depression, were increasingly being identified as a hindrance to some students being successful in school (as cited in Bennett & Dorjee, 2016). Bennett and Dorjee (2016) hypothesized that providing students with a mindfulness program could help students develop coping skills and become more resilient when faced with stressful situations in school (e.g., examinations).

The researchers’ longitudinal design measured school attendance, academic grades, and the impact of the program on students’ well being, per self-reports, at 3 time points: pre-intervention of the 8-week course, post intervention during week 8, and at a
3-month follow up, during examination week. The students participated in the MBSR course for 2 hours a day, after school, in a group format. Results from their feasibility study provided evidence that the MBSR course was an acceptable intervention that can be delivered with high attendance and retention rates, within a school setting (Bennet & Dorjee, 2016). Surprising to the researchers, their study identified 50% of their sample as having moderate-severe levels of anxiety, based on Lovibond and Lovibond’s (2015) Depression, Anxiety, Stress Scale-21 (DASS 21) and that only 25% of those in need of treatment actually received it, according to the United Kingdom Centre for Economic Performance Mental Health Policy Group (2012; as cited in Bennet & Dorjee, 2016).

At the close of the study, Bennet and Dorjee’s (2016) participants reported that their depression and anxiety levels had improved, as had their academic grades. These results suggested that participation in a mindfulness program may indeed help students strengthen coping skills for dealing with stress. The students found it acceptable to receive training in a group format. Such a format provides a non-stigmatizing space where students, who may otherwise not participate, feel comfortable. In fact, participating in a mindfulness intervention amongst peers may be preferable to seeking individualized counseling (Bennet and Dorjee, 2016).

**Mindfulness and the student with ASD.** This author found only two research articles that have been written specifically about youth with ASD and potential benefits of practicing mindfulness, though several have been written about training parents of children with ASD. It is important to note that there is one publication, besides those aforementioned, by Bögels, Hoogstad, Van Dun, De Schutter, and Restifo (2008), that examined the effect of mindfulness practice on a heterogeneous population that included
youth with ASD, ADHD, and oppositional-defiant and/or conduct disorder. However, unlike the two studies which this author examined, their results pertained to the entire group of participants as a whole (Bögels et al., 2008).

De Bruin, Blom, Smit, Van Steensel, and Bögels (2015) stated that their pilot study on the effects of mindfulness training on children and adolescents with ASD, as well as the effects of training their parents, was the first on this topic. In actuality, another group of researchers – Hwang et al. (2015) – published an article on the same topic of concomitant training the same year. The difference is that De Bruin et al. (2015) directly trained the adolescents and measured their perceptions whereas Hwang et al. (2015) trained the mothers, who in turn, trained their children. These children were not assessed by the researchers, but by their mothers. De Bruin et al.’s (2015) article will be examined first.

De Bruin et al. (2015) surmised that the benefits of mindfulness training that have been demonstrated with other populations, could also be demonstrated with adolescents with ASD. This was based on studies (e.g., Block-Lerner, Adair, Plumb, Rhatiganm, & Orsillo, 2007) that have shown that mindfulness practice enables a normative population to become more self-aware and emphatic toward others (as cited in De Bruin et al., 2015). Typically, adolescents with ASD struggle with aspects of social situations such as understanding the perspectives and emotions of others. As discussed in a study by Happé & Frith, (2006), they also might experience dysfunction with sensory input due to underdeveloped processing ability (as cited in De Bruin et al., 2015). Since mindfulness practice has been shown to strengthen cognitive flexibility as a result of shifting attention from the breath to the mind, De Bruin et al. (2015) hypothesized that children and
adolescents with ASD may learn to better process external and internal stimuli, and even become more efficient at seeing the bigger picture and not be so overwhelmed with details. Finally, there is evidence that mindfulness practice reduces anxiety amongst adults (Zeidan, Martucci, Kraft, McHaffie, & Coghill, 2014). In adolescents with ASD, anxiety rates have been shown to rise from 14% in childhood up to 37% in adolescence (De Bruin et al., 2007). It is reasonable to hypothesize that mindfulness practice might decrease anxiety levels in adolescents with ASD.

For their intervention, De Bruin et al. (2015) implemented a curriculum based on the MYmind protocol for children with ADHD (see Van der Oord, Bögels, & Peijnenburg, 2012). In a series of 9 sessions, each with a different topic, De Bruin et al. (2015) found that “adolescents learned to focus and enhance their attention, (bodily) awareness, and self-control by doing mindfulness exercises (i.e., breathing meditation, body scan, sensory awareness exercises, sounds meditation, and yoga), which were based on Mindfulness-Based Cognitive Therapy and Mindfulness-Based Stress Reduction programs” (p. 908). Data were collected via self-reports, a measurement tool that other researchers, such as Shipman, Sheldrick, and Perrin (2011), have found to be valid and reliable (as cited in De Bruin et al., 2015). Data regarding core symptoms were also collected from the short form of the Autism Questionnaire.

The researchers needed to modify presentation of the MYmind sessions to suit the characteristic needs of adolescents with ASD. These young adults required structure and concrete directions. The original exercises utilized metaphors, which would have been lost on these participants, and perhaps even frustrating. The researchers stated the following:
In more classical mindfulness trainings, one of the key aspects is not to anticipate, but to just experience, and therefore, the training does not start with an oversight of the program. However, for patients with ASD, sessions were outlined and very predictable, in order to reduce insecurity. Inquiry was kept short, and during the meditations, there was less verbal guidance as the adolescents indicated they preferred more silence. (De Bruin et al., 2015, p. 908)

The researchers also studied the parents of these adolescents. An important reason for parents and adolescents to participate in mindfulness training simultaneously is due to the reciprocal relationship between parenting stress and child behavior problems. As stated by Neece (2014), increased behavior problems are related to increased parenting stress and vice versa (as cited in De Bruin et al., 2015). The parents of the adolescent participants were trained in Mindful Parenting, an extensive guide created by Bögels and Restifo (2013). The researchers described sessions as follows:

Roughly, two-third of each session consists of regular MBSR/MBCT meditation practices [and] one-third focuses on mindful parenting issues such as understanding the effect of parental reactivity, paying unbiased attention to the child, becoming aware of own boundaries, and accepting the child and his difficulties. The mindful parenting practices were adapted to the specific obstacles and needs of parents of adolescents with ASD. (p. 909)

The parents described their sessions in self reports and completed several questionnaires, including the Five Facet Mindfulness Questionnaire (FFMQ; Bohlmeijer, Ten Klooster, & Fledderus, 2011) and the Interpersonal Mindfulness in Parenting Scale (IM-P; De Bruin et al., 2012). The FFMQ assesses five facets of mindfulness:
Observing, Describing, Acting with awareness, Non-judging, and Non-reactivity. The IM-P assesses mindfulness in the parenting relationship with five subscales: Listening with full attention, Emotional awareness, Self-regulation in the parenting relationship, Nonjudgmental acceptance, and Compassion. The parents also completed questionnaires that pinpointed parenting styles as well as the extent to which parents feel they have (in)sufficient skills to manage their child(ren) (De Bruin et al., 2015). De Bruin et. al (2015) reported the results of their study as follows:

Adolescents reported an increase in quality of life and a decrease in rumination. Nine weeks after the training, they ruminated less about things such as pain, sadness, why they feel, and react like they do. Possibly, the practice of mindfulness had taught them to look at events (and thoughts) more from a distance, to let them be as they are without getting caught up in them. (p. 911)

Furthermore, parents “felt their children were better able to communicate their feelings and understand other people’s feelings, make better eye contact, make contact with peers more adequately, and focus less on the details” (p. 911). One adolescent explained that “his thoughts were like overcrowded subways in rush hour. In the MYmind training, he had learned to just be on the platform. Subways with many thoughts would still come to his platform, but he was now able to let them pass, to just observe them and stay calm” (p. 911). Apparently metaphors were no trouble for this teenager.

The second article that focused on the effect of mindfulness practice on children and adolescents with ASD and their mothers was written by Hwang et al. (2015). Like De Bruin et al. (2015), Hwang et al. (2015) examined the effect that mindfulness training had on the reciprocal relationship shared by youth with ASD and their mothers, whereby
a child’s behavior influences his or her mother’s behavior and vice versa. However, Hwang et al.’s study differs in that they trained mothers to become mindfulness teachers to their own children.

Their study was divided into two stages. During stage one, mothers participated in an 8-week mindfulness program to attain proficiency in mindfulness meditation. Their stress levels were then evaluated. According to Silva and Schalock (2012), stress in parents of children with ASD is 4 times greater than those of typically developed children and twice those of other types of developmental disabilities. Their perceptions of the quality of life and the effect that their training had on their children’s behavior were also evaluated.

During the second stage, the mothers taught their children mindfulness techniques. Again, mothers were evaluated on parenting stress, life quality, and perception of their children’s behaviors. Throughout the entire intervention, online group meetings and social media were provided in order to support practice. The following exemplifies the children’s training:

The mindfulness training provided to children with ASD was guided by the principles of differentiation, video modelling, and self-determination. The diversity of these children demands differentiation of learning content and process. This began with individual interviews before the training to assist design of the initial mindfulness activities, and continued with home visits and online sessions during the training to modify existing mindfulness exercises or create new ones. The initial mindfulness activities were a set of five, designed to ground their attention over time using bodily movement, sounds and breathing. (p. 3097)
The results of Hwang et al.’s (2015) study were generally positive. Upon the completion of stage one, 6 of the 5 participating mothers reported reductions in parenting stress and improvement in life quality. Measurement results did not reflect these qualitative reports, however, perhaps due to that mothers already rated their quality of life as high previous to training. Upon completion of parent mindfulness training, and before training their children, mothers reported that their children appeared less anxious and that their problem behaviors had improved.

Upon completion of stage two, measures of reductions in parent stress and improvement in family life quality were statistically significant, as were reductions in anxiety for children at the group level. Hwang et al. (2015) suggested that future studies could examine the effect of mindfulness practice in a school environment where children with ASD could regularly practice mindfulness in a group.

**Obstacles of Classroom Implementation.** According to Meiklejohn et al. (2012), the typical foundation of mindfulness-based curricula for K-12 students includes “age-appropriate mind-body practices that aim to increase focused attention, social competencies, and emotional self-regulation” (p. 298). The researchers continued to explain that “skills are learned over time, and the intention is that, through sustained practice, mindful awareness becomes a positive way of being in the world for students – whether learning and interacting at school, at home, or in the community” (p. 298). To develop a feasible mindfulness program that will complement the rigors of an already full academic program while meeting the needs of students, teachers, and their families is no small task. Meiklejohn et al. (2012, p. 302) suggested consideration of the following challenges that may be inherent to implementing a mindfulness program:
1. the need for continued development and refinement of the best practices for adapting well established adult mindfulness training for younger populations;

2. lack of agreement on the active ingredients of the programs and ways to measure their effectiveness through rigorous scientific research;

3. motivating schools to embrace the curricula;

4. frequent changes in school’s educational policies, budgeting, priorities, proposed solutions, and decision makers;

5. the need for funding;

6. finding trained and experienced mindfulness teachers to teach teachers, students, and parents; and

7. scheduling teaching in multiple schools, including finding a suitable time with in the school curriculum, and finding space conducive to practice within a school.

To overcome these challenges, it is critical to continue providing credible research while developing and implementing reliable and valid measurements for these programs. Evidence-based results of interventions will offer confidence to school administrators, whose primary job is to meet academic state requirements, that mindfulness programs will be a valuable addition to the school day. According to Meiklejohn et al. (2012), research programs which are based on trustworthy empirical evidence include the following aspects: (a) intervention effectiveness, (b) how and why the intervention works, and (c) predictions for whom and under what conditions the intervention will be effective (p. 302).
Since the implementation of mindfulness programs in schools is still in its infancy, a theory of change model is not yet well supported. Researchers will need to address the following questions:

1. What is the most promising theoretical framework for conceptualizing the effects of mindfulness training? How might mindfulness processes be conceptualized from a behavioral, cognitive, or bio-behavioral perspective, or from the perspective of executive function?

2. What are the core intervention activities and processes common to mindfulness practices with youth, and how do they differ from those with adults?

3. What short- and long-term outcomes can reasonably be hypothesized to result from mindfulness practice?

4. How can a short- or long-term outcome from one practice (e.g., open awareness) be distinguished from the outcome of another (e.g., loving-kindness)?

5. What are the specific mechanisms of action that link mindfulness practices to these outcomes?

6. How much mindfulness practice is necessary to predict a certain outcome in different age groups?

7. And finally, should mindfulness be defined narrowly as attention training, or broadly as a multi-faceted portal to greater social and emotional well-being?

Table 1, based on research by Bostic et al. (2015), details potential obstacles to implementing mindfulness programs in schools.
Table 1

*Potential obstacles to implementation of mindfulness programs in schools*

<table>
<thead>
<tr>
<th>Potential Obstacle</th>
<th>Tactics to Address Obstacle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions by staff/parents</td>
<td>1. Provision of the actual events/curriculum so adults can view 2. Clarification of how mindfulness components “fit” (not compete) with religious/diverse cultural practices</td>
</tr>
<tr>
<td>The program competes with religious/cultural principles</td>
<td></td>
</tr>
<tr>
<td>Competition with other academic priorities</td>
<td>1. Staff/teacher information on benefits of mindfulness for academic achievement 2. Inclusion as part of health/physical education</td>
</tr>
<tr>
<td>Feasibility (how mindfulness will be implemented and delivered)</td>
<td>1. Identification of staff or local providers willing to train staff and/or conduct student sessions 2. Creation of motivated school committee to develop an implementation plan attentive to specific needs/concerns of that school 3. Piloting of the proposed program to identify benefits and potential obstacles</td>
</tr>
<tr>
<td>Safety (risks associated with program)</td>
<td>1. Identification of staff to respond to/address any injuries or complaints 2. Comparison of students receiving mindfulness with students not receiving</td>
</tr>
<tr>
<td>Age-appropriateness (e.g., physical “positions” that could be embarrassing or mental practices that could be seen as “weak” by peers)</td>
<td>1. Reviewing/eliminating particular physical postures that may be seen as too vulnerable, provocative, or potentially embarrassing for secondary school students 2. Providing context descriptions for practices that may be perceived initially negatively by students/staff</td>
</tr>
<tr>
<td>Attendance and retention</td>
<td>1. Provided at convenient times, make-up times available during the week 2. Reinforcement/rewards for regular participation</td>
</tr>
</tbody>
</table>
**Measurement of Mindfulness.** As the research for examining mindfulness programs in schools continues to develop, it is critical that valid scales of measurement are not only utilized, but are correctly administered and assessed. To this writer’s knowledge, there are only two inventories that are developmentally appropriately constructed for children and adolescents: The Child Acceptance and Mindfulness Measure (CAMM) and The Mindful Attention Awareness Scale-Adolescent (MAAS-A).

*The Child Acceptance and Mindful Measure (CAMM).* The CAMM was developed in 2011 by psychometricians Laurie Greco and Ruth Baer. In their research, they noted that several instruments had been developed for assessing mindfulness in adults up to the point of their developing the CAMM, include the Freiburg Mindfulness Inventory (Buchheld, Grossman, & Walach, 2001), the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), and others (as cited in Greco, Baer, & Smith, 2011). However, none of these inventories were suitable for assessing children and adolescents, as several items simply did not apply to them (e.g., an item about driving in a car on “automatic pilot”). The researchers stated that their scale – the CAMM – was one of the first to be developed for assessing the effect of mindfulness on children and adolescents. Further, they claimed that their 2011 article was among the first to describe the development and validation of a child-report measure of mindfulness skills (Greco et al., 2011).

In examining validity of the CAMM, Greco et al. (2011) evaluated three facets: (a) *Observing*, which involves “the degree to which respondents notice or attend to internal phenomena such as thoughts, feelings, and bodily sensations (e.g., “I pay close
attention to my thoughts”); (b) Acting with awareness, which refers to “present-centered awareness and full engagement in one’s current activity (e.g., “I walk from class to class without noticing what I’m doing”); and (c) Accepting without judgment, which entails “nonjudgmental awareness and openness to experiencing a full range of internal events (e.g., “I get upset with myself for having a certain thought”)” (p. 607).

To test validity of the CAMM, the researchers asked a random sample of 428 children to read the original 25 items that were assigned a 5-point scale, and instructed them to circle confusing statements. They also conducted interviews with 35 randomly selected participants and instructed them to restate items in their own words and to provide examples of each item to demonstrate comprehension.

To examine the factor structure of the 25 items to determine if any items should be deleted, the researchers instructed 334 randomly selected participants to complete the 25 item inventory. Nine of the observing items showed mixed correlations with other constructs, suggesting “that high levels of observing are not necessarily consistent with mindfulness in this population, probably because present-moment observation can be open and accepting (consistent with mindfulness) or can be judgmental and reactive (inconsistent with mindfulness)” (Greco et al., 2011, p. 608). Therefore, these items were dropped from the inventory.

Overall, the CAMM appeared to be a valid measure of children’s understanding and self-assessment of mindfulness in their lives. The scores of the CAMM “correlated significantly and positively with favorable outcomes as quality of life and academic competence and negatively with adverse outcomes such as internalizing symptoms and externalizing behavior problems” (Greco et al., 2011, p. 611). The researchers’
suggestion for future research was to examine how sensitive the CAMM is in detecting treatment effects, as well as how well the inventory can identify mechanisms of change.

*The Mindful Attention Awareness Scale – Adolescent (MAAS-A).* The MAAS-A is a 14 item modified version of the MAAS, which was developed in 2003 by Kirk Brown and Richard Ryan. Based on the MAAS – a single factor tool well validated with high internal consistency and test-retest reliability– Brown, West, Loverich, and Biegel (2011) created a slightly modified tool by deleting one item that was irrelevant to an adolescent population, ages 14 – 18. They then ran two studies – one with a normative group of adolescents and one with a psychiatric group who was primarily diagnosed with anxiety and/or a mood disorder – to test the modified MAAS, or MAAS-A (“A” for adolescent). The first study tested the factor structure. Brown et al. (2011) found the MAAS-A to be high in internal consistency and test-retest reliability and agreement and indeed showed strong evidence for a single factor structure in both exploratory and confirmatory factor analysis.

The second study examined the reliability and validity of the MAAS-A with a psychiatric population. The researchers found that the MAAS-A showed high internal consistency. Some students were randomly selected to receive an 8-week MBSR intervention. Their scores increased significantly from baseline to a 3-month follow up, compared to students who did not participate in the intervention. The non-intervention group’s test score changes were insignificant (Brown et al., 2011).

Both studies provide evidence that the MAAS-A is a reliable and valid tool for assessing both normative and psychiatric populations, thus suggesting it to be an effective tool in mindfulness intervention research. The researchers found the tool particularly
promising to use with a psychiatric population, in that mindfulness training appeared to result in mental health improvement. Brown et al. (2011) did note some limitations. Although age and gender were well represented, their sample did not encompass a range of ethnicities. Also, the psychiatric population presented with anxiety and mood disorders; other diagnostic categories were not included, and so further research is necessary before the tool can be recommended for use with specific groups. Finally, neither the normative nor the psychiatric group had extensive training in practicing mindfulness. Typically, this is true for groups that have been studied to date. In the future, if students become more experienced, the MAAS-A may require further modification (Brown et al., 2011).

**Life in the Mindful Classroom.** With current educational state standards focusing on the development of “core knowledge,” proponents of school mindfulness programs must demonstrate that such programs teach problem-solving skills that are useful in the classroom and beyond. Researchers have been providing examples of “mindlessness” in schools for several decades. In 1991, in the classic example of how traditional didactic instruction can lead to mindlessness, Kamii and Lewis gave second graders the following problem: There are 26 sheep and 10 goats on a ship. How old is the captain? Eighty-eight percent of students from traditional classroom settings answered 36. No students remarked that the problem was lacking in information, despite the fact that these were students scoring above the 85th percentile on average on standardized tests. In comparison, nearly a third of the students in the more mindful “constructivist” classroom questioned the lack of logic in the problem (as cited in Ritchhart and Perkins, 2000, p. 29).
Research needs to provide evidence that teaching these skills are equally as important as teaching core academics, and that practicing these skills will strengthen students’ abilities to learn the core skills. Ritchhart and Perkins (2000), described the argument for incorporating mindfulness practice:

Consequently, the real educational potential of mindfulness lies not in raising test scores but in addressing some of the other intractable problems of education such as the flexible transfer of skills and knowledge to new contexts, the development of deep understanding, student motivation and engagement, the ability to think critically and creatively, and the development of more self-directed learners.

(p. 29)

Undoubtedly, these objectives are ideal, but in a world of accountability, which seems to rest on test scores, researchers need to demonstrate that mindfulness programs will not interfere with academic instruction. One way of doing so is by showing that after initially teaching mindfulness techniques, it takes little time to actually practice mindfulness. Hilt and Pollak (2012) found that when adolescents listened to an 8-minute recording everyday, they learned to prevent ruminating thoughts that interfered with learning. Bakosh, Snow, Tobias, Houlihan, & Barbosa-Leiker (2016) conducted their intervention study in an elementary school setting and found that 10-minutes of daily practice using pre-recorded instructions appeared to improve student academic achievement.

Once these skills are strengthened, teachers may guide students on how to notice an occasion for eliciting mindfulness skills. According to Ritchhart and Perkins (2000), mindfulness training is “helping students to be alert to occasions when one is likely to
engage in mindless behavior” (p. 31). With practice, students will learn to engage in mindfulness as if it were second nature, thus utilizing little time.

Another argument for the incorporation of mindfulness programs in schools is that they encourage students to become more sensitive to their environment, including those around them. According to Ritchhart and Perkins (2000), “developing sensitivity means giving students both the time to explore and the assurance that something valuable exists to be found” (p. 32). Students may learn to become more aware of another’s perspective, strengthening their social skills and abilities to understand empathy:

“Increased awareness of the behaviour and feelings of others may lead to greater appreciation of positive behaviours such as affection, generosity, or humour, and an increased understanding of the others’ difficulties” (Huppert & Johnson, 2010, p. 267).

Further, if mindfulness practice is offered to all students, and not considered an intervention reserved for subpopulations only, inequalities amongst students might be minimized. This would encourage an inclusive environment that would lessen the “stigma and social comparison that often arise when targeting interventions at subgroups of young people within schools” (Kuyken et al., 2013, p. 126). In other words, school-wide mindfulness practice might foster community and social acceptance.

Before any of the above arguments can be put into practice, however, children have to decide for themselves that this is a program worthwhile of participation. It is a program that simply will not work if the students are disinterested or disengaged. When learning core academics, researchers such as Langer and Piper (1987) have found that children are much better engaged in learning if they are given conditional or guided instruction as opposed to absolute instruction. Guided instruction with options proved to
be much more acceptable (as cited in Ritchhart & Perkins, 2000). In the same study by Langer and Piper (1987), they found that absolute instruction of core academics interfered with students’ natural thought processes and led to greater mindlessness, whereas students who received conditional instruction demonstrated greater mindfulness (as cited in Ritchhart & Perkins, 2000). Likewise, when teaching mindfulness practice, Ritchhart and Perkins (2000), stressed that “mindfulness must be more than a set of instructional techniques. It must take hold in classrooms in ways that permeate the lives of both students and teachers” (p. 29). Further, by teaching how mindfulness practice can be utilized in dealing with every day stressors, students might acquire a tool that can used outside of the classroom, improving their overall well-being (Kuyken et al., 2013).

Example one of a mindful classroom: Learning to BREATHE: Meiklejohn et al. (2012) summarized the Learning to BREATHE program as “a universal school-based prevention program for adolescents which integrates principles of social and emotional learning with mindfulness components of mindfulness-based stress reduction (MBSR)” (p. 299). Developed by Patricia C. Broderick, she describes the curriculum as such: “Six lessons are built around the BREATHE acronym, and each lesson has a core theme. The six themes include body awareness, understanding and working with thoughts, understanding and working with feelings, integrating awareness of thoughts, feelings and bodily sensations, reducing harmful self-judgments, and integrating mindful awareness into daily life” (Broderick, 2009, p. 38). Per the curriculum website, (https://www.learning2breath.org), the main goals of the program are as follows:

1. To provide universal, developmentally appropriate mindfulness instruction that fosters mental health and wellness;
2. To enhance emotion awareness and emotion management skills and to foster wholesome emotional balance;

3. To strengthen attention;

4. To expand the repertoire of skills for stress management;

5. To help students integrate mindfulness into everyday life.

*Example two of a mindful classroom: Mindfulness in Schools Project (MiSP):*

Developed by Richard Burnett and Chris Cullen, in 2009, MiSP is a program that teaches individuals how to become mindfulness teachers. Per the website, the aim of MiSP is “to improve the resilience and wellbeing of all young people to enhance their school career and to support them throughout life” (https://www.mindfulnessinschools.org). The curriculum consists of three programs: .b (pronounced ‘dot-b’, which stands for stop and be) for 11-18 year olds, *Paws b* for 7-11 year olds, and *.b Foundations*, which was written for teachers and school staff. Per the website, “the .b curriculum is a set of 10 lessons, each teaching a distinct mindfulness skill, and designed to do so in a way which engages young minds. The lessons typically include images and animations which bring these skills to life and most importantly, practical exercises which teach the core skills and make them relevant to the pupils lives” (http://www.mindfulnessinschools.org). The creators list the following program objectives for the .b program:

1. To experience greater well-being (e.g., feel happier, calmer, more fulfilled);

2. To fulfil their potential and pursue their own goals (e.g. be more creative, more relaxed, academically, personally);
3. To improve their concentration and focus, in classes, in exams and tests, on
the sports field, when playing games, when paying attention and listening to
others;

4. To work with difficult mental states such as depressive, ruminative and
anxious thoughts and low moods; and

5. To cope with the everyday stresses and strains of adolescent life such as
exams, relationships, sleep problems, family issues.

Table 2, based on research by Meiklejohn et al. (2012) briefly describes these
programs, as well as five others, and provides website addresses for further consideration.

Table 2

_Mindfulness-based programs in schools_

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Kids Program</td>
<td>The New ABCs—Attention, Balance and Compassion—are taught through games, activities, instruction and sharing to develop: (1) Awareness of inner experience (thoughts, emotions, and physical sensations); (2) awareness of outer experience (people, places and things); (3) awareness of both together without blending the two.</td>
</tr>
<tr>
<td><a href="http://www.susankaisergreenland.com">www.susankaisergreenland.com</a></td>
<td></td>
</tr>
<tr>
<td>Inner Resilience Program (IRP)</td>
<td>Integration of social and emotional learning with contemplative practice: Create healthy environments for teaching and learning by practicing self-regulation, attention, and caring for others. Emphasis on repeated practice of skills over time in the context of a caring learning community.</td>
</tr>
<tr>
<td><a href="http://www.innerresiliencetidescenter.org">www.innerresiliencetidescenter.org</a></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2 (Cont)

**Mindfulness-based programs in schools**

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to BREATHE learning2breathe.org</td>
<td>Integration of social and emotional learning with mindfulness components of mindfulness-based stress reduction (MBSR). Focuses on empowerment and emotion regulation.</td>
</tr>
<tr>
<td>Mindfulness in Schools Project (MiSP)</td>
<td>Core MBSR program for adolescent audience. Teachings include: mindfulness of breath, body scan, mindful eating, mindful movement, mindfulness of thought and sound, several variations, and mindful texting.</td>
</tr>
<tr>
<td>Mindful Schools <a href="http://www.mindfulschools.org">www.mindfulschools.org</a></td>
<td>Engages children through lessons including mindfulness of sound, breath, body, emotions, test taking, generosity, appreciation, kindness, and caring.</td>
</tr>
<tr>
<td>MindUP <a href="http://www.thehawnfoundation.org">www.thehawnfoundation.org</a></td>
<td>Fosters social and emotional awareness, enhances psychological well-being, and promotes academic success.</td>
</tr>
<tr>
<td>Wellness Works in Schools™ <a href="http://www.wellnessworkinschools.com">www.wellnessworkinschools.com</a></td>
<td>Health and wellness program based on mindful awareness principles and practices. Students develop skills to address stress, mental health, emotional balance, behavior, and learning readiness.</td>
</tr>
</tbody>
</table>
Chapter Three

Method

As indicated in Chapter 1, the purpose of this study was to determine how practicing mindfulness affected stereotypic pacing exhibited by an adolescent who was diagnosed with ASD and anxiety. The research questions required examining how practicing mindfulness influenced an adolescent’s frequency of pacing and the duration of each pacing episode. This chapter outlines the research methodology that was used. The discussion of the sampling plan is presented first, followed by a brief description of the participant and the setting where a study was conducted. This is followed by the discussion of the study variables, research design, study procedures (including IRB), and data analysis.

Sampling Plan

This study employed a small-N design in that one adolescent from Oregon, Ohio participated in the study. The researcher was familiar with the student, and chose this student based on convenience. As such, a non-probabilistic convenient sampling was used. Inclusion criteria demanded that the student be diagnosed with both ASD and an anxiety disorder, and be demonstrating pacing behaviors at least once a day for a duration of at least two minutes per each pacing episode.

Participant

The observed participant was a 15-year-old male enrolled in the 10th grade. He met all the inclusion criteria and agreed to participate.
Setting

The setting included the participant’s home, specifically the home’s driveway and the home’s living room. According to the participant’s parent, these were the areas the participant typically engaged in pacing.

Variables

**Dependent Variable.** The study examined two dependent (outcome) variables. They included frequency of pacing and duration of pacing. The frequency of pacing was measured as the number of episodes of pacing by the participant at his home at any point between the hours of 4:00 p.m. and midnight. An episode of pacing occurred if the participant walked back and forth at least 4 paces in one direction before turning 180 degrees and commencing to walk in the opposite direction. The duration of pacing was measured as the total number of minutes that episodes of pacing occurred between the hours of 4:00 p.m. and midnight.

**Independent Variable.** The study included one independent variable that was manipulated and included three conditions: no intervention (baseline phase A₁), intervention (phase B), and withdrawal of the intervention (baseline phase A₂).

Experimental Design

Originally, the design was structured as a quasi-experimental small-N multiple baseline design to examine a student diagnosed with ASD and anxiety in two of his classrooms. The design was structured to observe the student for 8-weeks, with time allotted for determining a baseline. Due to logistics and unforeseen circumstances with the designated school setting, the design was altered to examine one adolescent with the same diagnoses, but in his home. In this modified small-N design, time for determining a
stable baseline and implementing the intervention was shorter. Similar to the original design, the alternate design was quasi-experimental. As such, random assignment to groups, a characteristic of true experiments, was not possible and irrelevant. Instead, the researcher conducted a study with one participant, whereby the single participant was compared to himself. The participant’s frequency and duration of pacing observed during baseline (phase A₁) were compared to the frequency and duration of pacing observed during the intervention (phase B) and again to the second baseline, after the intervention was withdrawn (phase A₂). As such, an ABA design was used. The rationale for implementing ABA designs was to look for changes in targeted behavior during the intervention phase (e.g., facilitation or suppression). If the behavior reverted back to baseline levels once the treatment were withdrawn, the experimenter could conclude that treatment was responsible for the change in behavior (Alberto & Troutman, 2013). Each of the three phases is discussed next in detail.

**Procedures**

**Baseline A₁.** The baseline phase A₁ lasted for 5 days. Data on frequency and duration of pacing were collected each day, in order to establish stability in behavior. The baseline data were collected at the participant’s home, between the hours of 4:00 p.m. and midnight. This baseline collection occurred immediately prior to the intervention.

**Intervention.** The intervention used in the study was mindfulness practice whereby the participant sat in a chair, with eyes closed and hands on his lap, and breathed deeply (as evidenced by the rise and fall of his chest) and quietly for 20- minutes, as he listened to a recording of how to focus on his breath and stay in the present moment. A
recording was used because this researcher was not trained to facilitate mindfulness sessions. The recording guided the student into acknowledging his straying thoughts, and encouraged him to neither judge himself, for straying from the present moment, nor the thoughts themselves. The intervention was implemented Monday – Friday, at 9:00 p.m. for 4 weeks during which the researcher collected data on the frequencies and durations of stereotypic pacing.

**Baseline A2.** After 4 weeks, the researcher withdrew the intervention and, after a 1 week break, resumed documenting daily frequencies and durations of stereotypic pacing for another 1 week. The purpose of these observations was to determine the lasting effects of mindfulness practice.

It is important to note that unlike a typical ABA design, the second baseline was not begun until after 1 week of withdrawal. No data were collected during the withdrawal period. The researcher regarded this phase much like a clinical therapist would. A therapist counsels one client during a session, just as a researcher studied one participant in this small-N study. During the week, when a therapist’s client is not receiving therapy, the therapist does not track behavior. Likewise, when this researcher’s participant was not receiving the intervention, the researcher did not track behavior. Although this design does not represent the ABA design in its purest form, researchers have argued that flexibility in design is important. Connell & Thompson (1986) stated the following:

*Flexibility can be used more effectively to create designs that are individually fashioned for the problems that they address…By using the flexibility of these*
designs clinical researchers can obtain more valuable information about individual treatment procedures and other important clinical issues. (p. 214)

Materials

The researcher used Jon Kabat-Zinn’s (2006) album entitled “Mindfulness for Beginners.” Specifically, track 2, “Mindfulness of Breathing” was utilized.

Institutional Review Board

Due to the fact that this researcher implemented mindfulness practice with a family member at his home, and the intervention was considered a type of family exercise as opposed to an experiment. As such, the University of Toledo’s Institutional Review Board (IRB) determined this study to be exempt from requiring IRB approval. Therefore, no consent or assent forms were necessary.

Data Analysis

Visual analysis was used to determine if mindfulness practice had an effect on the frequency and/or the duration of daily stereotypic pacing. Different methods have been proposed for assessing and interpreting behavioral changes in small-N studies; however, visual inspection of data using criteria, such as differences in level and variations in trend or slope, has been the most commonly used (Hurtado-Parrado & Lopez-Lopez, 2015), and were employed in this study. According to Hurtado-Parrado and Lopez-Lopez (2015), “visual inspection strategies incorporate variability as informative data that can prompt further experimental analyses of the sources of such variability” (p. 328).

In addition to the traditional visual analysis, the frequency and duration of pacing episodes were also examined using a weekly count (for frequency) and weekly averages
(for duration). This was helpful for assessing a shift in behavior. Daily peaks and valleys would have disguised the actual trend that is depicted in Figure 2 (p. 60).

The results of these analyses are presented in Chapter 4. The results are presented separately for each outcome variable and each type of analysis.
Chapter Four

Results

Frequency of Pacing

Figure 1 shows the results of the visual analysis for the frequency of pacing outcome. As seen in Figure 1, during the first baseline period, the researcher was able to determine a trend in behavior represented by three points that indicated a decrease in frequency level. The number of times in one day that the participant initiated and continued to pace for a duration of at least 2 minutes, peaked in the middle of the school week of October 10th. The participant then steadily decreased his number of pacing episodes per day, from midweek until Friday.

![Frequency of Pacing Per Day](image)

*Figure 1.* Number of pacing episodes per day, during pre-intervention, intervention, and post-intervention. The vertical arrow indicates the withdrawal period during which no data were collected.

Figure 1 also shows that during the first week of the mindfulness intervention (phase B), there was an upward trend in the participant’s frequency of daily pacing, from midweek until Friday. In other words, the pattern observed during this phase was the
opposite to the pattern observed during the baseline phase. In fact, the greatest number of pacing episodes per one day during baseline (i.e., 3 episodes), was equal to the smallest number of pacing episodes per one day during the first week of intervention (i.e., 3 episodes).

Interestingly, a downward trend was evident during the second week of the intervention, again from midweek until Friday. The participant’s number of episodes peaked on Tuesday with 4 episodes, and then decreased and stayed steady at 1 episode per day, from midweek on. During the third week of the intervention, there was no evident trend from one day to the next. However, for 3 days of the week, the participant only paced 1 time per day. This is quite a different picture compared to the first week of the intervention, where, for 3 days of the week, he paced 5 times per day.

The fourth week of the intervention resulted in the most stability of any of the preceding weeks, including baseline, with the participant pacing 2 times per day, for the first 3 days of the week, and then only 1 time per day, for the last 2 days of the week. After one week of no intervention, the participant still demonstrated peaks and valleys, but actually disengaged from pacing entirely for 2 of the 5 days.

In Figure 2, weekly counts are represented. As seen in Figure 2, the participant paced more times during week 1 of intervention (n = 22), than in any other week, and that he paced considerably fewer times during week 2 of intervention (n = 9), than in week 1. It is also evident that the participant paced fewer times during the week following the withdrawal period (n = 4), than in any other week during pre-intervention and intervention.
Figure 2. Number of pacing episodes per week (i.e., weekly counts).

**Duration of Pacing Episode.** With regard to the duration of pacing episodes, the results of the visual analysis show a great range of variability (see Figure 3). The participant paced for as few as 0 minutes to as many as 110 minutes.

During week 1 of the intervention, pacing durations peaked and plummeted throughout the week. When compared to the frequency of episodes in week 1 (see Figure 1), the durations lasted longer on low frequency days and vice versa. For example, the duration of pacing for day 5 (n = 17 min.) was the least amount of time spent pacing that week. Day 5 was also a day of high pacing frequency (n = 5 episodes). What is most visually striking is the huge spike in pacing duration that occurred during week 2 of the intervention. On the first day of week 2, the participant paced for a duration of 110 minutes. The next greatest duration of time for that week was 18 minutes. Two episodes of pacing contributed to the duration time of 110 minutes, whereas 4 episodes of pacing contributed to the duration time of 18 minutes. By week 4 of the intervention, the frequency and duration of pacing began to coincide. More frequent episodes contributed
to higher durations and vice versa. For example, on day 1 of week 4, the participant engaged in 2 episodes and accumulated 47 minutes of pacing. On day 5 of week 4, the participant engaged in 1 episode and accumulated 12 minutes of pacing.

![Duration of Pacing Each Day](image)

**Figure 3.** Duration of pacing episodes per day, during pre-intervention, intervention, and post-intervention. The vertical arrow indicates the withdrawal period during which no data were collected.

The duration of pacing episodes was also examined using weekly average duration times (see Figure 4). As seen in Figure 4, the participant spent more time (50.6 min.) pacing during week 1 of the intervention than during any other week. This result is similar to the weekly count analysis of the frequency of pacing presented in Figure 2. Since the participant paced more frequently during week 1, this naturally translated into more minutes that the participant accumulated during that week. However, this was not necessarily always the case because several more frequent episodes were shorter in duration, thus accounting for fewer minutes of pacing than one very long episode. For example, the participant engaged in fewer episodes of pacing during post-intervention (n = 4) than during pre-intervention (n = 7). However, the participant spent .60 more
minutes pacing during post-intervention (17.4 min.) than during pre-intervention (16.8 min.).

Figure 4. The average length of time spent pacing, in minutes, per week, during pre-intervention, intervention, and post-intervention.

Overall, the results indicate that when analyzing weekly frequency counts and average durations, there appears to be a downward trend in both aspects of stereotypic pacing, although the trend is more pronounced with the frequencies. In other words, the participant consistently decreased his frequency of weekly pacing after peaking during the first week of the intervention. The participant’s duration of pacing also peaked during the first week of the intervention, and then decreased by almost 50% during week 2. There was a 9.4-minute increase during week 3, but a consistent decline thereafter. Daily durations of pacing were inconsistent, with some durations lasting more than 1 hour with others lasting as little as two minutes.
Chapter Five

Discussion

Major Findings

This study examined the effectiveness of mindfulness practice on stereotypic pacing exhibited by an adolescent diagnosed with ASD and anxiety. Using a Small-N design, the researcher examined the trends in the frequency and duration of pacing across 6 weeks that consisted of two 1-week baseline phases and a 4-week intervention phase.

The major findings were as follows: the participant engaged in more frequent episodes of pacing as well as paced for more minutes during week 1 of the intervention than during any other week, including pre-intervention and post-intervention weeks. However, by week 2 of the intervention, the participant’s frequency of pacing episodes had decreased; and during the post-intervention week, he paced fewer times than during both pre-intervention and intervention periods. Conversely, by week 2 of the intervention, the participant’s weekly duration of pacing had increased by 169 minutes since baseline. By post intervention, the duration had decreased to 149 minutes, but still exceeded the baseline by 65 minutes. However, the data suggest a downward trend in duration times, particularly from week 1 to post intervention.

Thus, the overall trend towards decrease in frequency suggests that the mindfulness intervention was working. Moreover, the results indicate that this intervention does not constantly need to be in place to yield positive results. This is consistent with other researchers’ findings who reported that positive effects of mindfulness practice continued over time (Hwang & Kearney, 2013). Finally, several spikes in the behavior that were observed could be explained because the researcher has
known the participant for over a decade. With regard to this adolescent, the researcher has observed in the past that he became anxious when attempting new things. He has also exhibited traits of perfectionism and a desire to please those whom he respects. As such, a spike in stereotypical behavior during week 1 of the intervention was not surprising. Further, according to the diagnosis, adolescents with ASD typically respond negatively to change. Being observed and participating in an intervention for 6 weeks had likely created some discomfort in this individual who finds it important to perform well and exceed expectations. In summary, the study provided some evidence of the effectiveness of the mindfulness intervention, but not a very convincing evidence.

**Implications for Practice**

Although the study produced some evidence of effectiveness of the mindfulness practice and was short in duration, the fact that a trend did develop whereby the frequency and duration of pacing appeared to decrease by the end of the intervention, and continued to do so after the intervention was removed, implies that practicing mindfulness may provide an alternative intervention for decreasing stereotypic pacing often exhibited by adolescents with ASD. If mindfulness practice were to be implemented in schools that service students with ASD, mindfulness sessions should be offered at a predetermined time each day, to appeal to this population’s need for structure and a predetermined schedule. Implementing mindfulness practice into the school day structure would enable the intervention to continue throughout the year, promoting stronger and more lasting effects.
Limitations

There were notable limitations to this study that related to the length and intensity of the intervention. Small-N designs are typically longer in duration than large-N designs, in order to allow behavior to stabilize over time. The intervention in this study was only implemented for 4 weeks, and so stability in behavior may not have been completely attained. Mindfulness-based stress reduction programs are typically 8-weeks long, including 31 hours of direct instruction. Attendance of a 7.5-hour day is required in programs based on Jon Kabat-Zinn’s MBSR model (http://www.umassmed.edu/) and there are 45-60-minute daily homework assignments to complete. According to Carmody and Baer (2009), “the mindfulness-based stress reduction (MBSR) program was designed to be long enough for participants to grasp the principles of self-regulation through mindfulness and develop skill and autonomy in mindfulness practice” (p. 627). The participant in this study practiced mindfulness for only 20 minutes a day for 4 weeks, totaling 7 hours (rounded) of practice by the end of the study.

To expand on this consideration of the length of time necessary to engage in this particular intervention, it is critical to examine the physiology of the brain. According to McEwen (2016), “the brain is the central organ for adaptation to experiences, including stressors, which are capable of changing brain architecture as well as altering systemic function through neuroendocrine, autonomic, immune, and metabolic systems” (p. 56). Just as the brain can adapt and change its architecture in response to stressors, it can also adapt and change aspects of its structure (e.g., cortical volume) in response to de-stressors, such as mindfulness practice. As stated by McEwen (2016), mindfulness
practices such as MBSR “engage the brain-body interconnection while opening “windows of plasticity” that allow the brain to change itself” (p. 57).

Researchers have found that MBSR has been shown to increase regional brain gray matter density in the hippocampus, cerebellum, and the prefrontal cortex, which are involved in learning and memory processes, emotion regulation, self-referential processing, and perspective taking (Hölzel et al., 2011; McEwen, 2016). Adolescents diagnosed with ASD often experience dysfunction with self-referential processing—the ability to make sense out of stimuli that affects one’s own person (Northoff, Heinzel, De Greck, Bermpohl, Dobrowolny, & Panksepp, 2006). They also struggle with understanding and appreciating the perspectives of others. Based on the plasticity of the brain, disciplined MBSR practice could potentially improve these weaker cognitive processes found in adolescents with ASD. The critical point, however, is that the changes take place over time.

A final limitation to this study was that this researcher indirectly facilitated the mindfulness intervention via a recording as opposed to personally leading the mindfulness sessions. As noted in the procedures section of the method, this researcher was not trained to facilitate mindfulness sessions and believed there was more validity in utilizing a recording by the developer of MBSR than in trying to guide the participant based solely on personal experience. However, a recording can not observe and guide the participant as to how to better engage with the practice. A mindfulness instructor’s level of expertise is a critical consideration when striving for optimal outcomes (Carmody & Baer, 2009).
Future Research

Although schools have begun to implement mindfulness programs into their curricula, very little research has focused on the effects of mindfulness practice on students diagnosed with ASD, let alone diagnosed with additional disorders. As previously mentioned, programs such MBSR are time demanding, and a study examining if an abbreviated program could still yield similar results would be worth pursuing. Furthermore, it seems imperative to design a mixed-method study, so that the people who are most affected—the adolescents who are experiencing the intervention—have the opportunity to provide insight and suggestions for why the program is working and what modifications are necessary for it to work better.
References


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What are the symptoms of autism? Retrieved from https://www.autismspeaks.org/what-autism/symptoms


Appendix A

Frequency and Duration Chart  
Target Behavior: Pacing

<table>
<thead>
<tr>
<th>Date</th>
<th>Setting*</th>
<th>Begin Time</th>
<th>End Time</th>
<th>Total Time Min.</th>
<th>Frequency**</th>
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*Setting will be coded: DW for Driveway; LR for Living Room

**Frequency**: Each frequency coincides with an accompanying duration. Therefore, each frequency box, in-line with a duration, will contain a ‘1.’ This variable is included in the chart for visual organization.