Title
Mind on Breathing: The Effects of a Mindfulness Breathing Exercise on Academic Engagement

Author
Cornell, Benjamin

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Mind on Breathing: The Effects of a Mindfulness Breathing Exercise on Academic Engagement

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by

Benjamin Laurence Cornell

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Dissertation Committee:
Dr. Austin Johnson, Chairperson
Dr. William Erchul.
Dr. Katherine Stavropoulos

The Dissertation of Benjamin Laurence Cornell is approved:

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Committee Chairperson

University of California, Riverside

Dedication

This dissertation is dedicated to my family, faculty, colleagues, and friends who have supported me throughout this journey.

To my Grandma, Dorothy Sidelle, who had first introduced me to meditation. To my Pa, Ronald Sidelle, who had given life-lessons and love that I will never forget. To my grandparents, Marcia and Alan Cornell, who have provided the support needed for the journey. And to my parents, Patti and Laurence Cornell, who have always encouraged me to pursue my own happiness, even when it involved moving 3000 miles away from home.

To the New London County 4-H Camp, the organization that gave me the confidence to serve youth and exposed me to the great pleasure inherent in that pursuit.

To the University of Vermont, the institution that provided the foundation and love of psychology required to build my expertise. To Dr. Dale Jaffe and Dr. Elizabeth Pinel, who had seen my potential and helped me to see it too. And to Jim Hagan, who had brought me to Tibet and taught me how to promote my own happiness.

To UC Riverside's School Psychology program, the institution that provided the education needed to achieve my pursuits. To my advisor Dr. Austin Johnson, who had provided the professional and personal support needed to survive graduate school.

To Claudia Alejandra Castro, who had held my hand through the most challenging time of my life. She made the bad days good and made the good days great.

To my family, faculty, colleagues, and friends. I thank them all for being fundamental in the pursuit of this degree. I hope to make them proud in how I apply it.

ABSTRACT OF THE DISSERTATION

Mind on Breathing: The Effects of a Mindfulness Breathing Exercise on Academic Engagement

by

Benjamin Laurence Cornell

Doctor of Philosophy, Graduate Program in Education
University of California, Riverside, June 2019
Dr. Austin Johnson, Chairperson

The Mind-on-Breathing (MOB) intervention is a mindfulness-breathing exercise that aims to help promote student academic engagement (AE) and reduce off-task behaviors (OFT). MOB is designed from simple, shared technical features common to meditation, mindfulness, and breathing-related exercises that can be implemented in one-on-one settings with minimal training and no monetary cost. Using a multiple baseline design, the effects of MOB on student academic engagement and off-task behaviors were investigated with a sample of three 5th grade students. Systematic Direct Observation (SDO) was used to collect data on academic engagement and off-task behaviors using momentary time sampling and partial-recording, respectively. Results were interpreted using visual analysis as well as nonparametric effect size estimates (i.e., Percent of nonoverlapping data; PND; Scruggs, Mastrodieri, & Casto, 1987, Tau U; Parker, Vannest, Davis, & Sauber, 2011). Data suggested that MOB was effective for all three participants in increasing academic engagement and reducing off-task behaviors. Implications for interpreting results within a behavioral framework for implementation in a multitiered system of supports (MTSS) are provided.

Table of Contents

Mind on Breathing: The Effects of a Mindfulness Breathing Exercise on Academic Engagement

> Take a moment for yourself and let go of thoughts relating to what has happened, is happening elsewhere, or is going to happen. In this moment, focus exclusively on breathing in a relaxed, natural, and diaphragmatic manner. When you find your thoughts deviating to other topics, try to nonjudgmentally return your attention to your breathing (Appendix A).

On the surface, these instructions are fairly simple and straightforward. However, these basic procedures for a mindfulness-breathing exercise are derived from a vast and varied collection of literature. With religious, cultural, and scientific foundations, the history of mindfulness-related exercises is as complex as the proposed implications for their implementation. However, through a thorough review of literature, these complexities can be unraveled. The following is an attempt to help disentangle the complexities surrounding meditation, mindfulness, and breathing related exercises as they could be applied within a school-based setting. Specifically, this study aims to implement a researcher-created mindfulness-breathing exercise called "Mind-on-Breathing" developed by identifying, minimizing, and combining common features found in these related interventions. As such, this intervention study aims to evaluate the effectiveness of a simplified mindfulness-breathing intervention regarding improvements in rates of academic engagement and reductions in off-task behaviors.

In this study, academic engagement is the outcome variable of interest that is hypothesized to be positively impacted by the reception of this modernized mindfulness-breathing exercise. Educational and school-psychology literature has repeatedly found positive correlations between academic engagement and measures of academic achievement and success (Blumenfeld & Paris, 2004). As such, this intervention aims to increase these desired behaviors for typically developing general education students, instead of decreasing specific unwanted behavior for identified groups in need of intervention. Given these aims, implications of this study are particularly relevant to schools implementing positive behavior interventions and supports (PBIS) in a multitiered system of supports. Specifically, this intervention may potentially serve as a Tier 1 or Tier 2 intervention for supporting student academic engagement at the classroom level. However, the current study had implemented this service in a one-on-one setting as a pilot to investigate this "new" intervention and its proposed dosage (i.e., 5 minutes per day, 3 days per week, for a range of 6-12 intervention sessions total). Rates of off-task behaviors were also measured in order to investigate possible reductions in unwanted behaviors.

General Definitions

The topics of meditation, mindfulness, and breathing related-exercises have been discussed and defined differently across different fields. In the literature review to follow, specific working definitions for these terms will be provided within their presented context. However, before exploring specific examples, it is important to establish general, basic definitions that appear to be fairly consistent across disciplines. For example, whether the term appears in religious texts or scientific studies, the term "meditation" can generally be thought of as the active practice of developing cognitive awareness and control (Cardoso, de Souza, Camano, & Leite, 2004; Powers, 2007), functionally changing the way an individual thinks about and responds to their environment (Nash & Newberg, 2013; Powers, 2007).

Similarly, whether included as a part of related meditative exercises or when practiced separately, “mindfulness” generally refers to the process of focusing attention on the present moment while nonjudgmentally dismissing other thoughts (Bishop et al., 2004). As such, mindfulness is a cognitive state that is either present or absent in any given moment. Mindfulness does not exist on a spectrum, but rather, individuals may vary based on the amount of time that they are mindful. For example, in a 2010 study on rates of mindful behavior, researchers estimated that participants spent about 46.9% of their waking hours thinking about something other than what they are engaged in (Killlingsworth & Gilbert, 2010). However, to capture individual differences in the likelihood of engaging in activities with mindfulness, or mindlessness, measures of mindfulness have been developed (e.g., the Langer Mindfulness Scale; Langer, 2004). Often, meditative practices include a mindfulness-related exercise in addition to other cognitive components. Likewise, both meditation and mindfulness exercises often include breathing-related components, which can similarly be practiced in isolation.

Despite taking many different forms across different fields, “breathing-related exercises” generally refers to any specific, active practice of monitoring and/or controlling the rate of respiration. Despite the differences in how these topics are discussed, the constructs of meditation, mindfulness, and breathing-related exercises seem to be conceptually intertwined and may reflect similar processes.

Extracting Shared Technical Features from a Literature Review of Mindfulness-Related Practices

The history of meditation, mindfulness, and breathing related exercises is certainly complex. Various religious sects, cultural movements, and scientific theoretical orientations have advocated for the use and benefits of their own interpretations of these practices. In order to understand the modernization of these practices as applied in educational settings, it is important to appreciate their historical foundations. For example, an investigation into the roots of these practices can help identify functionally similar practices and ideas that have been historically labeled and/or discussed differently due to linguistic, cultural, and/or other group differences. According to Eifring (2013), these "technical features" of the practices can be identified and addressed separately from the religious components that are "thematic, scriptural, and devotional" (p. 3). In other words, a review of religious, cultural, and scientific literature can demonstrate how many different peoples have practiced similar exercises but have used different language and philosophies to explain and understand their effects. When these differences are separated from the behavioral practices, shared technical features remain and may provide insight into functionally similar practices (Eifring, 2013). Eifring (2013) proposed five criteria for a technical feature:

1. It is a deliberately undertaken practice aiming to produce certain effects
2. Its procedures are specified with some degree of clarity
3. It is clearly set aside from other activities in time
4. It is continuous – repetitive or durative – rather than sequential

5. Some or all of its effects are based on general psychobiological working mechanisms (p. 8).

Using a review of literature, it is from the history of meditation, mindfulness, and breathing-related exercise that shared technical features can be identified. These identified technical aspects were then simplified and combined to create the current mindfulness-breathing intervention.

A Brief Summary of the History of Mindfulness-Related Practices

In a review of the history and modernization of meditation, mindfulness, and breathing-related exercises, shared technical features (Eifring, 2013) can be identified. The technical features identified by Eifring (i.e., recitations, visualizations, and breathing) across religious practices (Abrahamic, Hindu, and Buddhist religions) also appear to exist in other components of our shared history. For example, meditation, mindfulness, and breathing-related exercises appear in cultural adaptations of these practices (e.g., self-help books; Dass, 1971; Tolle, 2004), institutionalized practices (e.g., "box breathing" in the military; Lauria et al., 2017), medical practices (e.g., for children experiencing anaphylaxis; Manassis, 2012), clinical psychological practices (e.g., in the treatment of anxiety and depression; Goyal et al., 2014; Hofmann, Sawyer, Witt, & Oh, 2010) and in other applied psychological purposes (i.e., other psychological benefits for nonclinical populations; Eberth & Sedlmeier, 2012; Sedlmeiere al., 2012).

Physiological mechanisms have been identified that underlie these exercises, like vagus nerve stimulation in diaphragmatic breathing (Wang et al., 2010) and increased activity in "frontal lobe regions associated with executive attention" during mindfulness meditations (Tomasino, Chiesa, & Fabbro, 2014, p. 38). The vagus nerve is an important component of the autonomic nervous system such that vagal stimulation is associated with parasympathetic nervous system arousal (Barnes, Pendergrast, Harshfield, & Treiber, 2008). Parasympathetic arousal is associated with relaxation and decreasing the "fight or flight" responses of sympathetic nervous system arousal (Dallman & Hellhammer, 2010), such as increased cognitive reactivity (Edenfield & Saeed, 2012). Conversely, thoracic breathing relies on intercostal muscles to expand the chest to draw in air, often inhaling through the mouth (Bacon & Poppen, 1985). This type of chest breathing is behaviorally different from diaphragmatic breathing and produces different physiological responses in the body (Bacon & Poppen, 1985). Thoracic breathing can result from being startled (Skaggs, 1930) leading to sympathetic nervous system arousal, eliciting responses such as vasoconstriction (Ackner, 1956) and anxiety (Rama, Ballentine, & Azaya, 1976).

In regards to Buddhist mediations, which focus on achieving a state of mindfulness, a review of 263 participants across 16 experiments indicated associations between this school of meditation and increased activity in "frontal lobe regions associated with executive attention" (Tomasino et al., 2014, p. 38). Specifically, Tomasino and colleagues (2014) observed activation in the frontal superior medial gyrus, an area associated with self-referential processes; first-person perspective taking; cognitive distancing and control; and in distributed, executive and in sustained attention. In addition to the associations between mindfulness breathing exercises and increases in attention, there is also support for effects relating to decreases in reactivity to stimuli. For example, transcendental meditation (Orme-Johnson, Schneider, Son, Nidich, & Choo, 2006) and mindfulness breathing exercises (Zeidan et al., 2011) are associated with decreases in pain unpleasantness, as opposed to pain intensity, as indicated by participant reports and as shown in results of fMRI data. In these studies, mindfulness meditations were associated with decreased activation in the thalamus, suggesting a learned gating mechanism such that perceived irrelevant stimuli are not relayed to other brain regions for a reactive response (Orme-Johnson et al., 2006; Zeidan et al., 2011). Similar to this decreased reactivity to distracting or noxious stimuli, trait mindfulness is significantly and negatively associated with cognitive reactivity; practicing mindfulness skills, through interventions such as MBCT, may further decrease cognitive reactivity while increasing mindfulness skills (Raes, Dewulf, Van Heeringen, & Williams, 2009). As such, mindfulness seems to be negatively correlated with the propensity to engage in negative thinking in response to mild negative affective states.

Legislation such as No Child Left Behind (NCLB; 2001) and the Individuals with Disabilities Education Improvement Act (IDEIA; 2004) has created an era of high-stakes accountability within public schools (Erchul & Martens, 2010). These historical influences have contributed to, and improved, our current understanding of meditation, mindfulness, and breathing-related exercise in educational and school psychology practice. According to Wilson (2013), the medicalization of mindfulness has been largely influential in the spread of meditative, mindfulness, and breathing-related exercises. This medicalization has allowed mindfulness practice to exist in public settings, such as hospitals and schools (Wilson, 2013). By reconceptualizing mindfulness as a psychological or medical intervention, the expertise now falls under the secular, modernist ideals of the scientific approach (Wilson, 2013). This "legitimates mindfulness through the gatekeeping authority of science and institutionalized medicine" (Wilson, 2013, p. 103).

Current Understanding of Mindfulness-Related Exercises in Education and School Psychology

Psychological research has investigated rates of mindfulness, and mindlessness, while engaged in everyday activities and its association with happiness. Killingsworth and Gilbert (2010), using a representative sample of 2,250 participants, estimated time spent mindful and mindless each day using a Web application for the iPhone. At random intervals, this app would contact participants through their iPhones and ask them to report what they were doing, how happy they were, and whether they were mindful or mindless while engaged in that activity (Killingsworth & Gilbert, 2010). The authors found that participants were mindless 46.9% of the time and 10.8% of their happiness can be attributed to mindfulness while only 4.6% of a person's happiness in a given moment is attributable to the specific activity they are engaged in. Using cross-lag analyses, Killingsworth and Gilbert (2010) found that mindlessness was more likely to be the cause, rather than the result, of unhappiness.

A recent publication reviewed the literature on mindfulness-based interventions (MBIs) for improving student outcomes relating to cognition, academic achievement, behavior, and socioemotional functioning (Maynard, Solis, Miller, & Brendel, 2017). Overall, across the 61 studies included in the review, these researchers found positive effects of MBIs on cognitive and socio-emotional processes but did not find significant results in outcomes relating to behavioral or academic achievement across populations of preschool, primary, and secondary school students (Maynard et al., 2017).

Outcomes in this review related to cognition included measures of executive function, memory, cognition, and attention, while socioemotional outcomes included anxiety, stress, engagement, social skills, self-esteem, emotion regulation, grit, and internalizing behaviors (Maynard et al., 2017, p. 9). Competencies in socioemotional outcomes are positively associated with academic success, impulse control, concentration, and attention in school and negatively associated with academic, behavioral, and social problems (Denham & Brown, 2010). Behavioral outcomes included in these analyses included disciplinary referrals, aggression, externalizing behaviors, time on task, compliance, and attendance while the category of academic performance included outcomes such as standardized achievement tests, grades, reading, and measures of content mastery (Maynard et al., 2017, p. 9). Similarly, Maynard and colleagues reviewed MBI studies with physiological outcome measures, such as heart rate, brain activity, and cortisol levels (2017).

This system for categorizing and organizing the many proposed outcomes relating to meditative exercises is necessary in this type of systematic review. However, some outcomes remain difficult to categorize. For example, academic engagement was considered an aspect of academic performance in the Carboni, Roach, and Fredrick (2013) study (as cited in Maynard et al., 2017, p. 110). However, academic engagement may be defined as on-task behaviors (Carboni et al., 2013; Shapiro, 2004). On task behaviors were categorized as an outcome in the behavioral domain, as were off-task behaviors (Maynard et al., 2017, p. 111). This is consistent given that off-task behaviors can be seen as occurring in the absence of academic engagement (Shapiro, 2004). However, when time-on task was used as a measure for attention, as seen in Peck, Kehle, Bray, and Theodore (2005), it was categorized as an outcome in the cognitive domain (Maynard et al., 2017, p. 111). As seen in this example of academic engagement, some constructs may overlap in the categories of outcomes presented by Maynard et al. (2017) making them difficult to review within this system. As such, there is an empirical need to better address the specific relationships between mindfulness-based interventions and specific constructs, such as academic engagement.

The findings of Maynard and colleagues (2017) are similar to previous meta-analyses investigating MBIs with youth. Zenner, Herrnleben-Kurz, and Walach (2014) studied the effects of MBIs in school-based research, although included studies were not necessarily peer-reviewed, and found small-to-medium effects with larger effects on outcomes of cognitive performance compared to emotional problems or stress. Similarly, Zoogman, Goldberg, Hoyt, and Miller (2015) conducted a meta-analysis of MBI research across 20 peer-reviewed studies and found overall small effects across outcomes. However, effects were generally larger in clinical populations (Zoogman et al., 2015). Furthermore, psychological outcomes were associated with larger effects than measures of attention or objective measures, such as blood pressure (Zoogman et al., 2015).

Common features of mindfulness-based interventions. In Maynard and colleagues' (2017) review, 62% of the 61 included studies utilized fully or partially manualized interventions. This is similar to Zenner et al. (2014), who identified 67% of its included 24 studies as a manualized program (p. 72). Specifically, 20 of these intervention studies were based on either MBSR (Kabat-Zinn, 1990) or MBCT (Segal, Williams, & Teasdale, 2002). The intensity of these interventions ranged in duration (i.e., 4 to 28 weeks), number of sessions (i.e., 6 to 125 total sessions), and in frequency (i.e., 1 to 5 times a week; Maynard et al., 2017). Duration of individual intervention sessions was also highly variable. For example, 3-minute intervention sessions were used in both the Britton and colleagues (2014) and Schonert-Reichl and colleagues (2015) research studies. On the other end of the spectrum, Raes, Griffith, Van der Gucht, and Williams (2014) implemented 100-minute sessions and the full implementation of MBSR (Kabat-Zinn, 1990) includes 2.5-hour classes and even a full day retreat.

Within the MBIs meeting inclusion criteria are interventions that specifically promote a breathing-related exercise. For example, the Breathing Awareness Mediation (BAM; as cited in Barnes et al., 2008) explicitly teaches a specific breathing exercises that would meet the criteria of a technical feature as defined by Eifring (2013). BAM is the first exercise taught within Kabat-Zinn's (1990) MBSR Program and includes "focusing on the moment, sustaining one's attention to the breathing process, and passively observing thoughts" (Barnes et al., 2008, p. 3). Specifically, individuals are instructed to "sit upright in a comfortable position with eyes closed," "focus on diaphragm movements while breathing in a slow, deep, relaxed manner," and to nonjudgmentally acknowledge and accept "unwanted thoughts, ideas or images" and "return attention to the diaphragmatic breathing" (Barnes et al., 2008, p. 3). Barnes and colleagues (2008) found significant effects on systolic blood pressure levels and heart rate during school hours in African American adolescents, compared to controls, after implementing BAM for 10 minutes per day for 3 months.

Other interventions such as MBCT, and the child version MBCT-C (Semple, Reid, & Miller, 2005), similarly include instructions for breath awareness (Semple, Lee, Rosa, & Miller, 2010). Segal and colleagues (2002) described a mindfulness exercises focusing on awareness of the breath, including instructions for proper sitting posture, passive natural breathing, and nonjudgmental awareness of stray thoughts and returning attention to the act of breathing (p. 168). In this exercise, individuals are instructed to notice the physical sensations of breathing, both inhalations and exhalations, with a focus on the natural rate of respiration as opposed to forcibly controlling the breath (Segal et al., 2002). Ironically, the Learning to BREATHE intervention (Broderick & Metz, 2009) teaches principles of mindfulness but does not include specific instructions for a breathing exercise. Instead, the authors use BREATHE as an acronym to teach individuals themes including "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 & Metz, 2009, p. 38). Besides attending to the breath, other interventions include an object of attention such as: mindful eating, walking, and body scans (Broderick & Metz, 2009); focus on specific body parts (e.g., soles of the feet; Singh et al., 2007); or other sustained attention on concepts such as "loving-kindness" (Lau & Hue, 2011). In loving-kindness mindfulness meditation, the object of attention is a feeling of compassion and the sending of "well wishes and blessings to oneself and all other people in the world" (Lau & Hue, 2011, p. 319).

Many existing mindfulness-based interventions are only available for a cost. Herman et al. (2017) estimated that the cost of MBSR per 16 hours of group sessions, plus the 6-hour retreat, was $150 per person. This was the same cost per participant, per 16 hours of group sessions, as cognitive behavioral therapy (CBT). In a cost-effectiveness analysis regarding the treatment of chronic low back pain, the authors found that, compared to usual care, the mean incremental cost per participant to society of CBT was $125 and MBSR was a net saving of $724. As such, both CBT and MBSR were found be cost-effective treatments compared to usual care in adults with chronic low back pain, with MBSR having a high probability of being cost-saving for payers and society. According to Minkos (2016), the costs associated with many school-based mindfulness programs are significant and also typically require specialized training. For example, the Mindful Schools curriculum (Liehr & Diaz, 2010) costs $125 for a prerequisite 6-week Mindfulness Fundamentals course and an additional $550 for the Curriculum Training Course and program materials.

Common study designs. The Maynard and colleagues' (2017) review of MBIs included studies that used randomized controlled trials, quasi-experimental, single group pre-post test, or single subject design methodologies. In the single subject methodologies employed, several methodological variations are present across the literature. For example, Peck and colleagues (2005) used A-B-A, Singh and colleagues (2007) used A-B-C-A, and Felver, Frank, and McEachern (2014) used a multiple-baseline approach.

Of the 61 studies included in the review, 35 of those studies utilized randomized or quasi-experimental designs and therefore could be included in the meta-analysis (Maynard et al., 2017). In these studies, Maynard and colleagues identified “moderate to high risk of bias”, for reasons such as failure to use blinded methodologies, not reporting protocols or measures, evidence of researcher allegiance bias, funding source bias, and confounding factors (p. 11). The primary interventionist was either the classroom teacher (31% of studies) or a mindfulness-trained interventionist outside of the school (60% of studies). Student participants varied in demographics relating to educational placement (e.g., general education, special education, or alternative education setting), across pre-school, primary, and secondary grades.

Common applications of mindfulness-based interventions. Mindfulness-based interventions have been implemented in a variety of settings for diverse student needs. Studies have found support for the effects of these exercises for general education students as well as clinical populations (e.g., Viafora, Mathiesen, & Unsworth, 2015). Similarly, MBIs have been implemented in one-on-one settings (e.g., Felver et al., 2014), groups (e.g., Raes et al., 2014), and classroom settings (e.g., Broderick & Metz, 2009). This suggests the potential for mindfulness-based interventions to be implemented at all tiers of a multitiered system of supports (MTSS; Glover, 2010).

Besides the aforementioned interventions that explicitly implement mindfulness-based strategies as a core component of treatments (e.g., MBSR or MBCT), other intervention packages have also used similar strategies. For example, mindfulness and breathing-related exercises are presented in manualized interventions, such as Aggression

Replacement Training (ART; Glick & Gibbs, 2011) and Coping Cat (Kendall & Hedtke, 2006). Therapeutic approaches, such as Dialectical Behavior Therapy Skills Training (Linehan, 2015; Rathus & Miller, 2014) have also used mindfulness principles within their intervention frameworks. As such, these interventions are applying mindfulness and breathing-related exercises to serve populations struggling with externalizing behavioral concerns in the area of aggression, and internalizing behavioral concerns in the areas of anxiety and depression.

Recent research has also investigated mindfulness and breathing-related exercises for improving educationally related outcomes. Although the review by Maynard and colleagues (2017) did not find significant effects of MBIs on academic achievement, some promising results were found for some academic behaviors (e.g., academic achievement and off-task behaviors). However, Maynard and colleagues (2017) pointed to the generally weak evidence offered by the studies included in their review, including high risk of bias and suggest caution with interpretation. This suggests a need for more studies of higher empirical quality to be carried out. This idea is shared by Greenberg and Harris (2012) who cautioned against the optimistic view of the science behind MBI research indicating the need for more high quality, empirical investigations to be carried out.

Associations between mindfulness and academic engagement. By teaching the mind to be less reactive to unwanted stimuli and to be more focused and attentive on the object of mindfulness, and based on the findings of extant research, it is reasonable to hypothesize that mindfulness exercises could be related to academic engagement. Results from Carboni and colleagues (2013) suggest that mindfulness was effective in increasing rates of on-task behaviors for 8-year-old student participants. Similar results were found for the Soles of the Feet mindfulness intervention (Singh et al., 2007), such that third grade students demonstrated fewer off-task behaviors and more time academically engaged in response to the intervention (Felver et al., 2014). The yoga-based intervention used by Peck and colleagues (2005) demonstrated large effect sizes, and medium-to-large follow-up effect sizes, for first to third grade students in the outcome of time on task as an indicator of attention. A mindfulness and bio-feedback program produced a significant reduction in off-task behaviors and insignificant increases in academic engagement (Rush, Golden, Mortenson, Albohn, & Horger, 2017), suggesting value in measuring both academic engagement and off-task behaviors despite their conceptual similarity.

Recently, Klingbeil, Fischer, and colleagues (2017) conducted a meta-analysis of single-case design research investigating the effects of MBIs on disruptive behaviors and found medium effects across the 10 studies meeting inclusion criteria. Using What Works Clearinghouse (WWC) standards for single-case design research (Kratochwill et al., 2010), Klingbeil, Fischer, and colleagues (2017) identified one study meeting evidence standards, three studies meeting standards with reservations, and six studies that did not meet standards. Although the literature on mindfulness exercises on student populations is still developing, there appears to be some support for their effects of student academic behaviors, such as academic engagement and off-task behaviors. However, more research is needed to establish MBIs as evidence-based practices for reducing disruptive behaviors and improving academic engagement. Standards for establishing an evidence based practice are also provided by Kratochwill and colleagues (2010), such that a minimum of 5 studies meeting standards, or standards with reservations, are conducted by at least 3 different research teams, and the total number of experiments must total at least 20 cases across all studies before establishing relationships between proposed independent and dependent variables.

There appear to be more studies meeting standards, as proposed by What Works Clearinghouse (WWC), in group-design studies compared to single-case. In another meta-analysis investigating MBIs for youth participants, Klingbeil, Renshaw, and colleagues (2017) identified 21 group-design studies meeting WWC standards without reservations, 16 meeting standards with reservations, and 39 studies that did not meet methodological standards. Results of the meta-analysis suggest that MBIs are associated with small, positive effects across several outcomes in youth (Klingbeil, Renshaw et al., 2017). Furthermore, treatment effects found in school-based settings were comparable to those found in clinical settings (Klingbeil, Renshaw et al., 2017). These findings suggest that school-based practitioners could apply MBIs in secondary or intensive interventions within a MTSS model; however, previous literature (e.g., studies reviewed by Hattie, 2008) would suggest more universal and/or preventative applications compared to other well-established targeted interventions (Klingbeil, Renshaw et al., 2017, p. 97). This again suggests the potential to implement MBIs at any tier of a MTSS model. However, as shown in the Klingbeil, Fischer, and colleagues (2017) meta-analysis on disruptive behaviors, more research is needed to specifically address the relationship between MBIs and academic-engagement-related behaviors.

Understanding Academic Engagement and Off-Task Behaviors

When investigating academic problems, the literature has suggested that student academic engaged time is a critical variable to measure (Shapiro, 2004). Interest in student academic engaged time stems from Carroll's (1963) model of classroom learning, hypothesizing that student learning is a function expressed by "time engaged in learning relative to the time needed to learn" (Shapiro, 2011, p. 35).

Time engaged in learning, on-task behavior, academic engagement, are all terms that reflect the same underlying construct. Greenwood, Delquadri, and Hall (1984) referred to academic engagement as a combination of classroom behaviors including writing, reading aloud or silently, participating in tasks, talking about assigned tasks, and asking and answering questions. Typical definitions include students actively and/or passively attending to instruction or assigned instructional materials (Shapiro, 2004). As such, academic engagement entails the "self-regulation of attention" component of Bishop and colleagues' (2004) definition of mindfulness when applied to assigned academic tasks, but is missing the component reflecting a particular, nonjudgmental orientation to experience. Similar to mindfulness, academic engagement has been conceptualized as a discrete behavior that is either occurring or absent at any given moment of time. In the absence of academic engagement behaviors, students are perceived to be engaging in off-task behaviors (Shapiro, 2004). It is valuable to measure both academic engagement and off-task behaviors in order to better understand a student's behavior in an educational setting (Shapiro, 2004, p. 31). Therefore, although this study hopes to inform positive interventions for increasing desired student behaviors (i.e., academic engagement), off-task behaviors will also be measured. Just as academic engagement is positively related to academic performance and success (Shapiro, 2004), off-task behaviors, such as disruptive behaviors, are negatively associated with academic achievement (Finn, Pannozzo, & Voelkl, 1995).

Assessing academic engagement and off-task behaviors. Academic engagement and off-task behaviors can be measured by systematic direct observation (SDO). SDO is a powerful tool in assessment, helping educators to meet the accountability standards present in national law (e.g., Individuals With Disabilities Education Act; IDEA, 2004) because of their utility in informing educational decision making (Hintze, Volpe, & Shapiro, 2002). SDOs can utilize various recording methodologies for capturing a behavior, for example, using frequency, duration, latency, and time-sampling interval recording (Hintze et al., 2002).

Time-sampling procedures in turn can be measured in whole-interval, partial-interval, or momentary time-sampling methods. Whole-interval time sampling only captures a behavior if it is occurring during the duration of the interval and may be more likely to underestimate the actual occurrence of the behavior. Partial interval time sampling captures the target behavior with every occurrence within a specified interval and may be more likely to overestimate the actual occurrence of the behavior while momentary time sampling captures the behavior only if it is occurring during the moment of transition from one interval to the next. As such, momentary time sampling may be most likely to generally provide the least biased estimate of behavior (Suen & Ary, 1989). The BOSS (Shapiro, 1996) specifically measures academic engagement and off-task behaviors using, respectively, momentary and partial interval time sampling. In DuPaul and colleagues' (2004) study of 1st through 4th grade students, 53 students without AD/HD demonstrated average BOSS AET scores (*M* = 23.4, *SD* = 15.3) and PET scores (*M* = 59.3, *SD* = 18.7), summing to a total of academically engaged in an average of 82.7% of observed intervals and demonstrating off-task behaviors in an average of 5.2% (*SD* = 18.7) of observed intervals while engaged in reading.

Correlates of academic engagement and off-task behaviors. Following Carroll's (1963) model of classroom learning, one would expect correlations between academic engagement and academic achievement or other measures of learning. Positive and significant relationships have been identified between measures of academic engagement and academic performance and success (Shapiro, 2004). In an early example, Fredrick, Walberg, and Rasher (1979) found academic engagement to be moderately correlated with academic achievement (*r* = .54). In a review of academic engagement by Fredricks, Blumenfeld, and Paris (2004), the authors identified more recent studies reproducing this positive correlation between behavioral engagement and outcomes related to achievement (e.g., Connell, Spencer, & Aber, 1994; Marks, 2000; Skinner, Wellborn, & Connell, 1990; Connell & Wellborn, 1991). On the other hand, off-task behaviors, such as disruptive behaviors, are negatively associated with academic achievement (Finn, Pannozzo, & Voelkl, 1995). As such, interventions to promote academic engagement and reduce off-task behaviors are valuable in an educational context.

Interventions for academic engagement and off-task behaviors. Academic engagement is presumed to be malleable (Fredricks et al., 2004). In some cases, academic engagement is treated as a performance deficit. For example, Goodman and Williams (2007) recommend interventions that aim to increase the academic engagement of students with Autism Spectrum Disorder using strategies that alter instruction or the classroom environment. For example, by making instruction more visually engaging (e.g., using visual schedules), socially engaging (e.g., facilitating peer interaction), and physically engaging (e.g., incorporating opportunities for movement), a teacher may increase the rates of academic engagement in the classroom (Goodman & Williams, 2007). In other words, by matching instruction and the classroom environment to the particular abilities of students with Autism Spectrum Disorder, academic engagement can be improved. This assumes students have the prerequisite skills to demonstrate academic engagement behaviors, but are not performing because of environmental variables.

Similar approaches to academic engagement have been conceptualized for typically-developing students. In one study, to incorporate environmental data into an intervention for improving academic engagement, a functional behavioral assessment (FBA; Sugai et al., 2000) was used to understand the contingencies around a student's recurring off-task behaviors (Liaupsin, Umbreit, Ferro, Urso, & Upreti, 2006). In this particular example, the authors' data suggested that the student's off-task behaviors were in response to difficult assignments (i.e., the antecedent) and maintained by escaping the activity (i.e., negative reinforcement) as observed through off-task behaviors. Following the FBA, a corresponding function-based intervention was implemented for the student, leading to improvements in on-task behaviors (Liaupsin et al., 2006). This intervention targeted the antecedent (e.g., adjusting work to reflect student's ability), the established consequence (e.g., use of teacher redirection to prevent off-task behaviors of escape), and establishing a new consequence (e.g., use of reinforcement for on-task behavior). Similar to Goodman and Williams (2007), this intervention assumes that the student has the skill and ability to demonstrate on-task behaviors, but environmental stimuli interfere.

DiPerna (2006) offered modeling and coaching as two strategies of intervention for teaching a new skill. Modeling includes the demonstration of the skill by a teacher, parent, or peer and coaching includes the use of verbal instructions and feedback to teach the skill (DiPerna, 2006). For example, in another study investigating student off-task behavior through FBA methodologies, but this time with an individual with intellectual disability, Brooks, Todd, Tofflemoyer and Horner (2003) hypothesized that the student's off-task behaviors were preceded by independent work and maintained by attention. To teach the student a functionally equivalent replacement behavior, she was taught self-monitoring and self-recruited reinforcement skills. This intervention led to improved on-task behavior and assignment completion for the student (Brooks et al., 2003).

Teaching students self-monitoring and self-recruited reinforcement can be effective in general education classrooms too, leading to decreased problem behaviors, increased on-task behaviors, and an increase in work completion (Todd, Horner, & Sugai, 1999). A specific strategic self-monitoring intervention (ACT-REACT) has similarly been found to be effective in increasing academic engagement and productivity for students with disabilities (Rock, 2005). Recently, an audio-delivered mindfulness-breathing exercise, 5 minutes in duration per session, was implemented as an intervention for students in a non-residential alternative educational program (Minkos, 2016). From a behavioral orientation, one could view this MBI intervention as teaching self-monitoring skills; the observable manifestation of which in the educational context could include rates of academic engagement and off-task behaviors (Minkos, 2016). Minkos (2016) found increases in academic engagement as measured by SDO and Direct Behavior Ratings (DBR; Chafouleas, Riley-Tillman, & Christ, 2009) as well as decreases in disruptive behaviors. However, as a result of participants failing to complete the study, three demonstrations of an effect could not be observed. As such, much more research is needed in this area before causal relationships can be evaluated (Shadish, Hedges, Horner, & Odom, 2015).

The Current Study

A review of the educational literature suggests that academic engagement and off-task behaviors are valuable constructs to address for student populations (Shapiro, 2011). The research base on the effects of mindfulness-based interventions for youth in outcomes relating to academic engagement is nascent (Klingbeil, Fischer et al., 2017; Zenner et al., 2014). As reviewed above, Klingbeil, Fischer, and colleagues' (2017) meta-analysis identified some support in this area, but not across a sufficient quantity of empirical articles to establish an evidence base according to WWC standards. As such, there is a need for more studies meeting WWC standards that evaluate the effects of MBIs upon rates of academic engagement and disruptive behavior. By using low-inference decision making to link mindfulness-based exercises with behaviors relating to sustained attention on a task, this study aimed to expand upon the existing literature examining the effects of mindfulness-based interventions on student academic engagement and off-task behaviors.

Purpose. One goal of the current study was to minimize the complexities surrounding meditative, mindfulness, and breathing-related exercise by creating and evaluating a simple and non-dogmatic method for implementing these practices. The mindfulness-based interventions reviewed in the literature are often manualized (Maynard et al., 2017; Zenner et al., 2014), building off thorough but time-intensive intervention programs such as MBSR (Kabat-Zinn, 1990). In contrast, this intervention is aimed to be free to use, brief in duration, and easy to implement without use of a manual or trainer. However, similar to Kabat-Zinn's MBSR, this intervention aims to be a technique that could be applied without Buddhist, or other religious, associations (Dryden & Still, 2006). The primary purpose of this study was to examine whether this simplified mindfulness-breathing exercise could demonstrate effects on student academic engagement and off-task behaviors for general education students.

This simplification serves a few purposes. First, from a consultation perspective, the current intervention was designed to be easy for the interventionist to implement, with potential interventionists including teachers, parents, school-based counselors, or other related service providers. For example, the suggested length of implementation is 5 minutes in duration, it is designed to be able to be implemented in any setting, and no materials are needed for purchase. Secondly, the simplification can help promote buy-in across stakeholders (e.g., the interventionist, school administration, family, and student).

For example, this intervention was designed to be free to use, allowing schools and interventionists to use this as a tool without expending additional financial resources. The short suggested duration of 5 minutes was evaluated as this may minimize the loss of instructional time and could be simply integrated into a school-day, allowing the student to retain a regular schedule and receive the vast majority of their regularly planned educational experiences. Furthermore, when proposing to implement these practices, by having removed the religious and/or cultural components, the remaining intervention could be presented without being associated with any particular philosophy. For example, teachers demonstrate a greater likelihood of implementing interventions that philosophically agree with their current beliefs about behavior modification strategies (Telzrow & Beebe, 2014). A goal of this research was to further evaluate whether mindfulness-based breathing exercises can be considered an effective behavioral exercise when they are not associated with any particular philosophy, religion, or culture.

Another purpose of simplifying mindfulness-based interventions to their technical aspects can be expressed regarding their role in research. As stated by Eifring (2013), by removing the spiritual, devotional, and religious aspects of these practices, the remaining technical and behavioral features can be examined in greater clarity. This same logic extends to simplifying and extracting the same behavioral, technical features from the heterogeneity of interpretations and additional practices incorporated by manualized MBIs. Problematic methodological issues have been presented regarding the prevalent use of manualized curricula in evidence-based interventions. For example, Chorpita and Daleiden (2009) discussed how research examining evidence-based practices often treats specific manualized interventions or treatment protocols (e.g., Coping Cat; Kendall & Hedtke, 2006) as the independent variable of interest as opposed to its theoretical family (e.g., CBT; p. 566). Rotheram-Borus, Swendeman, and Chorpita (2012) noted additional methodological issues arising from the prevalence of manualized intervention studies, for example, complexities resulting from updated curriculum. Rotheram-Borus and colleagues (2012) argued that changes to a program's curricula are considered "violations of the principle of replication with fidelity" and as such, new random controlled trials are required to confirm that the program is still efficacious under these new conditions with an updated population (p. 465). As such, there may be substantial consultative and methodological benefits of a new study that rigorously measures the effects of a simplified, non-packaged, mindfulness-based intervention.

This study improves upon other similar research in several meaningful ways. First, by following WWC standards (Kratochwill et al., 2010), this study aimed to contribute to future meta-analyses and quantitative syntheses surrounding this practice. For example, although the Minkos (2016) study was well designed, attrition of participants prevented this study from meeting WWC standards. As such, additional research is needed in this specific area.

Additionally, the current study includes components of modeling and coaching strategies (DiPerna, 2006) to explicitly teach the mindfulness-breathing exercise, including periodic instructional reminders for both the mindfulness and the breathing-related components of the exercise. For example, in BAM (Barnes et al., 2008), participants are instructed to perform a similar mindfulness breathing exercise, but there is little discussion on teaching the participant how to "focus on diaphragm movements" or their definition of "breathing in a slow, deep, relaxed manner" (p. 3). Modeling and coaching strategies are important components of teaching both mindfulness and breathing-related exercises because poor form or technique can create unwanted outcomes. For example, Pyszczzynski and Greenberg (1987) note how sustained focused attention, when applied negatively, can function as ruminations and increase symptoms associated with depression. Similarly, poor technique in breathing exercises may result in thoracic breathing, instead of diaphragmatic, leading to increases in symptoms associated with anxiety (Rama, Ballentine, & Azaya, 1976). As such, it is important to explicitly teach and reinforce the specific mindfulness and/or breathing-related exercise.

Another proposed advantage of this current study, compared to similar studies, is in the intended ease of implementation. As this study evaluated a MBI that does not require the purchase of materials, this study offers a potential improvement over the Minkos (2016) approach that relied on the use of a device to play the 5-minute audio recording (e.g., CD player or iPod) and a copy of the recording. Furthermore, the flexibility of the MOB intervention potentially allows for implementation at longer, or shorter, sessions if desired. Whereas an audio-recording would create a fixed intervention time, which is very useful in research and has other benefits in regards to TI, the MOB intervention could easily be extended or shortened to fit real-world applications (e.g., a few minutes in the car before school, a handful of minutes after recess, and other brief periods of transition). However, for the current research, the MOB intervention was conducted during a designated 5-minute period.

Creating the intervention. The technical features of meditative practice in religious traditions were recitations, visualizations, breathing-related exercises, and unmediated practices (Eifring, 2013). Unmediated practices are excluded in this intervention study due to their heterogeneity, complexity, and lack of specified operational definitions. The recitations and visualization exercises detailed by Eifring (2013) often meet the proposed definition of mindfulness as suggested by Bishop and colleagues (2004). For example, recitations, as discussed by Wright (2001) include "focusing on a word or phrase and a disregard of other thoughts when they come into your mind" (p. 96). Similarly, visualizations can be viewed as a mindfulness exercise where the object of attention is a visualized object, or event, in the mind's eye. Therefore, in order to combine these mindfulness-based technical features with breathing-related exercise to create simplified intervention, it is conceptually reasonable to suggest "breathing" as the object of attention in a mindfulness-based exercise. In the investigated MOB intervention, elements of recitations are present as the interventionist is instructed to provide mindfulness reminders using simple phrases such as, "if you notice your attention has shifted, it is okay, but return your attention to your breathing." Similarly, elements of visualization are also present in the MOB intervention such that participants are instructed to focus on the physical sensations associated with breathing that may manifest cognitively as visualizing diaphragmatic breathing (e.g., picturing your stomach rising and falling with inhalations and exhalations).

The investigated mindfulness-based breathing intervention is a product of several major influences, each one presenting its own combined mindfulness and breathing-related exercise practice. Bacon and Poppen (1985) noted that Eastern meditative techniques often include elements of diaphragmatic breathing, nasal breathing, regular breathing, slow breathing, and focus on breathing. For example, Chödrön (2011) suggested a mindfulness exercise where focus is exclusively on the process and sensations associated with exhalation. Chödrön described exhalation in detail, for example, making note that it can be a completely passive process, not needing to be forced. In normal breathing, expiration is a passive process resultant of air moving out of the lungs down the pressure gradient as the diaphragm relaxes (Starr & McMillan, 2016, p. 182). Hanh (2017) described a breathing exercise that is very similar to "box breathing" (Lauria et al., 2017), such that four stages of respiration are noted: inhalation, the period between inhalation and exhalation, exhalation, and the period between inhalation and exhalation. However, Hanh (2017) noted that these stages of respiration may vary in duration and do not need to be forcibly controlled or counted.

Harris (2014) mentioned a mindfulness breathing exercise that focuses on nonjudgmental reaction to internal stimuli. Other mindfulness approaches focus on nonjudgmental reaction to external stimuli as well (Bishop et al., 2004). The Breathing Awareness Meditation (BAM; as cited in Barnes et al., 2008) previously described above is remarkably similar to these other mindfulness-breathing exercises. The investigated mindfulness breathing exercise seeks to combine the strengths from each of these approaches. For example, BAM may be improved upon by adding a component that explicitly defines breathing in a "relaxed manner" (Barnes et al., 2008, p. 3), using phrasing and instructions by recommended by Chödrön (2011) and Hanh (2017).

Similarly, to improve upon BAM, interventionist behavior components may be included to explicitly teach both the breathing (i.e., relaxed nasal diaphragmatic breathing) and mindfulness-related components (i.e., nonjudgmentally dismissing other thoughts). This guided meditation component was also heavily present in MBIs in educational research (Maynard et al., 2017). Together, the mindfulness breathing exercise investigated in the current study may be best described as a guided mindfulness exercise focused on breathing, or Mind-on-Breathing (MOB) for short. Instructions for the MOB intervention are presented in Appendix A.

The investigated mindfulness breathing exercise begins with instruction on the breathing exercise. Interventionists may use their own preferred instructional techniques to teach the breathing exercise; however, explicit instruction (Archer & Hughes, 2011) is recommended, for example using scaffolding, modeling, and unambiguous directions. Once the participant has demonstrated basic understanding of the breathing exercise, the mindfulness instruction may begin. It is not anticipated that instruction for the breathing exercise will need to be repeated in each session. Instead, the included interventionist components (i.e., the instructions shared in Appendix A) will guide the provision of periodic feedback (i.e., praise and corrections) as well as guide the mindfulness components. Following the recommendations of Trussell (2008), a ratio of 4 praise statements to 1 correction may be ideal (p. 184). However, these preliminary instructions may be repeated as needed.

The instruction on the mindfulness component includes teaching the student to nonjudgmentally let go of unwanted thoughts and return attention to the breathing exercise. The interventionist components are used throughout the mindfulness breathing exercise to provide continued instruction. For example, the interventionist should regularly state instructional reminders (i.e., mentions of good posture, closed eyes, hand on stomach, relaxed exhalations) as well as mindfulness reminders (i.e., nonjudgmental reminders to return attention to breathing). Specific examples of these interventionist components are provided in Appendix A. Taken together, the explicit instruction on a breathing-related exercise coupled with explicit instruction on mindfully attending to the breathing-related exercise comprise this investigated mindfulness-breathing exercise.

The investigated treatment dosage, 5 minutes per intervention session occurring once a day for three days a week for at least two weeks, was supported by prior research. As reviewed in their meta-analysis, Maynard and colleagues (2017) found that the intensity of MBIs ranged in duration (i.e., 4 to 28 weeks), number of sessions (i.e., 6 to 125 total sessions), and in frequency (i.e., 1 to 5 times a week). As previously noted, the duration of individual intervention sessions was also variable. On the lower side of the spectrum, 3-minute intervention sessions were used in both the Britton and colleagues (2014) and Schonert-Reichl and colleagues (2015) research studies. On the other end of the spectrum, Raes, Griffith, Van der Gucht, and Williams (2014) implemented 100-minute sessions and the full implementation of MBSR (Kabat-Zinn, 1990) includes 2.5-hour classes and even a full day retreat. Fodor and Hooker (2008) provided the recommendation that MBIs designed for children and adolescents should be concrete, short in duration, and clearly described. In general, researchers seem to agree that mindful breathing exercises for children and adolescents should be much shorter in duration when compared to adult exercises, for example, extending for only a few minutes when provided for young children (Shapiro et al., 2014; Wisner et al., 2010). The research by Minkos (2016) provided support for the potential effectiveness of a brief 5-minute intervention session received once per day.

There are many additional components found in other meditations and MBIs that were not incorporated into the currently presented MOB intervention. For example, excluded components include counting the number of inhalations and exhalations (e.g., box breathing; Lauria et al., 2017), abstract ideas as the object of attention (e.g., loving-kindness; Nash & Newberg, 2013), and daily homework (e.g., MBSR; as cited in White, 2012). Although these components may have value, this study aimed to investigate if student participants can benefit from a mindfulness-breathing exercise with a minimal number of components.

Population. As suggested by Klingbeil, Renshaw, and colleagues (2017), there is evidence to suggest benefits of implementing MBIs at any tier of a MTSS. Because this current study sought to implement a new, untested, and simple intervention, the proposed population was students receiving general education services without a significant history of behavioral concerns impacting academic engagement. As this study was piloting the effects of this new intervention, it would have been ethically questionable to remove students with known, meaningful deficits in academic engagement from their classroom and further reduce their access to instructional time. Using a sample of general education students may also help to generalize the results to other applications, such as use in Tier 1 services of a MTSS. However, before seeking to implement this intervention at a class-wide level, the researcher chose to pilot this intervention with a smaller individual-level sample in order to evaluate its effectiveness.

Additionally, students receiving special education services or those with a history of severe and persistent behavioral concerns impacting academic engagement may present other variables that could interact with the independent variable. For example, students with known behavioral concerns in this area may already be receiving other interventions for promoting academic engagement and reducing off task behaviors. Similarly, these students may differ in the function of their off-task behaviors and as such would respond differently to interventions targeting academic engagement. Therefore, to reduce variance attributable to between student differences, general education students were the proposed population in this study. However, to improve generalizability, school-wide demographic information is presented below. Despite this design, as explained below in the "Limitations" section of the manuscript, one Special Education student was included in the final sample.

Previous meta-analytic work investigating MBIs has suggested the potential to benefit non-clinical populations (Eberth & Sedlmeier, 2012; Sedlmeier et al., 2012) and student populations (Maynard et al., 2017; Zenner et al., 2014; Zoogman et al., 2015). Therefore, this study contributes to the research literature investigating the effects of MBIs on general education studies allowing implications for universal implementation as well as small-targeted groups within a MTSS.

Research questions. The primary purpose of this study was to examine whether the MOB intervention can demonstrate effects on student academic engagement and off-task behaviors for general education students, and if so, to what extent. As such, two primary research questions were investigated:

1. Is the implementation of the MOB intervention associated with gains in student academic engagement and if so, to what extent?

2. Is the implementation of the MOB intervention associated with decreases in student off-task behaviors and if so, to what extent?

Additionally, secondary research questions were also addressed. Specifically, this research aimed to investigate the extent to which the MOB intervention was implemented with fidelity, and the extent to which students and teachers perceived the intervention to be socially valid.

Hypotheses. Previous studies investigating the effects of MBIs on academic engagement and related behavior have found small to moderate effects (Klingbeil, Fischer et al., 2017). Given these findings, I hypothesized similar small to moderate effects in both academic engagement and off-task behaviors; specifically, that MOB will be associated with increases in student academic engagement and decreases in off-task behaviors. A low inference model for this relationship is shown below in Figure 1 and is very similar to the proposed theory of change suggested by Minkos (2016). Figure 2 demonstrates a more detailed hypothesized logic model explaining the relationship between mindfulness-breathing exercises and academic engagement using a combined behavioral and biopsychological theoretical approach.

For the secondary research questions, acceptable scores in treatment integrity were hypothesized. By design, the MOB intervention was designed to be simple to implement with fidelity. Similarly, acceptable scores in the social validity measures were also hypothesized, due to similarity between the current MBI and other mindfulness breathing exercises that have previously been investigated with similar measures. Specifically, Minkos (2016) found that teacher report data found the implemented MBI to be feasible, acceptable, and easily understandable. Similarly, students reported the mindfulness breathing exercise to be feasible, acceptable, and understandable as well (Minkos, 2016).

Method

This study implemented and investigated the effects of a new, simplified mindfulness-breathing exercise for general education students. This exercise, sustaining attention on diaphragmatic breathing while nonjudgmentally ignoring other stimuli as guided by an interventionist, was hypothesized to increase academic engagement and decrease off-task behaviors. Furthermore, this research aimed to investigate if the MOB intervention could be carried out with integrity and if the participating students and teachers perceived it as a socially valid intervention. University institutional review board approval was granted prior to initiating recruitment or study procedures.

Sample and Setting

The current intervention study was provided to elementary aged, general education student participants. Reviews of MBI studies have shown support for MBIs impacting student outcomes in this age range (Klingbeil, Fischer et al., 2017; Klingbeil, Renshaw et al., 2017; Maynard et al., 2017). Methodologically, this allows a sample of students from the same classroom with the same teacher. In middle school and high school, students transition across several classes and teachers each day following unique schedules. This creates variables between students that would need to be accounted for in analyses. When sampling from a single elementary classroom, participants would be more likely to follow the same daily schedule (e.g., receive the same instruction at the same time, eat lunch at the same time, take breaks at the same time, etc.). In the current study, a 5th grade teacher volunteered to participate and as such, the sample of participants were all recruited from the same 5th grade classroom. To promote generalizability, recruited students could have been of any race or ethnicity. For this multiple baseline study, a sample of at least 3 students was proposed and achieved in order to allow for the 3 baseline conditions and 6 phases total needed to meet WWC standards (Kratochwill et al., 2010).

Two research assistants agreed to participate in this study. The first three data points of IOA collected, as well as help in randomly assigning the first student to enter intervention, was provided by one research assistant. All other help (i.e., remaining IOA data and TI data) was provided by the second research assistant. Both research assistants were enrolled in a doctoral School Psychology program and had received formal instruction and training in using the BOSS. As such, no further training was needed to gather outcome data. Training on the collection of TI data was provided by the researcher to the research assistant. This training included a demonstration of the MOB exercise and training on the corresponding materials. Specifically, the research assistant was given Appendices A, B1, and B2. Explicit instruction (Archer & Hughes, 2011) was used in training the research assistant. For example, modeling and unambiguous directions were used in teaching how to collect TI data.

Recruitment. Student participants were sampled from the same classroom, such that variance attributable to differences between schools or classrooms would not influence findings. One 5th grade teacher volunteered to participate in this study. This teacher's school serves over 600 students and over 100 fifth grade students, with a population of 67% Hispanic, 12% white, 8% American Indian/Alaska Native, 7% Black, 4% two or more races, 1% Asian, and 1% Hawaiian Native/Pacific Islander (Common Core of Data; CCD, 2016). 27% of students are learning English (California Department of Education; CDE, 2015) and 78% of students are eligible for free or reduced-priced lunch (CCD, 2016). The school-wide average of students per teacher exists in a ratio of 27 students per teacher, which exceeds the national average of 16 students per teacher (CCD, 2016).

Prior to enrolling in the study, the teacher participant was informed of possible benefits from the intervention, such that some students will be pulled out of class to receive intervention with the intent of improving their academic engagement upon return. This benefit was intended to outweigh the cost of participation (e.g., the effort associated with consulting and communicating with the interventionist, nominating student participants, and completing the social validity measure).

Once a teacher and classroom had been identified, teacher nomination was then used to identify potential student participants. The teacher was asked to nominate general education students without a history of severe behavioral concerns impacting academic engagement, but with room to improve in this area. In other words, this study aimed to recruit average students. The teacher was instructed to nominate five students meeting inclusion criteria. Consultation with the researcher was provided to the teacher to assist in this process as needed (e.g., teaching the inclusion criteria). Once five students had been identified, informed consent paperwork was sent home to parents/guardians of potential student participants. The classroom teacher also called home to the parents of nominated students to explain the study and why their student had been nominated for participation. This research designed included recruited of five students to protect against attrition, difficulty receiving informed consent paperwork, or other variables that would reduce the sample size. Student written assent was also received before initiation of the intervention.

In consulting with the classroom teacher volunteer, 5 students were nominated for participation. Two students returned consent without the need for reminders within the first week. The third consent was returned after the teacher sent home a reminder letter (i.e., the same letter as the original recruitment letter sent home). Once three signed consents were received, and the students assented to participate, the teacher was informed that there was no need to continue the recruitment process. This process was completed in one week. The final sample included two male and one female students.

Setting. In the current study, consultation with school administration was used to identify a room or area to provide the intervention. This intervention could have occurred anywhere the student can comfortably sit and the interventionist can provide instruction without distraction. For example, a quiet spot in the library, an empty office space, or a bench outside would have sufficed, weather provided. However, a corner of the student's regular classroom would have been judged as undesirable, as other students could create distractions. Once the location was identified, and agreed to by researcher and school administration, the location was to remain constant for the duration of the intervention. Through consultation with the school's Principal, the intervention room was identified as a private room within the library. The room is typically used by interventionists or school psychologists needing a private space for counseling or intervention.

Consultation with the teacher was also used to identify the time of day for the MOB intervention and subsequent BOSS observations. The school day for 5th grade students at this particular elementary school began at 8:45am and concluded at 3:15pm. The originally elected time to receive the MOB intervention was from approximately 8:45am-9:35am and the BOSS observations were planned to occur from approximately 9:35am to 10:35am. However, on 5/2/18, I was notified by the classroom teacher that the students were to start required standardized state testing, the Smarter Balance Assessment Consortium (SBAC), occurring at a time that would interfere with the planned intervention and observation times. Further, due to the testing arrangements at the school, all students from the volunteering classroom teacher's class would transition into another teacher's class for a period of the day. With consideration for the other variables in play and consultation with both classroom teachers, the planned intervention time switched to 11:30am to 12pm with BOSS observations occurring from 12pm to 12:30pm within the "new" teacher's classroom. This "new" teacher signed the IRB approved informed consent form in order to document the agreement to participate.

Both classroom settings were general education classrooms. The original volunteering teacher had chosen to decorate his classroom with different instructional posters, including scientific posters demonstrating different bodily systems (e.g., digestive, reproductive, cardiovascular, and respiratory systems). Of note, the Respiratory System poster was labeled with lungs, diaphragm, and intercostal muscles, all of which are important within the context of the MOB intervention. In this classroom, students were sitting at individual desks arranged into square clusters of four desks, such that four students appear to be sitting around a larger square table. However, as noted above, observations were moved to the classroom of another volunteering general education teacher. In this alternate classroom, students were sitting in separate individual desks, per the classroom arrangement during SBAC testing. However, after SBAC testing had concluded, the teacher rearranged the class to include desk clusters similar to the arrangement in the original teacher's room.

Variables

The independent variable was the MOB intervention, while measures of academic engagement and off-task behaviors served as dependent variables. The degree of fidelity of implementation (i.e., treatment integrity; Sanetti & Kratochwill, 2009) was also measured throughout the intervention with a scaled checklist of essential intervention components (Appendices B1 and B2). Social validity was addressed with measures, delivered post intervention, for both the teacher (Appendix C) and the student (Appendix D).

Independent variable. The independent variable in this current study is the Mind on Breathing (MOB) exercise detailed in Appendix A. Please refer to Appendix A for instructions for teaching the breathing exercise used in MOB, instructions for mindfulness, as well as instructions for daily MOB sessions. Although Appendix A may appear as a script, suggested phrasings do not need to be read or repeated verbatim. Instead, the instructions presented in Appendix A should serve as an instructional guide. For example, when Appendix A suggests the phrase "Until the alarm sounds, we are only focused on our breathing" as a periodic mindfulness reminder, the interventionist may be flexible in their phrasing and use similar statements such as, "try to focus only on your breathing until you hear the alarm," "until we hear the alarm, we will continue to focus on the breathing exercise," "we will continue to focus only on our breathing exercise until we hear the alarm," and other similar phrasings that express the same idea.

MOB was delivered once a day, three days a week, for at least two weeks, for each student. This allowed at least six data points per phase for each student. Including two weeks of baseline conditions, the intervention aimed to last six weeks in order to serve, and observe, all three participants. The intervention was delivered on Mondays, Wednesdays, and Fridays to help standardize the time between each intervention session. Due to student attendance and other school-based variables, the intervention was carried out for 7 weeks in order to provide the minimum of six intervention sessions for each student and capture the corresponding observation data-points. The actual number of intervention sessions received was: 6 sessions (Student A), 13 sessions (Student B), and 8 sessions (Student C).

Treatment integrity. To measure the degree to which this independent variable was implemented with fidelity, treatment integrity (TI; Gresham, 2009; Sanetti & Kratochwill, 2009) data were proposed to be gathered for approximately 30% of sessions. Reporting treatment integrity data help to evaluate the internal validity of a study; low treatment integrity scores would suggest that effects observed in the dependent variable may not be attributable to planned manipulations of the independent variable (Shadish, Cook, & Campbell, 2002). In other studies examining TI data (e.g., in a study of performance feedback by DiGennaro, Martens, & Kleinmann, 2007), a minimum of 30% of intervention sessions was observed for procedural fidelity across teachers and students. As such, this study aimed to gather TI data on approximately 30% of intervention sessions. In the intervention, TI data were successfully gathered in 30.7% of sessions (Table 1).

Treatment integrity, in this study, was conceptualized as the percentage of essential intervention components observed during intervention sessions by an outside evaluator. For this purpose, a checklist of both student and interventionist behaviors was created to reflect the degree of implementation. In other words, essential intervention components are presented as observable behaviors. Please see Appendix B1 for the TI checklist for the MOB intervention. This checklist includes a Likert-type scale to capture the degree of implementation for behaviors that should be frequently occurring throughout each intervention session. All behaviors are given operational definitions and are provided in Appendix B2. The TI score is then presented as a percent of essential intervention components delivered as designed. Although subject to debate (Gresham, 2013), some researchers have suggested that 80% accuracy is an acceptable level of TI needed for replication (Gresham, 2013; Sanetti & Kratochwill, 2009). When TI scores are low, interventions such as performance feedback (PF; Alvero, Bucklin, & Austin, 2001) can be carried out to help remediate deficits. PF intervenes upon the interventionist to help improve fidelity using data, progress monitoring, and consultation. Establishing the checklist provided in Appendix B1 as a tool for measuring TI in MOB implementation can help to develop tools for monitoring interventionist progress in a performance feedback intervention. In this study, across 30.7% of intervention sessions, TI scores ranged from 91%-100% with a mean score of 99% across the 8 observed MOB intervention sessions. TI data are discussed further in the "Results" section of the manuscript below and are presented below in Table 1.

To implement this checklist and gather TI data, a research assistant volunteer was utilized. In the implementation of the study, with 3 participants, the volunteer would have needed to observe 9 of the 27 planned intervention sessions (i.e., 30% of 27 sessions = 8.1 sessions) to meet the proposed standard of 30%. However, student B was absent on one day, limiting the number of actual and observed intervention sessions (i.e., 8 of 26 observations = 30.7%). TI scores were collected over a total of 5 days. There was only one observation with TI scores below 100%. On this day, the TI score was shared with the interventionist to help improve performance in an informal performance feedback process (i.e., a data-guided conversation between research assistant and interventionist).

Dependent variables. The dependent measures in this study were academic engagement and off-task behaviors. Academic engagement was measured using the

Behavioral Observation of Students in Schools (BOSS; Shapiro, 2004). Psychometric properties of BOSS have been examined. In a review of systematic direct observation (SDO) methods, Volpe, DiPerna, Hintze, and Shapiro (2005) found high inter-observer agreements (e.g., Kappas = .93-.98; DuPaul et al., 2004), support for discriminant validity for students with ADHD compared to nondisabled peers (DuPaul et al., 2004), and support for treatment sensitivity such that BOSS scores are sensitive to instructional manipulation (Ota & DuPaul, 2002). However, Volpe and colleagues (2015) suggested that more research is needed to support the convergent validity, treatment sensitivity, and other psychometric properties of the BOSS. Of the seven coding schemes included in their review, all seven had limitations regarding need for more research investigating their psychometric properties. Therefore, despite the need for more research, the BOSS is relatively well supported compared to other potential SDO methods that could be selected for the identified purposes of this study.

Despite these cautions, the authors do recommend the BOSS as a measure for describing the classroom behaviors of children (Volpe et al., 2005). Therefore, although more research is needed in this area, it appears as though the BOSS has empirical support for its inter-rater reliability and is likely to meet standards suggested by WWC (i.e., $r > .8$; Kratochwill et al., 2010) as well as standards for use as a progress monitoring tool (i.e., $r > .7$) as suggested by Salvia, Ysseldyke, and Bolt (2010). Unfortunately for the science of SDO, researcher expectations for observations are typically less stringent than the psychometric considerations taken for intelligence and achievement tests and as such, there are some deficits in empirical support in this area (Hintze, 2005).

In the BOSS, Shapiro (2004) separated Academic Engagement into active (AET) and passive engaged time (PET). AET was defined as "those times when the student is actively attending to the assigned work" (p. 34) while PET was defined as "those times when the student is passively attending to assigned work" (p. 35). As such, Academic Engagement in this study was defined as those times when the student is actively or passively attending to the assigned work. Examples of academic engagement include: writing, reading aloud, and asking about the assigned material. Non-examples include: talking to peer for fun, looking at smartphone, and walking around the room.

In order to provide the least biased estimate (Suen & Ary, 1989) of the prevalence of occurrences of academic engagement behaviors, momentary time sampling was used, as recommended by Shapiro (2004). 10-second intervals were used for this time-sampling purpose in order to capture 48 intervals of data points on the target student for every 10-minute observation. This figure, 48 intervals of data points, is consistent with recommendations from Shapiro (2013b) such that "accurate observations require at least 10-15 minutes" (p. 8). With the recommended 15-second interval and peer observations occurring every fifth interval (Shapiro, 2004), this would suggest a recommendation of 32 to 48 intervals of data points for the target student in each observation. The plan for 10 minute observations was influenced by methodological concerns to recruit a sample of 5 students. In order to accommodate 5 students within an instructional hour, shorter (i.e., 10 minute) observation periods were chosen. To accommodate for shorter data collection periods per student, shorter intervals (i.e., 10 second) were chosen to allow for an increase in the total number of observed intervals per observation. However, despite this precaution, the study recruited 3 students in the final sample. As such, the dependent variable observations were able to be collected in 30 minutes.

Similarly, 10-second intervals were used to measure off-task behaviors. This data collection occurred concurrently with the 10 minute measures of academic engagement. As opposed to AET and PET, the BOSS recommends partial interval time sampling for the undesired behaviors under the off-task category (Shapiro, 2004). As such, this study measured off-task behaviors using partial interval time sampling while measuring academic engagement with momentary time sampling within the same interval. Shapiro (2004) defined nonengagement as off-task behaviors occurring when the student is not academically engaged (p. 35). Furthermore, Shapiro (2004) broke this construct down into three constituent parts: off-task motor (OFT-M), off-task verbal (OFT-V), and off-task passive (OFT-P).

In the BOSS manual (Shapiro, 2004), OFTM-M includes any motor activity unrelated to the assigned task (p. 36), OFT-V includes any audible verbalizations that are unrelated to the assigned task (p. 36), and OFT-P was defined as "those times when a student is passively not attending to an assigned academic activity for a period of at least 3 consecutive seconds" (p. 37). In the current study, which does not seek to discriminate between these different kinds of off-task behaviors, off-task behaviors were defined as those times when a student is demonstrating either OFT-P, OFT-M, or OFT-V behaviors. Using the BOSS as an outcome measure of academic engagement for elementary aged general education students, Riley, McKevitt, Shriver, and Allen (2011) reported that participants were on-task during an average of 64.68% (range 50%-91.7%) of observed intervals and off-task in an average of 35.5% (range 8.3-50%) of observed intervals when in starting baseline conditions.

To assist in the data collection, the BOSS iPhone app (Shapiro, 2013a) was used to capture both academic engagement and off-task behaviors. The only difference in procedures between Shapiro's (2013b) instructions for use and the current study was to combine the off-task categories into one behavior. Therefore, if the student demonstrated any combination of OFT-P, OFT-M, and/or OFT-V behaviors, only one instance of general off-task behavior was recorded for that interval. A partial interval time sampling methodology was still used, but the observer only needed to record the first instance of any off-task behavior regardless of category and then did not have to continuing monitoring the student for other types of off-task behavior during that same interval. This methodology was developed to allow the observer to use the default BOSS template without having to create a new template that had only one general off-task behavior option. If using the default BOSS template as designed, it would be possible to observe instances of OFT-P, OFT-M and OFT-V all within the same interval, producing scores ranging from 0 to 300% off-task in observed intervals, i.e., three observations of off-task behaviors in each interval. This issue is not present in the momentary time sample of academic engagement, such that PET and AET behaviors are mutually exclusive and captured only once per interval.

To interpret results, the intervals were summed where PET and AET were observed to create a total AE score to represent the percentage of observed intervals where AE was observed, with possible scores ranging from 0 to 100% academically engaged in observed intervals. Similarly, the intervals with OFT-P, OFT-M, and OFT-V behaviors were summed to create the total off-task behavior score. This would represent the percentage of observed intervals where off-task behaviors were observed, with scores ranging from 0 to 100% off-task in observed intervals. Because academic engagement and off-task are being measured on different time sampling measures (i.e., respectively momentary and passive), both outcome measures can be captured during the same observation period. In other words, the BOSS will allow for both outcomes to be measured at the same time.

To help control for variability associated with different academic tasks and different times of day, the current study proposed to measure all student participants within the same instructional block. As such, the observation period for the data collection of the outcome measures was planned to occur no longer than approximately 1 consecutive hour each day. Through consultation with the volunteering classroom teacher, a one-hour block of time was identified in which the students were engaged in a similar academic task (i.e., 9:30am-10:30am). During this time, students were tasked with completing past classwork and homework assignments. In order to capture the effects of the MOB intervention, this observation period occurred after the intervention period. As such, these outcome data were collected 3 times a week, occurring on Mondays, Wednesdays, and Fridays. The outcome data were collected strategically approximately 30 minutes after the MOB was delivered (e.g., student B received the intervention at ~9:00am and was observed in class at ~9:30am). This standardized delay between intervention and observation was to control for variables relating to the cognitive stress of the MOB exercise, allowing for a period of "recovery time" before being measured in class.

Inter-observer agreement. Following WWC standards as presented by Kratochwill and colleagues (2010), a study meeting standards must systematically measure the outcome variable over time by more than one observer. Specifically, a study needs inter-observer agreement data collected in each phase and in 20% of sessions across all phases (Kratochwill et al., 2010). As such, the research assistant who assisted with TI data also assisted with these IOA data. Across the sample of three student participants, a total of 29 baseline observations were conducted. A research assistant was present to collect IOA data in 6 of these observations (20.7%). Similarly, IOA was captured in 5 of the 22 intervention-phase observations (22.7%). In total, IOA data were collected in 11 of 51 (21.6%) BOSS observations.

Minimal acceptable standards for inter-observer agreement (IOA) range from .80 to .90 on average when measured by percentage agreement and should exceed $k = .6$ when measured by Kappa (Hartman, Barrios, & Wood, 2004). To calculate percentage agreement, the number of intervals with agreement between observers were divided by the total number of observed intervals. For example, with proposed 10-minute observations of 10-second intervals (i.e., six intervals per minute), a total of 60 intervals will be captured in each observation session. The BOSS iPhone application (Shapiro, 2013a) by default measures a peer comparison every fifth interval. However, as the current study only aimed to investigate the target student, and not the peer comparison, only the 48 intervals pertaining to the target student were assessed. This interval-by-interval procedure for calculating IOA is appropriate because the outcome measures are measured discretely in each interval as either present or not present (Cooper, Heron, & Heward, 2007).

In this study, the primary investigator served as the interventionist and primary data collector. Due to this non-blind design, a more conservative IOA statistic, kappa, was reported as well (Minkos, 2016). Kappa was calculated and reported as an appropriate statistic for IOA between two raters on nominal scale data (Hallgren, 2012). Kappa is more conservative because it corrects for agreement that may occur by chance (Kazdin, 2011). Kappa was calculated using the equation provided by Kazdin (2011) and reproduced below in Figure 3. IOA scores were reported for both outcome measures (i.e., academic engagement and off-task behaviors). Further results and discussion pertaining to IOA are presented below in the Results section of the manuscript.

Social validity. In the field of Applied Behavior Analysis (ABA), social validity has become an important consideration. Kazdin (1977) conceptualized social validity as comprised of three distinct components: social significance (i.e., the degree to which targeted behaviors are socially relevant), social appropriateness (i.e., the degree to which the treatment procedures are socially appropriate), and social importance (i.e., the degree to which the observed change in behavior is clinically significant). Social validity has been elaborated to include considerations for the social importance of the selected dependent variables, the treatment integrity of the independent variable, and reports from the interventionists suggesting the procedures are acceptable, feasible, and effective, along with clinically significant effects (Horner et al., 2005). The research associating academic engagement and off-task behaviors to academic outcomes suggests that these outcome variables are socially valid for student populations. Furthermore, following the purpose of creating a simplified, effective mindfulness breathing exercise, MOB is designed with social appropriateness in mind for both interventionist and student recipient. For example, the short 5-minute intervention without need of a manual or cost of materials should allow for greater feasibility and acceptability on behalf of the interventionist. In this regard, social validity concerns are incorporated into the design of the intervention.

Other concerns of social validity were addressed through the collection of data from the classroom teacher and from the student participants. For this purpose, the Usage Rating Profile – Intervention, Revised (URP-IR; Chafouleas, Briesch, Neugebauer, & Riley-Tillman, 2011) and the Children's Usage Rating Profile (CURP; Briesch & Chafouleas, 2009) were used. Together, in addition to the design of the intervention, these considerations address social validity from the perspective of the classroom teacher as well as the student participant.

Usage Rating Profile – Intervention, Revised (URP-IR). To capture social validity from the perspective of the classroom teacher, the Usage Rating Profile – Intervention, Revised (URP-IR; Chafouleas et al., 2011) was delivered post intervention. The URP-IR, shown in Appendix C, consists of 29 items in a self-report questionnaire (Briesch et al., 2013). The measure produces scores across the following six factors of social validity: acceptability, feasibility, understanding, system climate, family-school collaboration, and system support (Briesch et al., 2013). High reliability levels have been shown in each factor, as shown in acceptability (α = .95), system climate (α = .91), understanding (α = .80), family school collaboration (α = .79), system support (α = .72), and feasibility (α = .84; Briesch et al., 2013). Confirmatory factor analyses support the hypothesized factor structure (Neugebauer, Chafouleas, Coyne, McCoach, & Briesch, 2016). Furthermore, the authors found support for the ecological validity and use of the URP-IR to capture school-level factors for implementation in Tier 1 of a MTSS (Neugebauer et al., 2016). The URP-IR was previously used by Minkos (2016) for a similar mindfulness-breathing intervention who found the intervention to be socially valid from the perspective of teachers.

Children's Usage Rating Profile (CURP). To capture social validity from the perspective of the student participant, the Children's Usage Rating Profile (CURP; Briesch & Chafouleas, 2009a) was also administered post intervention. The CURP, as shown in Appendix D, is a 23-item, self-report questionnaire. The CURP purports to measure social validity across three factors: personal desirability, feasibility, and understanding. The CURP has shown high reliability across each subscale, specifically, understanding (α = .75), feasibility (α = .82) and personal desirability (α = .92) (Briesch & Chafouleas, 2009b). Similarly, Minkos (2016) used the CURP and found the mindfulness-breathing exercise to be socially valid from the students' point of view.

Procedures

Once at least three students had returned their informed consent paperwork, and provided their own written assent, baseline data collection began. The three students included in analyses were randomly assigned to be either the first, second, or third participant to receive the intervention. The use of random assignment to conditions can improve the internal validity and statistical conclusion validity of SCD studies (Kratochwill & Levin, 2014). The first participant to receive intervention had the shortest baseline and longest intervention phases. Conversely, the third participant had the longest baseline and shortest intervention phases. Following two weeks of baseline data collection, the data were reviewed by the researcher and academic advisor to determine if a stable baseline had been established. In this review of data, all three students appeared to be eligible to move into intervention.

A random number generator was used to identify which of the three eligible students would be selected as the first to receive the intervention. For this purpose, each student was assigned two numbers and a standard die was rolled by the research assistant who was blind to the conditions. Through this method, student B was identified as the first student to enter intervention. In this multiple baseline methodology, it was planned to stagger each student's introduction to the intervention phase with a one-week delay. For example, one week later, the second participant was scheduled to begin intervention. In another week's time, the third participant was planned to enter the treatment phase. In this study, due to the change in classroom settings associated with SBAC testing, there was a two-week period between Student B's introduction to intervention and Student C's introduction to the MOB exercise. This was to allow for three baseline observations in the new classroom settings in order to review the data for consistency and minimize the influence of changing settings. In other words, rather than have Student C enter intervention at the same time as another potentially meaningful variable, changing classrooms, more baseline data were collected. However, as planned, there was a one-week delay between Student C and Student A's introduction to the intervention phase.

As previously stated in the "Setting" section of this manuscript, consultation with school personnel was used to identify the particular time and location of the intervention. On intervention days, the interventionist escorted the students from the classroom to the intervention setting and similarly escorted the students back to the classroom post intervention. Each day, the interventionist would verify with the classroom teacher if it were still appropriate to provide intervention at the arranged time for each participant. Then, the interventionist would approach the student in the classroom and ask if they were ready for the intervention. Casual conversations and rapport building efforts occurred on the walks to and from the intervention room. While in the intervention room, the instructions in Appendix A were followed, including asking the student if any reminders were needed and providing reinforcement after each session before returning to class. All students received the intervention during the same ~30-minute period and were observed in class ~ 30 minutes following their intervention session. Specifically, after changing classrooms to accommodate for the SBAC testing, student B was scheduled to receive the intervention at 11:30am and was to be observed in class at 12:00am, student C was scheduled to receive the intervention at 11:40am and was to be observed in class at 12:10am, and student A was scheduled to receive the intervention at 11:50amm and was to be observed in class at 12:20am.

A research assistant volunteer had joined the interventionist and student on 30.7% of sessions to capture treatment integrity data. The research assistant had provided TI scores to the interventionist to allow for improvements to be made if needed. The research assistant had a choice of which 9 of the 27 intervention sessions to observe. Similarly, the research assistant had a choice of which 11 of the 54 outcome measurement sessions to observe in order to collected IOA data. In this study, the research assistant was present in 11 of the 51 (21.6%) BOSS measurements.

Following intervention, social validity data were captured by administering the URP-IR and CURP (Appendices C and D) to, respectively, the classroom teacher and student participants. Once the questionnaires were returned, all data for this intervention were collected. Next, data cleaning and analysis were carried out as described below. Results were shared with the participating school district, parent(s)/guardian(s) of the student participants, and are presented in this dissertation manuscript.

Research Methodology

Single case design (SCD) methods, sometimes called single subject designs, are used to "demonstrate experimental control within a single participant" (Kennedy, 2005, p. 12). In other words, SCD studies allow a participant to serve as their own control. Single case design methods have been used in many studies investigating the effects of MBIs (Klingbeil, Fischer et al., 2017). Horner and colleagues (2005) recommended the use of SCD in educational settings because of its cost-effective approach that provides detailed on a single subject. Furthermore, SCD research methods can identify "behavioral interventions that are appropriate for large scale analysis" leading toward "large-scale policy directives" (p. 175). As such, SCD seems to be an appropriate approach for this pilot study and its proposed implications for application in a MTSS. Of the various SCD approaches, for example ABAB or alternating treatments, multiple baseline designs are the most commonly used in experimental research because of their flexibility and ease of use (Cooper et al., 2007).

Multiple baseline designs are of use when the effects of an intervention cannot, or should not, be withdrawn (Cooper et al., 2007). In the meta-analytic review of single-subject designs investigating MBIs, Klingbeil, Fischer, and colleagues (2017) found increased effects of MBIs between treatment and maintenance phases (p. 82). Klingbeil, Fischer, and colleagues (2017) speculated that participants may choose to independently engage in taught mindfulness exercises if they perceive beneficial effects, as seen in participants of the Soles of the Feet intervention (Singh et al., 2007). Furthermore, consistent with Kabat-Zinn's (2003) approach to mindfulness exercises, the perceived benefits may continue to grow because "mindfulness develops through repeated practice" (Klingbeil, Fischer et al., 2017, p. 82). Neurological studies have suggested that mindful breathing exercises, when practiced consistently, may promote significant changes in the brain with some changes apparent after a short period of time (Chiesa & Serretti, 2010; van Leeuwen, Singer, & Melloni, 2012). Therefore, the effects of these mindful breathing exercise may not be immediately reversible (Minkos, 2016). As suggested by these findings, it may be difficult or impossible to immediately withdraw or reverse the effects of mindfulness exercises once implemented.

Additionally, the 10 studies included in the Klingbeil, Fischer, and colleagues (2017) meta-analysis were all multiple baseline designs. A defining feature of the multiple baseline design is the "staggered introduction of the independent variable at different points in time" (Horner et al., 2005). This staggered implementation protects against threats to validity concerning influential events occurring at a single time point influencing all participants, such as change in class-wide curriculum. In this current study, the introduction of the MOB intervention was staggered by at least one-week, such that a one-week delay exists across participant conditions.

As mentioned throughout this manuscript, this study is designed to meet WWC design standards as presented by Kratochwill and colleagues (2010). As suggested by Kratochwill and colleagues (2010), a study meeting design standards must present the following four design criteria. First, there must be systematic manipulation of the independent variable, as determined by the researcher (Kratochwill et al., 2010, p. 14). Next, Kratochwill and colleagues (2010) suggested that each outcome variable must be measured systematically over time by more than one observer, in at least 20% of all sessions, with IOA meeting aforementioned standards (i.e., 0.8 percent agreement and/or 0.6 if measured by Cohen's kappa) as presented by Hartmann and colleagues (2004). The third requirement for a study to meet standards is to include at least three demonstrations of an intervention effect at three different time points or with three different phase repetitions (Kratochwill et al., 2010, p. 15). The fourth and final requirement for a study to meet standards is minimal number of data points per phase. In multiple baseline methodologies, a minimum of six phases with at least 5 data points per phase is required to meet design standards without reservations (Kratochwill et al., 2010).

The current study meets these design standards for a single-case design. Participants were randomly assigned to be either the first, second, or third individual to receive the treatment that was be systematically implemented. As previously stated in the "Dependent Variable" section of the manuscript, IOA data were collected in both baseline and intervention phases, across 21.6% of total sessions, analyzed using both percent agreement and Cohen's kappa. Further IOA data are presented in the "Results" section of this manuscript. With a sample of three participants, the requirement for three demonstrations of an effect was satisfied as each participant experienced one baseline and one treatment phase. Similarly, from this design, six phases are present across all three participants. Furthermore, all participants were measured at least six times per phase, exceeding the criterion of 5 data points per phase. As such, the current study is eligible to meet design standards without reservations (Kratochwill et al., 2010).

When studies meet design standards, with or without reservations, Kratochwill and colleagues (2010) provided recommendations for interpreting the strength of evidence. Strong evidence, moderate evidence, and no evidence of a functional relation can be determined by: documenting the consistency of level, trend, and variability within each phase; documenting the immediacy of the effect, the proportion of overlap, consistency of the data across phases, and drawing comparisons between observed and predicted patterns in the data; and examining external factors (Kratochwill et al., 2010).

This interpretation, as applied to the current study, is provided in the "Results" section of the manuscript.

Analyses. Visual analyses and effect sizes were both used to judge the effect of the independent variable upon the dependent variable, with visual analysis used as the primary analysis method.

Visual analysis. Visual analysis of the outcome data included considerations of level, trend, variability, immediacy of the effect, overlap, and consistency of data across phases (Kratochwill et al., 2012). Level can be addressed through average value within a phase and should be meaningfully different between phases. Trend refers to the slope of the best-fit line of the data within a phase. For example, the present research hypothesized an upward trend in AE and a downward trend in off-task behaviors during the intervention phases. Variability may refer to the range or variance of the outcome measure about the best fitting line. Immediacy of the effect refers to how quickly the data changes shape (e.g., level, trend, and variability) between phases, such that more immediate changes support internal validity of the study. Considerations for overlap pertain to the proportion of data from one phase that overlaps with data from an adjacent phase, such that smaller proportions of overlap suggest a greater demonstration of an effect. Finally, consistency of data across phases involves comparing data from within similar conditions (i.e., baseline or treatment) and examining the degree of consistency in data patterns. Greater consistency is indicative of causal relations between the manipulated independent variable and the measured outcome.

Effect size analysis. To compliment visual analysis, Kratochwill and colleagues (2010) recommended including parametric or non-parametric effect size (*ES*) analysis. Parker and Hagan-Burke (2007) argued that effect size estimates can develop a more objective approach to investigating influences of an intervention. However, parametric effect size statistics may potentially violate the assumption of independence of errors (Kratochwill et al., 2012). Despite these concerns, Kratochwill and colleagues (2012) suggested that including effect size analyses in a study increases its credibility and allows for results to be more readily compared to other studies. There are a variety of ways to calculate effect size estimates in SCD research (Parker, Vannest, & Davis, 2011), but there "are no agreed upon criteria for statistical analysis for single-case design" (Kratochwill et al., 2012, p. 31). As such, two nonparametric ES estimates are reported.

Parker and colleagues (2011) recommended a nonparametric *ES* analysis as a first step in assessing the degree of a functional relationship between the independent variable and outcome measures. An advantage of nonparametric approaches is that they do not need to meet the rigorous parametric assumptions regarding distribution of data or scale type (Parker et al., 2011, p. 305). In the current study, Percentage of Non-Overlapping data (PND; Scruggs, Mastropieri, & Castro, 1987) and Tau-U (Parker, Vannest, Davis, & Sauber, 2011) are calculated. PND is calculated by dividing the total number of data points in the treatment phase by the number of data points exceeding the highest baseline data point (Scruggs et al., 1987). The formula for calculating PND is shown below in Figure 4A (Pustejovsky & Swan, 2018). An example calculation is shown below in Figure 4B (Scruggs et al., 1987). Limitations to PND include undesirable statistical qualities, inability to capture trend, and inability to measure the overall effect (Kratochwill et al., 2012).

An advantage of including Tau-U as an alternate non-parametric effect size is that it accounts for baseline and intervention trends (Bowman-Perrott, Burke, Zhang, & Zaini, 2014; Chaffee, Briesch, Johnson, & Volpe, 2017). Tau-U is based on nonoverlap between baseline and treatment phases and is derived from Kendall's rank correlation and the Mann-Whitney *U* test (Chaffee, Briesch, Johnson, & Volpe, 2017). A formula for calculating Tau-U is provided in Figure 5 (Pustejovsky & Swan, 2018). Limitations of Tau-U include inflated values that are not bound between -1 and 1, it cannot be visually graphed, and it is prone to Type I errors such that Tau-U over identifies treatments as effective (Tarlow, 2017). In this research, PND and Tau-U were calculated using the online effect size calculator provided by Pustejovsky and Swan (2018). According to guidelines, PND values of 90% or greater would indicate highly effective outcomes, values between 70% and 90% would indicate fair outcomes, values between 50% and 70% represent questionable effects, and PND values below 50% would suggest unreliable treatments (Scruggs, Mastropieri, Cook, & Escobar, 1986). Tau-U values between 0 and 0.65 represent small effects, 0.66 to 0.92 represent medium to high effects, and values greater than .93 can be interpreted as large effects (Bowman-Perrott et al., 2014; Parker & Vannest, 2009).

Assumptions of, and threats to, the model. Threats to internal validity in single case design include: ambiguous temporal precedence, selection, history, maturation, statistical regression to the mean, attrition, testing, instrumentation, and additive and interactive effects of the threats to internal validity (Kratochwill et al., 2010). A multiple baseline design helps to control for threats to internal validity by using both within and between subject comparisons (Horner et al., 2005). External validity is supported by the replication of effects across participants and time (Horner et al., 2005).

Results

The implementation of the MOB intervention was associated with increases in the rates of academic engagement and decreases in the rates of off-task behaviors, as supported by visual analyses and effect size calculations. The intervention was implemented with acceptable levels of fidelity, the outcome measures were captured with adequate reliability, and the intervention was perceived to be socially valid from the perspective of the participants.

Inter-Observer Agreement

Baseline IOA. Inter-observer agreement was captured, with the assistance of two Research Assistants, in 6 of the 29 baseline BOSS observations (20.69%). This quantity is greater than the minimum needed (i.e., 20%) to meet WWC standards (Kratochwill et al., 2010). Minimal acceptable standards for inter-observer agreement (IOA) may range from .80 to .90 on average when measured by percentage agreement and should exceed $k = .6$ when measured by Kappa (Hartman, Barrios, & Wood, 2004).

In baseline measures of Academic Engagement, the Percent Agreement ranged from 0.77 to 0.96, with an average Percent Agreement of 0.88. Kappa values ranged from 0.54 to 0.91 with an average value of 0.64. When measuring Kappa across all observations at once, a Grand Kappa value of 0.72 is found. As such, across both Percent

Agreement and Kappa measures of IOA appear to meet minimal acceptable standards for single-case design research.

In baseline measures of Off-Task behaviors, the Percent Agreement ranged from 0.67 to 0.92, with an average Percent Agreement of 0.80. Kappa values ranged from 0.32 to 0.83 with an average value of 0.50. When measuring Kappa across all observations at once, a Grand Kappa value of 0.59 is found. As such, across both Percent Agreement and Kappa measures of IOA appear to meet minimal acceptable standards for single-case design research as measured by Percent Agreement and nearly meets standards as measured by Kappa. These data are shown in Table 2 below.

Intervention IOA. Inter-observer agreement was captured, with the assistance of a research assistant, in 5 of the 22 intervention-phase BOSS observations (22.73%). This quantity is greater than the minimum needed (i.e., 20%) to meet WWC standards (Kratochwill et al., 2010).

In Intervention-Phase measures of Academic Engagement, the Percent Agreement ranged from 0.88 to 1.00, with an average Percent Agreement of 0.94. Kappa values ranged from 0.74 to 1.00 with an average value of 0.82. When measuring Kappa across all observations at once, a Grand Kappa value of 0.83 was found. As such, across both Percent Agreement and Kappa measures of IOA appear to meet minimal acceptable standards for single-case design research.

In Intervention-Phase measures of Off-Task behaviors, the Percent Agreement ranged from 0.88 to 0.92, with an average Percent Agreement of 0.91. Kappa values ranged from 0.29 to 0.92 with an average value of 0.66. When measuring Kappa across all observations at once, a Grand Kappa value of 0.77 is found. As such, across both Percent Agreement and Kappa measures of IOA appear to meet minimal acceptable standards for single-case design research. These data are shown below in Table 3.

Visual Analysis of Academic Engagement

The multiple-baseline, single-case design, graph of findings for the outcome measure of Academic Engagement is shown in Figure 6A. In this figure, changes in level, trend, and variability can be observed for each participant.

Student B was the first student to enter intervention and the corresponding data are shown on the top of the multiple baseline graph. These data show an expected, positive increase in level as demonstrated by the baseline average, 74.65% of observed intervals demonstrated academic engagement, increasing to an average of 82.87% of observed intervals while in the treatment phase. The data also show an expected and positive improvement to trend, such that academic engagement was decreasing at a rate of -2.24% of observed intervals per day during baseline and improved to a rate of -0.30% of observed intervals per day. This would suggest that the intervention has helped to alter the trajectory of this student's behavior. Student B did not experience an expected or desired change in variability across baseline and intervention phases. Student B's behavior was less variable in baseline, range = 27.08%, compared to in intervention, range = 35.42%). An immediate effect can be observed in these data. This would suggest that the MOB intervention had positive effects for Student B in regards to his rates of academic engagement.

Student C was next to enter the intervention phase and the data are shown in the middle of the multiple baseline graph. These data show expected and desirable changes in level, trend, and variability across phases with an apparent immediate effect. Student C's data document a change in level, such that the average rate of academic engagement in baseline, 75.62% of observed intervals, increased to 94.64% of observed intervals while in the intervention phase. This student also demonstrated an expected and positive increase in trend, such that the rates of academic engagement during baseline were decreasing over time at a rate of -0.32% of observed intervals per day. However, during intervention, rates of academic engagement were increasing at a rate of 0.17% of observed intervals per day. Similarly, as hypothesized, Student C experienced a decrease in variability across phases, such that the range of values in baseline, 25%, decreased to a range of 6.25% while in intervention. This would suggest that the MOB intervention had positive effects for Student C in regards to his rates of academic engagement.

Student A was the last student to enter intervention and these data are shown on the bottom of the multiple-baseline graph. Similar to Student C, Student A's data also suggest that the hypothesized improvements were found in respect to the level, trend, and variability of the data between phases. These data for Student A suggest an expected and positive increase in level, such that the average rate of academic engagement in baseline, 57.69% of observed intervals, increased to an average rate of 77.77% of observed intervals in intervention. Hypothesized improvements in the trend of the data were also observed, such that rates of academic engagement were decreasing during baseline at a rate of -0.24% of observed intervals per day, yet improved substantially during intervention, such that the rates of academic engagement were now increasing by 2.99% of observed intervals per day. Similarly, Student A experienced a decrease in variability across phases, such that the range of values in baseline, 72.91%, reduced to 50% while in the intervention phase. The immediacy of the effect is less clear for Student A compared to Student B and Student C. However, despite the data not demonstrating a clear immediacy effect, these data would suggest that the MOB intervention had positive effects for Student A in regards to her rates of academic engagement. As such, there appears to be Strong Evidence relating to increases in Academic Engagement, according to the standards provided by Kratochwill and colleagues (2010).

Visual Analysis of Off-Task Behaviors

The multiple-baseline, single-case design, graph of findings for the outcome measure of Off-Task Behaviors is shown below in Figure 6B. In this figure, changes in level, trend, and variability can be observed for each participant.

Student B was the first student to enter intervention and the corresponding data are shown on the top of the multiple baseline graph. These data show an expected reduction in the level of Off-Task Behaviors as demonstrated by the baseline average, 47.22% of observed intervals, decreasing to an average of 26.62% of observed intervals while in the treatment phase. The data also show an expected improvement to trend, such that Off-Task Behaviors were increasing at a rate of 3.51% of observed intervals per day during baseline and improved to a rate of 0.08% of observed intervals per day. This would suggest that the intervention has helped to positively alter the trajectory of this student's behavior. Student B did experience an expected and desired change in variability across baseline and intervention phases. Student B's behavior was more variable in baseline, range = 45.83%, compared to in intervention, range = 35.42%). An immediate effect can also be observed in this data. This would suggest that the MOB intervention had positive effects for Student B in regards to his rates of Off-Task Behaviors.

Student C was next to enter the intervention phase and the data is shown in the middle of the multiple baseline graph. These data show expected and desirable changes in level, trend, and variability across phases with an apparent immediate effect. Student C's data document a change in level, such that the average rate of Off-Task Behaviors in baseline, 36.25% of observed intervals, decreased to 9.52% of observed intervals while in the intervention phase. This student also demonstrated an expected change in trend, such that the rates of Off-Task Behaviors during baseline were increasing over time at a rate of 0.26% of observed intervals per day. However, during intervention, rates of Off-Task Behaviors were decreasing at a rate of -0.10% of observed intervals per day. Similarly, as hypothesized, Student C experienced a decrease in variability across phases, such that the range of values in baseline, 33.33%, decreased to a range of 8.33% while in intervention. This would suggest that the MOB intervention had positive effects for Student C in regards to his rates of Off-Task Behaviors.

Student A was the last student to enter intervention and these data are shown on the bottom of the multiple-baseline graph. Similar to Student B and Student C, Student A's data also suggest that the hypothesized improvements were found in respect to the level, trend, and variability of the data between phases. The data for Student A suggest an expected decrease in level, such that the average rate of Off-Task Behaviors in baseline, 51.60% of observed intervals, decreased to an average rate of 31.94% of observed intervals in intervention. Hypothesized improvements in the trend of the data were also observed, such that rates of Off-Task Behaviors were increasing during baseline at a rate of 0.05% of observed intervals per day. During intervention, the rates of Off-Task Behaviors were decreasing at a rate of -3.32% of observed intervals per day. Similarly, Student A experienced a decrease in variability across phases, such that the range of values in baseline, 77.08%, reduced to 54.17% while in the intervention phase. The immediacy of the effect is less clear for Student A compared to Student B and Student C. However, despite the data not demonstrating a clear immediacy effect, these data would suggest that the MOB intervention had positive effects for Student A in regards to her rates of Off-Task Behaviors. Similar to Academic Engagement, these data would also suggest that there is Strong Evidence observed relating to reductions in off-task behaviors (Kratochwill et al., 2010).

Effect Size Calculations

According to guidelines, PND values of 90% or greater would indicate highly effective outcomes, values between 70% and 90% would indicate fair outcomes, values between 50% and 70% represent questionable effects, and PND values below 50% would suggest unreliable treatments (Scruggs et al., 1986). Using these standards, the data would suggest that Student A experienced unreliable treatment effects in both Academic Engagement (PND = 0.33) and Off-Task behaviors (PND = 0.33). However, Student B demonstrated questionable effects in regards to Academic Engagement (PND = 0.56) and

Off-Task Behaviors (PND = 0.67). The data would suggest that Student C experienced a highly effective response in regards to both Academic Engagement (PND = 1.00) and Off-Task Behaviors (PND = 1.00). Across the three participants, the average effects on Academic Engagement (PND = .63) and Off-Task Behaviors (PND = .67) can be reported as a Questionable Effect. These data are shown below in Table 9.

Tau-U values between 0 and 0.65 represent small effects, 0.66 to 0.92 represent medium to high effects, and values greater than .93 can be interpreted as large effects (Bowman-Perrott et al., 2014; Parker & Vannest, 2009). By these standards, Student A experienced a small effect in regards to Academic Engagement (Tau-U = .58) and Off-Task Behaviors (Tau-U = .54). Student B experienced medium to high effects in Academic Engagement (Tau-U = .72) and large effects in the outcome of Off-Task Behaviors (Tau-U = .94). Student C experienced large effects in both Academic Engagement (Tau-U = 1.06) and Off-Task Behaviors (Tau-U = 1.06). Average Tau-U values across the three participants are within the Medium to High range for the outcomes of both Academic Engagement (Tau-U = .79) and Off-Task Behaviors (Tau-U = .85). These data are shown below in Table 10.

Treatment Integrity

Treatment integrity (TI) data were captured in 8 of the 26 intervention sessions (30.7%), as shown below in Table 1. The target percent of total interventions sessions was 30%. The average TI Score across these eight data points is 99%, indicating a very high degree of fidelity was observed. Across these eight TI Checklist observations, the scores ranged from 91% to 100% with only one observation scored below 100%. The goal would be to implement the intervention with 100% integrity each time, but researchers have argued that 80% accuracy is an acceptable level of TI needed for replication (Gresham, 2013; Sanetti & Kratochwill, 2009). The TI Checklist for the MOB Intervention is shown in Appendix B1, with operational definitions shown in Appendix B2. In review of the one occasion with less than 100% fidelity rating (91%), the areas of improvement were found in both Interventionist and Student behaviors. The Interventionist did not ask the student if reminders for the instruction were needed. The research assistant also scored the Student Behaviors of Good Posture and Relaxed Exhalation (not forced) to be a 3 of 4, indicating that she "occasionally observed" the behaviors as opposed to a 4 of 4 (i.e., "frequently observing" the behavior). All other components of the intervention were observed to be delivered to an extent earning the maximum points.

Social Validity

Concerns of social validity were addressed through the collection of data from the classroom teachers and from the student participants. For this purpose, the Usage Rating Profile – Intervention, Revised (URP-IR; Chafouleas, Briesch, Neugebauer, & Riley-Tillman, 2011) and the Children's Usage Rating Profile (CURP; Briesch & Chafouleas, 2009) were used. Together, in addition to the design of the intervention, these considerations will thoroughly address social validity from the perspective of the classroom teacher as well as the student participant. Results are shown below in Tables 4 through 8.

In Table 4, the URP-IR data from the Referring Teacher, the original volunteer classroom teacher, is shown. These data would suggest that this teacher perceived the intervention to be Acceptable, Understandable, Feasible, and aligned with the System Climate without requiring System Support. However, scores on Home School Collaboration would suggest a perceived need for collaboration between the student's family and the school.

In Table 5, URP-IR data from the Alternate Teacher is provided. Here, the data suggest that this teacher found the intervention to be Acceptable, Feasible, and in alignment with the System Climate. However, these data also suggest that the intervention was not very understandable, required Home School Collaboration, and required System Support. The differences in responses between the two teacher respondents could be attributed to their different levels of involvement in the intervention. On one hand, the referring teacher received extensive consultation regarding what the intervention entails (e.g., in order to ascertain whether or not he would be willing to participate), who would be participating (i.e., he nominated the student participants) and when they would receive the intervention (i.e., he was able to pick the ideal times of days for the intervention and BOSS data collection). Conversely, the alternate teacher received this information only once the contextual variables created a need to bring her into the study. As such, despite my efforts to provide consultation, the alternate teacher was much more limited in her experiences. For example, she could not nominate student participants. Additionally, she was more limited in regards to the times of day for me to provide intervention and visit for BOSS data collection because of the SBAC testing variable.

Social validity data from Student A, captured with the CURP-Actual and shown below in Table 6, would suggest that she found the intervention to be very Personally Desirable and Understandable and would agree that it is Feasible. Student B similarly reported the MOB intervention to be Personally Desirable, Understandable, and Feasible as well, as shown below in Table 7. During the second to last intervention session, without prompting, Student B shared that he liked the intervention and was planning to practice it at home. In Table 8, the CURP data from Student C is shown. Again, the student participant rated the intervention as Personally Desirable, Feasible, and Understandable.

Discussion

Interpretation of Findings

The primary purpose of this study was to examine whether the MOB intervention can demonstrate effects on student academic engagement and off-task behaviors for general education students, and if so, to what extent. As such, two primary research questions were investigated:

1. Did the MOB intervention result in gains in student academic engagement and if so, to what extent?

2. Did the MOB intervention result in decreases in student off-task behaviors and if so, to what extent?

Additionally, secondary research questions were also addressed. Specifically, this research aimed to investigate the extent to which the MOB intervention was implemented with fidelity, and the extent to which students and teachers perceived the intervention to be socially valid.

Effects on student academic engagement. The visual analyses provided in the current research provide support for positive effects of the MOB intervention regarding improvements in student academic engagement across all three participants. Student A and Student C demonstrated improvements in level, trend, variability, with an apparent immediacy effect, and consistency of data-points across phases. Student B similarly demonstrated improvements in level, trend, with an immediacy effect and consistency of data-points across phases. However, Student B experienced an increase in variability in the treatment phase compared to baseline.

However, PND effect size calculations would suggest that Student A experienced unreliable treatment effects (PND = 0.33), Student B experienced questionable treatment effects (PND = 0.56), and Student C was observed to experience a highly effect response to intervention (PND = 1.00) regarding improvements in Academic Engagement. Across all three participants, the average effect size can be interpreted as a Questionable Effect (PND = 0.63).

Additionally, Tau-U effect size calculations would suggest that Student A experienced a small effect (Tau-U = 0.58), Student B experienced a medium to high effect (Tau-U = 0.72), and Student C experienced a large effect (Tau-U = 1.06) regarding improving academic engagement. Across all three participants, the average effect size can be interpreted as a Medium to High effect regarding improvements in Academic Engagement (Tau-U = 0.79). These data would suggest that the implementation of the MOB was associated with medium to high effects regarding increases in student Academic Engagement.

Effects on student off-task behavior. The visual analyses provided in the current research provide support for effects of the MOB intervention regarding decreases in student off-task behaviors across all three participants. Student A, Student B, and Student C all demonstrated improvements in level, trend, variability, with an apparent immediacy effect, and consistency of data-points across phases.

However, PND effect size calculations would suggest that Student A experienced unreliable treatment effects (PND = 0.33), Student B experienced questionable treatment effects (PND = 0.67), and Student C was observed to experience a highly effect response to intervention (PND = 1.00) regarding decreases in rates of Off-Task behaviors. Across all three participants, the average effect size can be interpreted as a Questionable Effect (PND = 0.66).

Additionally, Tau-U effect size calculations would suggest that Student A experienced a small effect (Tau-U = 0.54), Student B experienced a large effect (Tau-U = 0.94), and Student C also experienced a large effect (Tau-U = 1.06) regarding decreases in the rates of Off-Task Behaviors. Across all three participants, the average effect size can be interpreted as a Medium to High effect regarding decreases in rates of Off-Task behaviors (Tau-U = 0.85).

These data would suggest that the implementation of the MOB was associated with medium to high effects regarding decreases in student Off-Task behaviors.

Treatment integrity. The aforementioned TI data suggest that the MOB intervention was delivered with fidelity. Across 30.7% of treatment sessions, an average TI score of 99% fidelity was observed. This would suggest that the intervention can be implemented as designed, including both research and student participant behaviors.

Social validity. The aforementioned Social Validity data suggest that the investigated MOB intervention was a socially valid technique. All three students reported the intervention to be Personally Desirable, Understandable, and Feasible. The original volunteering teacher reported the intervention to be Acceptable, Understandable, Feasible, and aligns with the System Climate without requiring System Support. However, scores on Home School Collaboration would suggest a perceived need for collaboration between the student's family and the school. The second participating teacher, the alternate teacher, found the MOB intervention to be Acceptable, Feasible, and in alignment with the System Climate. However, these data also suggest that the intervention was not very understandable, requires Home School Collaboration, and requires System Support. However, as previously stated, the alternate teacher did not receive the same information at the same time as the original teacher and this experience could have impacted the Social Validity scores. Given these findings, the MOB intervention was generally found to be Socially Valid.

Interpretation of Findings Relative to Reviewed Research

The present research demonstrates findings consistent with prior research studies. In the meta-analysis of MBIs targeting disruptive behaviors for youth participants, the authors found a small effect across 10 studies (Tau-U = 0.59; Klingbeil, Fischer, et al., 2017). This finding is smaller in magnitude compared to presented findings. The presented findings would suggest medium to high effects for promoting Academic Engagement (Tau-U = 0.79) and decreasing off-task behaviors (Tau-U = 0.85). The samples of participants included in the Klingbeil, Fischer, and colleagues (2017) meta-analysis were a combination of diagnosed and non-diagnosed student participants. The findings of Zoogman and colleagues' (2015) meta-analysis suggests that larger effects are generally associated with interventions for clinical populations. However, in the present research targeting general education students, larger effects were found when compared to the clinical populations measured in the Klingbeil, Fischer, and colleagues (2017) study. As such, although hypotheses were supported regarding the direction of the effects (i.e., improvements in Academic Engagement and decreases in Off-Task behaviors), the magnitude of the effects were greater than hypothesized. Differences between the presented results and those shared by Klingbeil, Fischer, and colleagues (2017) may be attributable to differences in sample characteristics, interpretation and implementation of the MBI, outcome variables measured, and interventionist. Additionally, only four of the studies included in the Klingbeil, Fischer, and colleagues (2017) meta-analysis met WWC standards with or without reservations.

The Carboni et al. (2013) study was the one study reviewed by Klingbeil, Fischer, and colleagues (2017) that had met WWC standards. The Carboni et al. (2013) study included a sample of four 8-year-old boys with a diagnosis of ADHD, receiving education in the general education classroom, and with average cognitive functioning. All four participants were receiving medication to treat their symptoms relating to ADHD. A school psychologist, with training in mindfulness, met individually with each participant for 30 to 45 minute intervention sessions, twice a week, for a total of 300 to 450 minutes of intervention. The mindfulness training program was partially adopted from a mindfulness-based stress reduction course for children (Saltzman & Goldin, 2008) including the use of an audio compact disc from Lantieri and Goleman's (2008) text on building emotional intelligence for children. Rates of on-task behavior were measured. The average effect size found (Tau-U = 0.74) was similar to, but slightly below, the presented findings (Tau-U = 0.79).

Although positive effects were hypothesized in the current research, it was unexpected to find this degree of similarity to a study that had longer intervention sessions (i.e., 30 to 45 minutes compared to the 5 to 7 minutes in this presented research), with a greater total number of intervention minutes (i.e., 300 to 450 minutes compared to 30 to 60 minutes total), with more intervention sessions (i.e., a minimum of 10 sessions compared to a minimum of 6 interventions sessions), with a longer duration (i.e., a minimum of 5 weeks compared to 2 weeks), using materials from a packaged curriculum, and delivered to a clinical population. Given these differences, it was unexpected for the presented study to find effects greater than those found by Carboni et al. (2013). The age of participants (i.e., 8 years old, compared to 5th Grade students) may have been a contributing factor. Another contributing factor may have been the number of intervention sessions per week, such that in Carboni et al.'s (2013) study, the intervention was delivered twice a week, whereas the presented study investigated the MOB intervention as delivered three times a week. This suggests the number of the intervention sessions per week may be an important variable to consider when conceptualizing the dosage of a mindfulness-based intervention.

The Singh, Lancioni, Manikam, et al., (2011) study met WWC standards with reservations (Klingbeil, Fischer, et al., 2017). This study used the Soles of the Feet (SOF) intervention (Singh et al., 2007), as delivered at home by a parent, for five 30-minute sessions delivered across five consecutive days, and a total dosage of 150 minutes of intervention. The sample was three adolescents diagnosed with Autism Spectrum Disorder. An audiotape with instructions was used as a part of the intervention. Participants were aged 14 years (6th grade), 16 years (9th grade), and 17 years (10th grade). Physical aggression was the outcome variable of interest. In this study, the average effect size was the same as in the presented investigation of the MOB intervention, regarding decreases in off-task behaviors (Tau-U = 0.85).

This similarity is unexpected given that the intervention used by Singh, Lancioni, Manikam, et al., (2011) was delivered at a larger dosage (i.e., 150 total minutes compared to 30 to 42 minutes), used an established packaged intervention (SOF; Singh et al., 2007), and applied it for a clinical population. However, despite these variables that would suggest greater intervention effects, similar effect sizes were observed. One difference between the Singh, Lancioni, Manikam, et al., (2011) study and the presented research is the duration of the intervention, such that the participants in the Singh, Lancioni, Manikam, et al., (2011) study received one week of intervention compared to the participants in the presented research who had received at least two consecutive weeks of intervention. This suggests that the duration of the intervention is a variable to consider when conceptualizing the dosage of a mindfulness-based intervention. The age of the participants (younger in the presented study), may also be a contributing variable.

The study by Singh, Lancioni, Singh, et al., (2011) also met WWC standards with reservations. This study also used the SOF program (Singh et al., 2007), was delivered at home by a parent, implemented across 5 intervention sessions, and measured decreases in aggressive behaviors. A difference between this study and the Singh, Lancioni, Manikam, et al., (2011) study, would be a that the dosage was half the intensity (i.e., 75 minutes total, compared to the 150 minutes used in the aforementioned study). Intervention sessions were 15 minutes long, compared to 30 minutes. The population was also different, serving three individuals with Asperger syndrome, aged 15 years, 13 years, and 18 years. Parent interventionists were trained on SOF for a month prior to implementation. Similar effects were found (Tau-U = .070), yet were slightly lower than those found in the Singh, Lancioni, Manikam, et al., (2011) study and those observed in the presented research (Tau-U = 0.85). As previously noted, it is unexpected that the lower dosage associated with the MOB intervention in the presented research would be associated with similar, or greater, effect sizes compared to studies with a larger dosage. However, the MOB intervention was implemented over a minimum of two weeks, a longer duration than the five days of intervention received in the Singh, Lancioni, Singh, et al., (2011) study. This again suggests that the duration of the intervention is a variable to consider when conceptualizing the dosage of a mindfulness-based intervention.

The fourth study reviewed by Klingbeil, Fischer, and colleagues (2017) was a non-programmed intervention by Singh, Lancioni, Winton, and colleagues (2013), which met WWC standards with reservations. In this study, the intervention was implemented in the school setting, across 8 intervention sessions, for a total of 960 minutes of intervention, as implemented by a clinician. The outcome variables were physical and verbal aggression, as well as compliance with teacher requests. The findings suggested a smaller effect (Tau-U = 0.66) compared to the presented research (Tau-U = 0.85). In this study, preschool teachers received the mindfulness training intervention and student rates of disruptive behaviors were measured. As such, this study appears fundamentally different than the other reviewed MBIs reviewed by Klingbeil, Fischer, and colleagues (2017). However, despite the positive findings, it is difficult to compare the specific effects of an intervention delivered to students compared to an intervention delivered to the teachers.

In Minkos' (2016) study, changes in Academic Engagement in response to a mindfulness breathing exercise was measured by both Direct Behavior Ratings (DBR; Chafouleas, Riley-Tillman, & Christ, 2009) and Systematic Direct Observation (SDO). In this study, one student demonstrated a large effect in response to intervention (Tau-U = 1.00) when measured by SDO and a small effect when measured by DBR (Tau-U = 0.35). The second participant demonstrated a small effect (Tau-U = 0.61) when measured by SDO and a small effect when measured by DRB (Tau-U = 0.40). In the current research, changes in Academic Engagement as measured by SDO ranged from Tau-U = 0.58 to Tau-U = 1.06, with an average effect size of Tau-U = 0.79, interpreted as a medium to high effect (Bowman-Perrott et al., 2014; Parker & Vannest, 2009). As such, the results of the present research are consistent with prior research investigating the effects of a mindfulness breathing exercise on rates of Academic Engagement.

As previously stated, Riley and colleagues (2011) reported that participants were on-task during an average of 64.68% (range 50%-91.7%) of observed intervals when in starting baseline conditions. The participants in the current study demonstrated similar rates of behavior in baseline. Specifically, Participants A, B, and C were measured to demonstrate academically engaged behaviors in respectively 57.69%, 74.65%, and 75.62% of observed intervals, on average. Despite starting at fairly typical levels of academic engagement, each participant was observed to demonstrate an increase in their levels, improving to demonstrations of academic engagement in respectively 77.77%, 82.87%, and 94.64% of observed intervals. Therefore, despite being sampled as typically developing students, improvement in the rates of academic engagement was observed. This finding would support the implementation of MBIs for typically developing students.

Similarly, Riley and colleagues (2011) reported that participants were off-task in an average of 35.5% (range 8.3-50%) of observed intervals when in starting baseline conditions. The participants in this study demonstrated similar, or greater, levels of off-task behaviors while in baseline. Specifically, Participants A, B, and C were observed to demonstrate off-task behaviors in respectively 51.60%, 47.23%, and 36.25% of observed intervals on average. As hypothesized, each participant experienced a decrease in their rates of off-task behavior when in intervention, decreasing their levels to a demonstration of off-task behaviors in, respectively, 31.94%, 26.62%, and 9.52% of observed intervals. Therefore, despite being sampled as typically developing students, decreases in the rates of off-task behaviors were observed. This finding would support the implementation of MBIs for typically developing students.

Limitations

A limitation of this pilot study for this intervention is that it is being delivered as a pull-out service in one-on-one groups (i.e., similar to Tier 3), but results are intended to generalize to general education students with the potential for class-wide or group intervention (i.e., similar to Tier 1 and Tier 2 supports respectively). The justification for one-on-one groups investigated with SCD methodology is rooted in the growing evidence for such interventions, but with respect to the notion that more research is needed. To help promote generalization to a general education population, as opposed to student populations with disabilities that could be eligible for one-on-one support, this study aimed to recruit a sample of students who are not currently receiving Special Education Services.

Another limitation to the study can be understood through a social psychological lens. Although the shared presence of meditation, mindfulness, and breathing related exercises across religious and cultural groups may be perceived as grounds for bridging cultural gaps and forging stronger relationships across peoples, this has not always been the case. Despite shared common ground, some individuals still associate these practices with particular groups. This may be a product of the religious, cultural language, and meanings attached to these practices as discussed in media, pop-culture, and literature. For example, as recently as 1979, Protestant churches were critical of meditative practices because of their “eastern” origins and “Hindu-inspired rhetoric” (Eifring, 2013, p. 4). In a 1993 survey of school-based counselors, fewer than 40% of respondents indicated that they perceive meditation and relaxation training to be effective in treating adolescent behavioral concerns and 25% of respondents used such techniques in their practice (Laselle & Russell, 1993). As such, the appropriation of the term “mindfulness” may result in this intervention being met with resistance due to these associations with religious and/or esoteric practices.

From a consultation perspective, this could create difficulties in implementation, treatment fidelity (Sanetti & Kratochwill, 2009) and social validity (Kazdin, 1977; Wolf, 1978). For example, teachers demonstrate a greater likelihood of implementing interventions that philosophically agree with their current beliefs about behavior modification strategies (Telzrow & Beebe, 2014). Using social psychological theories, such as Terror Management Theory (TMT; Pyszczynski, Greenberg, & Solomon, 1997), we can understand this resistance as the product of one worldview being perceived as a threat to another, an out-group’s theology challenging an in-group’s theology. By attempting to highlight and incorporate the common ground of various practices, this current research aims to help to breakdown this false notion that this is an “out-group” practice derived from one particular religion, culture, or scientific orientation. Instead, this research aims to present these mindfulness breathing exercises as “human behaviors” derived from our shared history. In other words, rather than presenting this intervention as a product from one particular point of view, this research aims to present the intervention as an exercise that can be practiced, and benefited from, by all peoples. Despite this practical limitation, the current study did find promising results regarding the social validity of this intervention. However, given that the participating teacher volunteered to participate, there may be a selection bias effect such that the teacher may have agreed to participate due to a preexisting preference or bias in favor of mindfulness breathing interventions. Nonetheless, the student participants that were nominated for participation, as opposed to volunteered, rated the MOB exercise as a socially valid intervention.

Another limitation in the current study design is regarding treatment integrity. TI scores may be inflated due to the researcher’s personal experience in the MOB intervention. With dual-roles as designer of the study and sole interventionist, it is possible that the observed TI scores may be higher than what would be observed from an untrained school staff member or other potential service provider. This is problematic because the MOB intervention is designed to be easily implemented with fidelity by non-experts. However, it is important to empirically demonstrate that this intervention can produce effects in the desired outcomes before attempting to have an untrained individual act as interventionist. This reduces the variables associated with un-trained implementation. However, as previously noted, the MOB intervention is designed with the un-trained interventionist in mind. The current research provides evidence that the

MOB intervention can be implemented with fidelity by the researcher. With this evidence, future research could now benefit from replicating the study with non-expert interventionists.

Within this study's design, another limitation is present. The researcher was not blind to hypotheses. This is a limitation because the researcher served multiple roles, including interventionist and observer for the collection of outcome data. As such, this research was subject to experimenter biases, such as observer-expectancy effects, confirmation biases, and discounting errors. However, this limitation was minimized through research design. For example, the use of a research assistant when randomly assigning the participants to enter the treatment condition was included in the methodology to help reduce experimenter biases. Further, before identifying a student as eligible to enter treatment, the data was reviewed with the researcher's academic advisor. This consultation served as another layer of protection against experimenter biases. Additionally, the presence of IOA data can also minimize the limitations associated with the non-blind design, such that this data supports a reliable collection of outcome data by the researcher. Specifically, experimenter biases may skew the researcher's observations of classroom behavior and the ability to reliably identify academic engagement compared to off-task behaviors. However, the IOA data presented would suggest that the experimenter observed the classroom behaviors similarly to the research assistant.

In the design of the methodology, another limitation is present. In addition to receiving the planned 5 minutes of MOB intervention in each intervention session, other experiences were also regularly received. Specifically, on the way to and from the intervention room, the participants received one-on-one attention. Similarly, while participating in the MOB intervention, students also experienced a break from their regular class setting, peer group, and task demands. Therefore, the measured changes in behavior could also be attributed to these other intervention components. Future research could benefit from methodological designs that include measuring the rates of academic engagement and off-task behaviors when receiving one-on-one attention and breaks from the regular classroom setting without receiving the MOB intervention. Such a design could help disentangle the effects specific to MOB from the effects associated with other changes in daily activity that result from receiving an intervention outside of the classroom.

In the implementation of the intervention, additional limitations manifested. One potentially meaningful limitation was identified in the recruited sample. Despite instructions to nominate general education students, Student A had been receiving Special Education services due to deficits in reading. This information was shared to the researcher by the alternate teacher. This limitation hinders the generalizability of the findings to exclusively general education students. As supported by the findings of Zoogman and colleagues' (2015) meta-analysis, larger effects are generally associated with interventions for clinical populations. Despite this finding, Student A demonstrated the smallest effect sizes, as measured by both PND and Tau-U, in both Academic Engagement and Off-Task behaviors compared to the other two participants. This may be because Student A's disability was related to reading, as opposed to behavioral concerns, suggesting that she did not have as much room to improve as other clinical populations, such as those with attention deficit related disorders. Similarly, her baseline rates of engagement and off-task behaviors may have been more associated with the type of task demand, e.g., reading intensive compared to less reading intensive tasks, as opposed to her ability to attend to academic tasks in general.

The alternate teacher also shared that Student B had a reputation for having behavioral concerns. Therefore, despite his status as a general education student, there was a perceived room to improve that may have been greater than his average classroom peer. Despite this subjective finding shared by the alternate teacher, Student B did meet the inclusion criteria of being a general education student without a history of severe behavioral concerns, but with room to improve.

A second potentially meaningful limitation that manifested during the implementation of the study was the occurrence of SBAC testing. As previously mentioned, the SBAC testing mandated a change in intervention and observation times and setting. Specifically, the students were now observed in a different teacher's classroom. However, as evidenced by visual analysis of student behaviors shown below in Figures 6A and 6B, the introduction of SBAC testing was not associated with changes in student behavior. SBAC testing was introduced between the 7th and 8th data point. At this time, Student B had already received his first MOB intervention session and Students A and C were still in baseline. Although this change in classrooms was not expected, a strength of multiple-baseline designs is that they protect against threats to validity concerning influential events occurring at a single time point influencing all participants

(Horner et al., 2005). As such, despite this limitation, the design of the research helped to reduce the influence of this unexpected variable.

A third limitation that manifested during the implementation of the study pertains to possible interaction effects between participants. Although sampling participants from the same classroom provided many methodological advantages, e.g., increasing the likelihood that all participants would be engaged in the same educational activities in the same environment during observation periods, this methodology did present possible interaction effects as well. For example, Student B was observed to distract Student A with his off-task behaviors due to their proximity in the classroom. As such, reductions in Student B's behavior, possibly associated with the implementation of the MOB intervention, may have had an influence on Student A's behavior. Despite this limitation, visual analysis of the rates of academic engagement and off-task behaviors would suggest that Student B's introduction to the MOB intervention did not appear to have a meaningful impact on the trend of Student A's data. Student A's data continued to be variable, compared to the trends observed in Student B's data. Pearson's correlation coefficient was calculated to investigate this possible relationship between Student A and Student B's outcome data for the baseline condition. Regarding a possible association in academic engagement, an insignificant positive correlation of $r = 0.228$, $p = .664$ is found. When investigating off-task behaviors, an insignificant positive correlation of $r = 0.548$, $p = .260$ is found. This would suggest that increases in the rates of Student B's academic engagement and off-task behaviors were not associated with increases in the rates of Student A's behaviors.

Implications

Despite the aforementioned limitation of resistance due to perceived religious associations, this study in its essence seeks to remove the religious, cultural, and other non-technical aspects from the intervention. As such, this intervention could help to bridge the cultural gap by normalizing mindfulness through its secular, simplified, behavioral design and proposed Tier 1 implementation. This research aims to promote mindfulness-breathing exercises, like MOB, as beneficial exercises that could be valued in the same way that physiological exercises are appreciated. For example, just as the benefits of jogging are fairly widely accepted and do not belong to any particular worldview, mindfulness-breathing exercises could also be viewed in the same way. In other words, just as jogging is viewed as an exercise to increase health, mindfulness related exercises could be viewed as activities to increase relaxation and attention while decreasing reactivity to other stimuli. They are both behaviors that exercise a part of the body, which when regularly practiced, can lead to specific changes in corresponding physiological areas. Jogging may help to improve leg muscles and components of the respiratory system while mindfulness may help to activate parasympathetic nervous system processes (Wang et al., 2010) and neurological activation of regions associated with executive attention and Thalamus deactivation (Orme-Johnson et al., 2006; Tomasino et al., 2014) allowing for less cognitive reactivity (Edenfield & Saeed, 2012), and increased attention (Sedlmeieret al., 2012) in the school context.

Although this study proposes a way to practice mindfulness, it is not the only way. This intervention is not supposed to represent the best and most effective method;

but rather, it could serve as a one-size-fits-all product. This type of intervention may be appropriate as a Tier 1 service in a PBIS multitiered system of supports. In other words, this intervention is designed to have benefits for all student participants in the area of academic engagement. Future research may investigate the effects of the MOB intervention on groups of general education students. However, for specific students/student populations with identified needs, more specific and intensive mindfulness interventions could be implemented at Tier 2 or Tier 3.

The simplicity in the design of the MOB intervention, coupled with the treatment integrity data, would suggest that the intervention could be implemented with fidelity with relative ease. Future research may investigate the treatment integrity, and effects, of the MOB intervention when delivered by an individual without training in mindfulness exercise.

The current study provides an important contribution to the research base of mindfulness-based interventions and their relationship to academic engagement and off-task behaviors. As previously noted in the literature review, the 2017 meta-analysis by Klingbeil, Fischer, and colleagues (2017) identified 4 studies that meet WWC standards (Kratochwill et al., 2010), with or without reservations, regarding the reduction of disruptive behaviors in youth as measured in single-case research. However, in order to be established as an evidence-based practice, at least 5 studies must be identified. The presented study, as intended through a methodologically rigorous design and as observed through successful demonstrates of effects, meets WWC standards. With this contribution, 5 studies can now be identified that meet WWC standards. These studies

(Carboni et al., 2013; Singh, Lancioni, Manikam, et al., 2011; Singh, Lancioni, Singh, et al., 2011; Singh, Lancioni, Winton, et al., 2013), in addition to the current research, were carried out by at least 3 of research teams, with a sample greater than 20 participants (n = 31 across all 5 studies). As such, one could now argue that mindfulness-based interventions are an evidence-based practice for reducing off-task behaviors for youth populations.

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Tables

Table 1

Table of Treatment Integrity Scores

Date	Treatment Integrity Score	Student Participant
5/2/18	100%	B
5/4/18	100%	B
5/9/18	100%	B
5/18/18	100%	A
5/18/18	91%	B
5/18/18	100%	C
5/25/18	100%	A
5/25/18	100%	C

Table 2

Inter-Observer Agreement for Baseline-Phase

Measure	Percent Agreement		Kappa		
	Range	Average	Range	Average	Grand Kappa
Academic Engagement	0.77 to 0.96	0.88	0.54 to 0.91	0.64	0.72
Off-Task Behaviors	0.67 to 0.92	0.80	0.32 to 0.83	0.50	0.59

Table 3

Inter-Observer Agreement for Intervention-Phase

Measure	Percent Agreement		Kappa		
	Range	Average	Range	Average	Grand Kappa
Academic Engagement	0.88 to 1.00	0.94	0.74 to 1.00	0.82	0.83
Off-Task Behaviors	0.88 to 0.92	0.91	0.29 to 0.92	0.66	0.77

Table 4

Table of URP-IR Data from the Referring Teacher

Factor	Acceptability	Understanding	Home School Collaboration	Feasibility	System Climate	System Support
Sum Total	45	13	13	29	24	10
Average (1-6 scale)	5	4.33	4.33	4.83	4.8	3.33*

*Reversed Scored in Aggregating for Total
Total of Average Scores = 26.96
Average of Average Scores = 4.49

Table 5

Table of URP-IR Data from Alternate Teacher

Factor	Acceptability	Understanding	Home School Collaboration	Feasibility	System Climate	System Support
Sum Total	41	9	15	25	20	16
Average (1-6 scale)	4.55	3	5	4.12	4	5.33*

*Reversed Scored in Aggregating for Total
Total of Average Scores = 22.34
Average of Average Scores = 3.72

Table 6

Table of CURP-Actual Data from Student A

Factor	Personal Desirability	Feasibility	Understanding
Sum Total	28	18	24
Average (1-4 scale)	4	2.25*	4

*Reversed Scored in Aggregating for Total
Total of Average: 10.75
Average of Average Scores = 3.58

Table 7

Table of CURP-Actual Data from Student B

Factor	Personal Desirability	Feasibility	Understanding
Sum Total	27	12	21
Average (1-4 scale)	3.86	1.5*	3.5

*Reversed Scored in Aggregating for Total
Total of Average: 10.86
Average of Average Scores = 3.62

Table 8

Table of CURP-Actual Data from Student C

Factor	Personal Desirability	Feasibility	Understanding
Sum Total	26	11	18
Average (1-4 scale)	3.71	1.38*	3

*Reversed Scored in Aggregating for Total
Total of Average: 10.34
Average of Average Scores = 3.44

Table 9

Percent of Non-Overlapping Data (PND) Effect Size Measurements

Student	Academic Engagement	Off-Task Behaviors
A	0.33	0.33
B	0.56	0.67
C	1.00	1.00

Table 10

Tau-U Effect Size Measurements

Student	Academic Engagement	Off-Task Behaviors
A	0.58	0.54
B	0.72	0.94
C	1.06	1.06

Figures

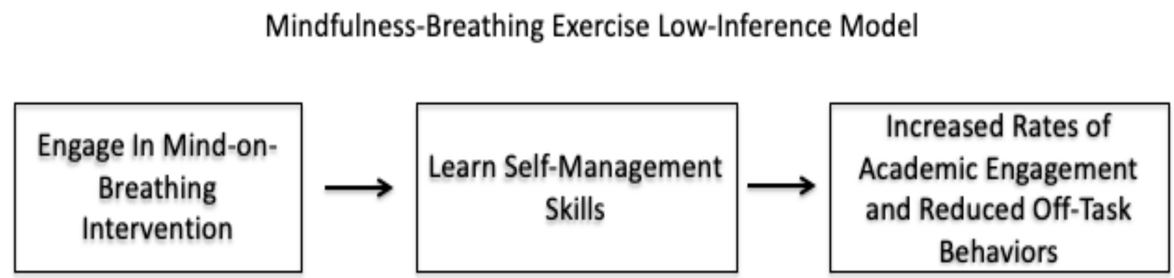

Figure 1

Mindfulness-Breathing Exercise: Low-Inference Model (adapted from Minkos, 2016, p 92).

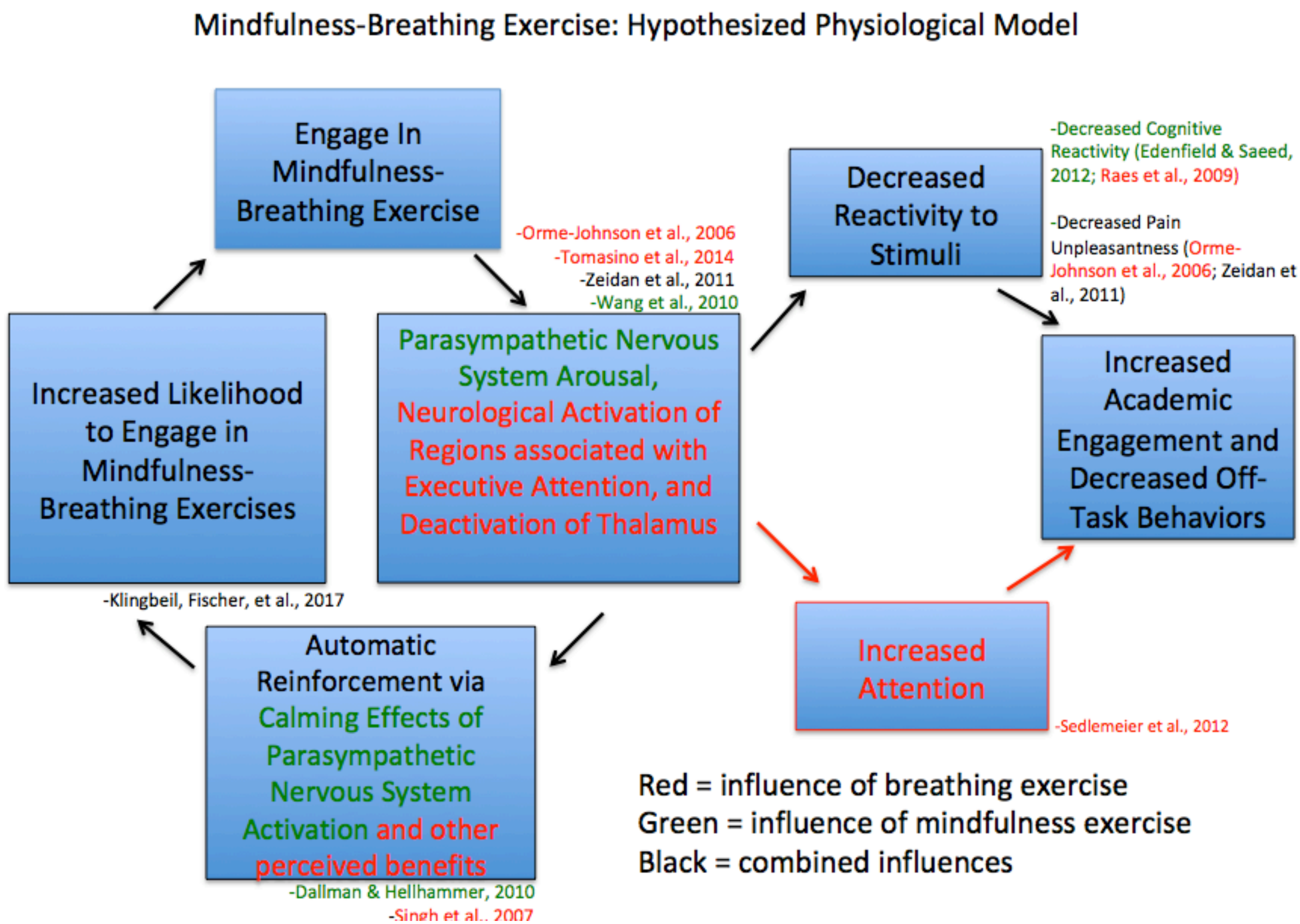

Figure 2

Logic Model of Hypothesized Relationship of Mindfulness-Breathing Exercises and Academic Engagement

$$k = \frac{\text{Po} - \text{Pc}}{1 - \text{Pc}}$$

Po = Proportion of observations in agreement
Pc = Proportion of observations in agreement due to chance

Figure 3

Formula for Calculating Kappa provided by Kazdin (2011)

For an outcome where increase is desirable

$$\text{PND} = \frac{1}{n}\sum_{j=1}^{n} I(y_j^B > y_{(m)}^A)$$

where $y_{(m)}^A$ is the maximum value of $y_1^A, \ldots, y_m^A$

For an outcome where decrease is desirable

$$\text{PND} = \frac{1}{n}\sum_{j=1}^{n} I(y_j^B < y_{(1)}^A)$$

where $y_{(1)}^A$ is the minimum value of $y_1^A, \ldots, y_m^A$

Figure 4A

PND Formulas provided by Pustejovsky and Swan (2018)

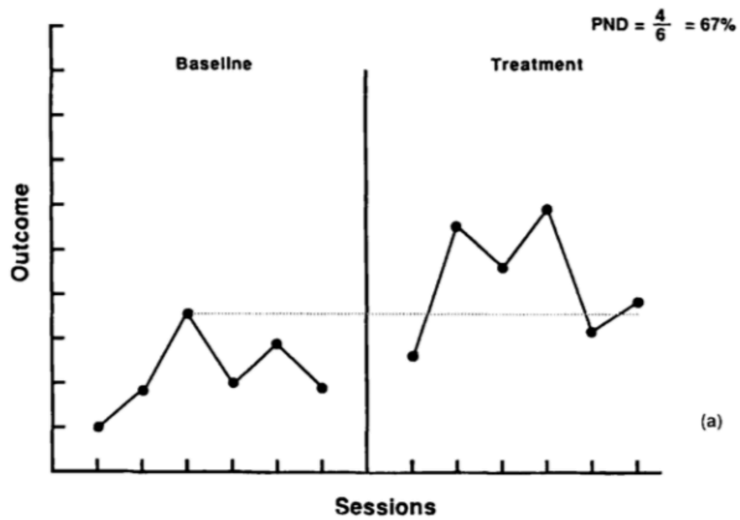

Figure 4B

PND Example provided by Scruggs and colleagues (1987)

Let $y_1^A, \ldots, y_m^A$ denote the observations from phase A. Let $y_1^B, \ldots, y_n^B$ denote the observations from phase B

For an outcome where increase is desirable, calculate

$$w_{ii}^{AB} = I(y_i^B > y_i^A) - I(y_i^B < y_i^A)$$

and

$$w_{ij}^{AA} = I(y_j^A > y_i^A) - I(y_j^A < y_i^A)$$

For an outcome where decrease is desirable, calculate

$$w_{ij}^{AB} = I(y_j^B < y_i^A) - I(y_j^B > y_i^A)$$

and

$$w_{ij}^{AA} = I(y_j^A < y_i^A) - I(y_j^A > y_i^A)$$

. The effect size index is then calculated as

$$\text{Tau-U} = \frac{1}{mn}\left(\sum_{i=1}^{m}\sum_{j=1}^{n} w_{ij}^{AB} - \sum_{i=1}^{m-1}\sum_{j=i+1}^{m} w_{ij}^{AA}\right).$$

Figure 5

Tau-U Formulas provided by Pustejovsky and Swan (2018)

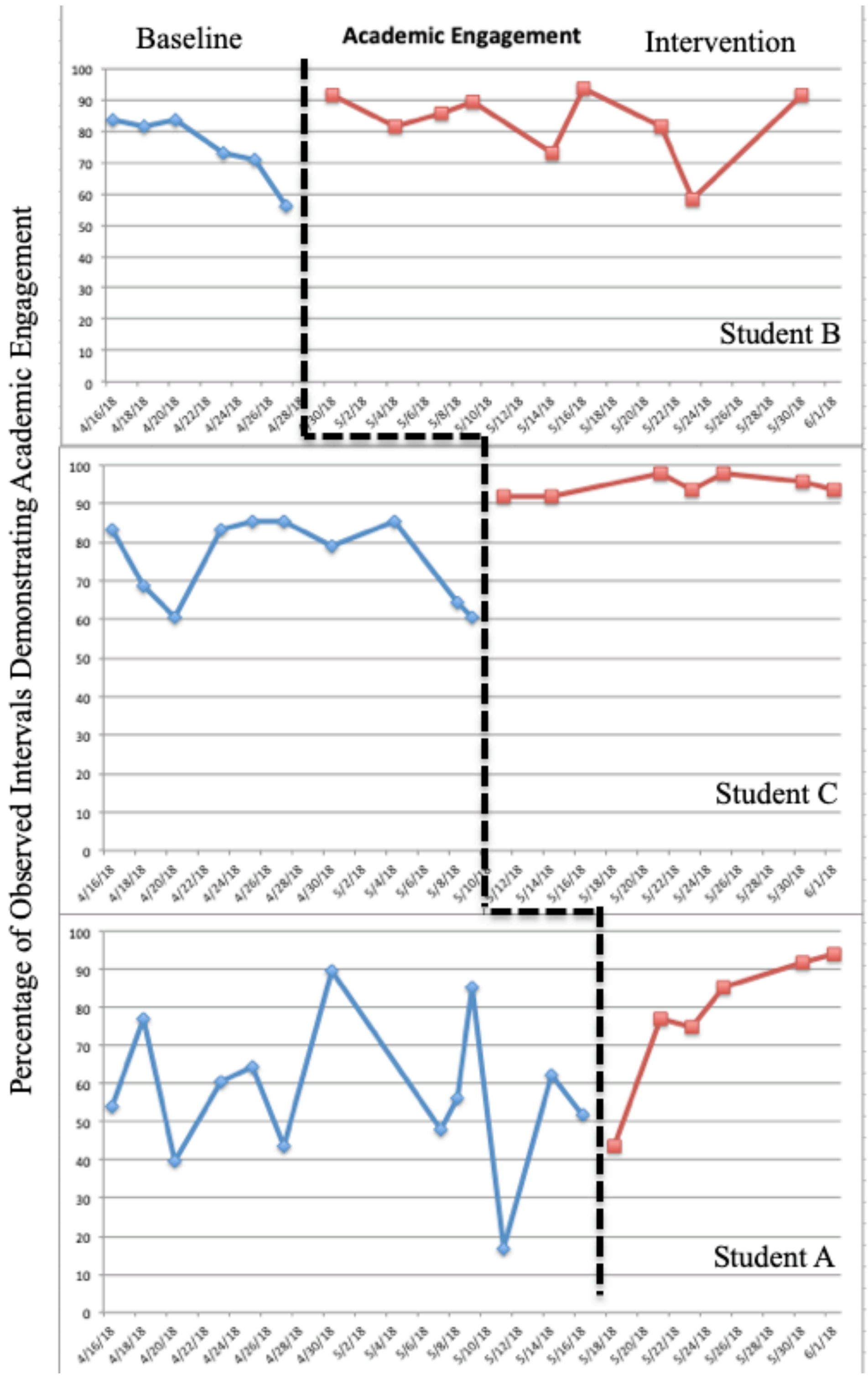

Figure 6A

Multiple Baseline Data for Current Study: Academic Engagement

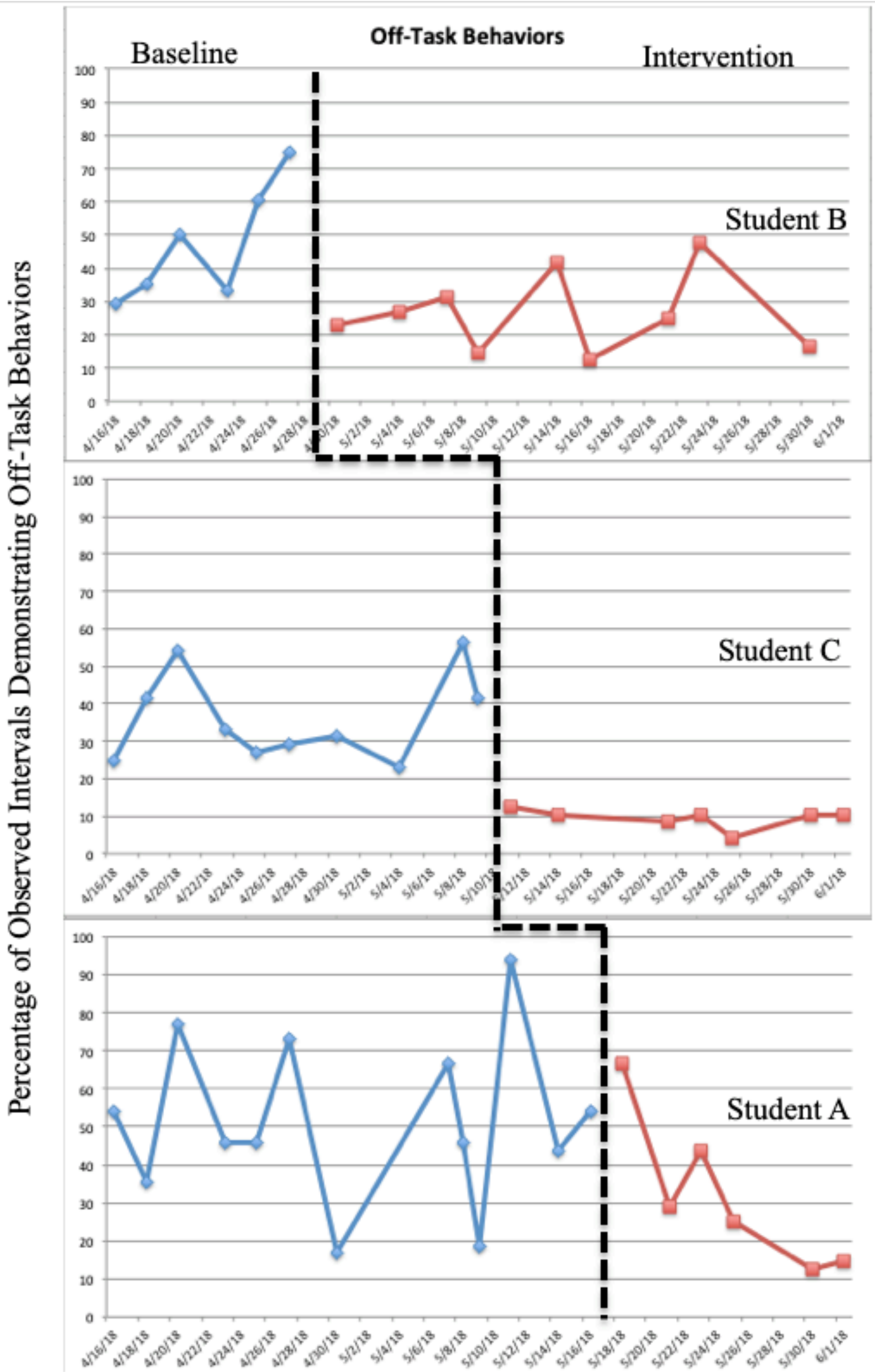

Figure 6B

Multiple Baseline Data for Current Study: Off-Task Behaviors

Appendix A

Mind-on-Breathing Instructions / Protocol

Preliminary Instructions: How to Breathe

Instructions for the interventionist are written in normal type face, while suggested scripts to be read aloud are written in italics. However, suggested scripts are simply suggestions and do not need to be repeated verbatim. Instructions may be repeated in part, or whole, as needed.

Begin by introducing the participant to the mindfulness breathing exercise by providing an introductory statement with basic definition of mindfulness and a description of the task. For example:

Today we will learn a mindfulness-breathing exercise. Mindfulness means focusing on the present experience and nonjudgmentally letting go of other thoughts. Together, we will try to mindfully carryout a simple breathing exercise for 5 minutes.

List the following components of the breathing exercise. Components 1-3 can be presented in any order, but it is recommended that the procedures for respiration presented in components 4-7 be presented in order.

1) Sit or stand with your best posture.

2) Close your eyes.

3) Place a hand on your stomach.

4) When you inhale, focus on the feeling of the air entering your body and filling up your lungs. Draw the air into your body, through the nose, by contracting the *diaphragm. You should feel the air expand your body, filling up your lungs as your diaphragm pushes out on your stomach. Feel this with your hand.*

5) Once your body feels full, notice the period between inhalation and exhalation.

6) Following the natural inclinations of your body, let go of the breath. Do not forcibly exhale the breath. Instead, let the difference in pressure gradients release the air from the chamber of your lungs, like air from a balloon. Feel your stomach returning to its resting position using your hands.

7) Once empty, notice the moment between exhalation and inhalation. Following the natural inclinations of your body, repeat the process.

Daily Instructions: Mind-on-Breathing

Suggested prompt to begin exercise following Day 1:

Its time for another 5-minute session of Mind-on-Breathing. Remember the breathing-exercise we have worked on, do you have any questions or need a reminder of what to do?

1) Repeat Day 1 Steps and/or answer questions if needed.

2) Begin M.O.B intervention. Start 5-minute timer.

Suggested phrasing (does not need to be repeated verbatim):

Take a moment for yourself and let go of thoughts relating to what has happened, is happening elsewhere, or is going to happen. In this moment, focus exclusively on breathing in a relaxed, natural, and diaphragmatic manner. When you find your thoughts deviating to other topics, try to nonjudgmentally return your attention to your breathing.

2a) Provide Mindfulness Reminders Periodically.

For example*: If you feel yourself feeling hungry, its okay, you will be able to eat later. If you feel an itch on your nose, it is okay, you can scratch it later. If you smell something funny, its okay, you can figure it out later. If you are thinking of your friends and family, its okay, but you can think about them later. Until the alarm sounds, we are only focused on our breathing.*

2b) Provide Instructional Reminders Periodically.

For example: *Try to keep good posture. Keep your eyes closed and your hands on your stomach. Feel the air enter your body as it pushes out against your hand. Don't push out the breath, instead, just let it go.*

Periodic Instructional Reminders can, and should be, primarily phrased as reinforcement rather than corrections. For example, if the student is exhibiting all MOB behaviors during sessions, the interventionist can say, "great job keeping your hand on your stomach", "keep up the good work breathing naturally", "I like how you are sitting upright with eyes closed", and so on. Aim for a 4:1 ratio of praise to corrections (Trussell, 2008, p. 184).

3) Conclude MOB intervention session.

Use reinforcement, both praise and tangibles, for students participating in the intervention. Consult with school personnel to identify appropriate tangible reinforcers (e.g., bouncy balls, book marks, erasers, etc.).

Appendix B1

Mind on Breathing: Treatment Integrity Checklist

M.O.B. Component		**Degree of Implementation**		
	Not Observed (1)	**Observed Once (2)**	**Occasionally Observed (3)**	**Frequently Observed (4)**
Interventionist Behaviors				
Ask Student if Instruction is Needed				
Correct Use of Timer				
Periodic Instructional Reminders (Praise or Corrections)				
Periodic Mindfulness Reminders				
Reinforcement Delivered Post Session				
Student Behaviors				
Eyes Closed				
Hand on Stomach				
Good Posture				
Diaphragmatic Breathing				
Relaxed Exhalation (not forced)				

Score / Max Score = Treatment Integrity Score
______ / 34 = ______________________

Appendix B2

Operational Definitions for the Mind on Breathing: Treatment Integrity Checklist

Interventionist Behaviors

-1) Ask student if instruction is needed:

-Definition: Interventionist should ask student participant if they remember how to engage in the MOB breathing exercise.

-Example: Student, could you please show me the four components of MOB? If you remember, can you tell me the four components of the mindfulness breathing exercise?

-Non-example: You remember what to do, right? Lets begin.

-2) Correct Use of Timer:

-Definition: Interventionist begins a 5-minute timer once the student is ready to engage in MOB. Timer should begin once student has exhibited all required behaviors and accompanied with a verbal cue.

-Example: Student, you look ready to begin. I will hit “start” on this timer and then we will begin MOB for 5 minutes. Interventionist then hits begin. Interventionist ends MOB when timer sounds.

-Non-examples: Interventionist starts 5-minute timer when student enters room. Interventionist starts timer when asking if instruction is needed. Interventionist starts 5-minute timer appropriately, but ends MOB early or late.

-3) Periodic Instructional Reminders

-Definition: Interventionist frequently provides instructional statements to the student, either praise or correctional, to help remind the student to carry out the mandatory MOB behaviors.

-Examples. When interventionist notices student with eyes open, they may respond, “Please remember to keep your eyes closed. You can open your eyes when the timer sounds. For now, we are just doing MOB”. When interventionist notices a student sitting upright with hand on stomach, he/she may respond, “great job remembering to keep your hand on your stomach so that you can feel your body filling up with air as you inhale, and losing air as you exhale”.

-Non-example: Interventionist notices student engages in all the appropriate behaviors, but does not provide instructional reminders in the form of praise. Interventionist only provides periodic mindfulness reminders. Interventionist only provides instructional reminders at the beginning of session.

-4) Periodic Mindfulness Reminders

-Definition: Interventionist frequently provides statements to student participant to remind them to engage in mindfulness practice while engaging in MOB.

-Examples: Interventionist will frequently provide reminder statements such as, “If you feel your mind wandering to something other than your breathing, that is okay, but try to return your attention to your breath”, “If you feel an itch on your nose, that’s okay, you can scratch it later. Right now, we are breathing until we hear the timer”, “If you feel hungry and are thinking of lunch, that’s okay, lunch will come, but right now we are doing MOB until we hear the timer" and "If you smell something funky and you want to look around, that's okay, you can do so when the timer sounds, but for now, we are only focused on our breathing".

-Non-examples: Interventionist only provides instructional reminders. Interventionist says to student, "Focus on breathing! If you aren't, you are doing it wrong!".

-5) Reinforcement Delivered Post Intervention

-Definition: Interventionist provides student with reinforcement following MOB intervention.

-Example: Interventionist allows student to pick between a sticker, ruler, or other tangible reinforcer after the 5-minute timer sounds.

-Non example: Interventionist returns student to class without reinforcing the use of the MOB intervention. Interventionist uses praise only to reward student for participation.

Student Behaviors

-1). Eyes Closed

-Definition: student presents with eyes closed, both eyelids touching, when instructed to begin MOB intervention and continues to keep eyes closed until after 5 minute timer has sounded.

-Example: student has eyes closed.

-Non example: student sits with eyes open, focused on either a static object or changing focus of attention around the room.

-2) Hand on Stomach

-Definition: student places one or two hands gently on stomach. Hand should be resting comfortable on stomach.

-Example. Student sits with one hand on stomach.

-Non example: Student pushes against stomach with hand, preventing diaphragmatic breathing for raising the stomach area. Student sits with hands relaxed to their side. Student sits with hands placed on top of head. Student holds tangible item, like a fidget-spinner, in hands during intervention.

-3) Good Posture

-Definition: student sits or stands with a straight back, or as straight as naturally comfortable for particular individual participant.

-Example: student stands upright to best of ability for duration of MOB intervention. Student with scoliosis sits or stands with best posture that is comfortable for the duration of MOB intervention.

-Non example: student lays on ground, with straight back, for duration of MOB intervention. Student sits with relaxed posture in chair during MOB intervention. Student stands and leans against wall for MOB intervention.

-4) Diaphragmatic Breathing

-Definition: a particular form of nasal breathing that focuses attention on using the diaphragm to draw air into the body across a pressure gradient, observable as the abdomen rises.

-Example. Slowly breathing in through the nose, allowing the body to fill with air, observable as the abdomen rises as the diaphragm contracts.

-Non example: Rapidly breathing in and out through the mouth. During inhalation, the abdomen does not appear to be moved by diaphragm. The chest appears to expand with inhalations.

-5) Relaxed Exhalation

-Definition: natural exhalation that occurs through automatic physiological processes, such as relaxation of diaphragm, forcing the air out of the body across the pressure gradient.

-Example. Post inhalation, the student relaxes their body and exhalation occurs slowly and naturally until the student receives physiological prompts to inhale (e.g., lungs feel empty and wanting to inhale a fresh breath)

-Non example. Post inhalation, the student quickly and forcibly exhales the breath and quickly begins the next inhalation phase.

Appendix C

URP-Intervention

Directions: Consider the described intervention when answering the following statements. Circle the number that best reflects your agreement with the statement, using the scale provided below.

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	This intervention is an effective choice for addressing a variety of problems.	1	2	3	4	5	6
2.	I would need additional resources to carry out this intervention.	1	2	3	4	5	6
3.	I would be able to allocate my time to implement this intervention.	1	2	3	4	5	6
4.	I understand how to use this intervention.	1	2	3	4	5	6
5.	A positive home-school relationship is needed to implement this intervention.	1	2	3	4	5	6
6.	I am knowledgeable about the intervention procedures.	1	2	3	4	5	6
7.	The intervention is a fair way to handle the child's behavior problem.	1	2	3	4	5	6
8.	The total time required to implement the intervention procedures would be manageable.	1	2	3	4	5	6
9.	I would not be interested in implementing this intervention.	1	2	3	4	5	6
10.	My administrator would be supportive of my use of this intervention.	1	2	3	4	5	6
11.	I would have positive attitudes about implementing this intervention.	1	2	3	4	5	6
12.	This intervention is a good way to handle the child's behavior problem.	1	2	3	4	5	6
13.	Preparation of materials needed for this intervention would be minimal.	1	2	3	4	5	6

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
14.	Use of this intervention would be consistent with the mission of my school.	1	2	3	4	5	6
15.	Parental collaboration is required in order to use this intervention.	1	2	3	4	5	6
16.	Implementation of this intervention is well matched to what is expected in my job.	1	2	3	4	5	6
17.	Material resources needed for this intervention are reasonable.	1	2	3	4	5	6
18.	I would implement this intervention with a good deal of enthusiasm.	1	2	3	4	5	6
19.	This intervention is too complex to carry out accurately.	1	2	3	4	5	6
20.	These intervention procedures are consistent with the way things are done in my system.	1	2	3	4	5	6
21.	This intervention would not be disruptive to other students.	1	2	3	4	5	6
22.	I would be committed to carrying out this intervention.	1	2	3	4	5	6
23.	The intervention procedures easily fit in with my current practices.	1	2	3	4	5	6
24.	I would need consultative support to implement this intervention.	1	2	3	4	5	6
25.	I understand the procedures of this intervention.	1	2	3	4	5	6
26.	My work environment is conducive to implementation of an intervention like this one.	1	2	3	4	5	6
27.	The amount of time required for record keeping would be reasonable.	1	2	3	4	5	6
28.	Regular home-school communication is needed to implement intervention procedures.	1	2	3	4	5	6
29.	I would require additional professional development in order to implement this intervention.	1	2	3	4	5	6

Appendix D

CURP - Actual

Directions: Think about the method that your teacher or other adult has used with you. After reading each sentence, circle the number that matches your belief about it. For example, if the sentence was "I like chocolate ice cream," you might circle "4" for "I totally agree."

		I totally disagree	I kind of disagree	I kind of agree	I totally agree
1.	This was too much work for me.	1	2	3	4
2.	I understand why my teacher picked this method to help me.	1	2	3	4
3.	I could see myself using this method again.	1	2	3	4
4.	This is a good way to help students.	1	2	3	4
5.	It is clear what I had to do.	1	2	3	4
6.	I would not want to try this method again.	1	2	3	4
7.	This took too long to do.	1	2	3	4
8.	If my friend was having trouble, I would tell him/her to try this.	1	2	3	4
9.	I was able to do every step of this method.	1	2	3	4
10.	I felt like I had to use this method too often.	1	2	3	4

USAGE RATING PROFILE

		I totally disagree	I kind of disagree	I kind of agree	I totally agree
11.	Using this method gave me less free time.	1	2	3	4
12.	There are too many steps to remember.	1	2	3	4
13.	Using this method got in the way of doing other things.	1	2	3	4
14.	I understand why the problem needed to be fixed.	1	2	3	4
15.	This method focused too much attention on me.	1	2	3	4
16.	I was excited to try this method.	1	2	3	4
17.	This method made it hard for the other students to work.	1	2	3	4
18.	I would volunteer to use this method again.	1	2	3	4
19.	It is clear what the adult needed to do.	1	2	3	4
20.	I was able to use this method correctly.	1	2	3	4
21.	I liked this method.	1	2	3	4