2019

The Effects of a Guided Imagery Intervention on the Working Memory of Primary Aged Students

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THE EFFECTS OF A GUIDED IMAGERY INTERVENTION ON THE WORKING MEMORY OF PRIMARY AGED STUDENTS

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Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Psychology

July 2019

SCHOOL OF
PROFESSIONAL AND
PSYCHOLOGY

DISSERTATION APPROVAL

This is to certify that the thesis presented to us by Monica Addison-Walker, on the 25th day of June, 2019, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

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DEDICATION

To Marguerite and James Walker for suggesting the journey and Dr. Elizabeth A. Stafford for making the journey happen. I am humbled by your continued love, support, and faith.

ACKNOWLEDGEMENTS

This journey would not be possible without the academic and professional support of several persons. I send endless praise to a phenomenal committee: Dr. Virginia Salzer, Dr. George McCloskey, and Dr. Jobert Barin for their patience, guidance, and technical support; undying gratitude for professional advice, and mentorship to Dr. Margaret Grady Kidder; endless appreciation to Paul Kristoff (principal), Anita Grauer, Christian Knorr, and Ramona Schueler of the St Michael's St. Clements School for leading the guided imagery intervention; and Dr. Erika Wood and Dr. Joshua Foy for the best Baltimore team that PCOM ever encountered.

ABSTRACT

Many practitioners view working memory as the temporary capacity to store and manipulate information. Current findings suggest a developmental trajectory of working memory and other executive functions. Limited research has been effective in improving working memory using short term methods; however, recent findings suggest guided imagery and mindfulness meditation improves working memory in children. This study examined whether or not a 30 day guided imagery intervention affected the working memory of students in the primary grades of an elementary school. Participants from a sample of convenience were randomly assigned to a guided imagery intervention (n = 12) or to a waitlist control group (n = 12) and received the intervention following the 30 day implementation. Pretest and post test data determined no interaction between the groups and pretest and posttest measures following interaction. Qualitative data from teacher reports note growth in the ability to complete tasks independently and following multi-step directions. The study supports the feasibility of using a time limited guided imagery intervention with younger students during the school day to foster classroom climate and student mood. Study design elements hampered determining the impact of the guided imagery intervention on working memory and executive functioning. Additional studies may demonstrate these effects.

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CHAPTER 1: INTRODUCTION

School systems across the United States have grappled with assisting children in meeting the demands of increasingly academic, technological, and literacy-based curricula. Although struggles with meeting these demands have been explored through inequities in racial, cultural, socio-economic and cognitive differences, many students within of the general population additionally experience difficulty managing cognitively complex demands and stressors; this interferes with their ability to sustain attention effectively during learning, which in turn affects academic performance. Although young children are capable of holding and manipulating two unrelated thoughts, they struggle with attending and recalling information, especially when experiencing high memory load (Davidson, Amso, Anderson, & Diamond, 2006; deFokert, Rees, Frith, & Lavie, 2001). However, the developmental nature of memory capacity becomes further hampered by stressors and attention to task. According to a review by Matheny, Aycock, & McCarthy (1993), many primary-aged children experience stressors related to peer relationships, school work load, personal loss and injury, and loss of autonomy within the school setting. The natural preoccupation with these stressors affects a student's ability to be ready to learn; preoccupation with stressors may decrease focus and sustained attention during instruction. Several findings have asserted that mind wandering affects a student's ability to sustain attention to academic learning (Mrazek et al., 2013).

Within the structure of working memory, various conceptual models associate the integration of executive function into the effectiveness of working memory. For example, individuals need to update the contents of the working memory, shift between tasks, and inhibit irrelevant material (Titz & Karbach, 2014). However, high levels of stress and mind wandering may interfere with a student's ability to hold, manipulate, and recall material effectively (Mooneyham & Schooler, 2013). Fortunately, mindfulness training assists as a protective factor for working memory capacity during periods of high stress (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010), increases attention (MacLean et al., 2010; Morrison, Goolsarran, Rogers, & Jha, 2013; Mrazek, Franklin, Phillips, Baird, & Schooler, 2013), improves visual perception (McLean et al., 2010), and has proven beneficial in treating various mental health concerns (Cullen, 2011; Rees, 1995). Although most school-based interventions have focused on fostering resilience and reducing stress through coping and self-monitoring skill development (i.e. mindfulness-based stress reduction, mindfulness-based cognitive therapy, relaxation scripts, guided imagery, and self-hypnosis) (Burke, 2010; Cullen, 2011; Matheny, Aycock, & McCarthy, 1993; Meiklejohn et al., 2012), the interventions have not attempted to assist in supporting cognitive areas that may become impaired or delayed by the presence of continued stress.

The cognitive construct of working memory plays an important role in academic learning. Educational research has demonstrated the importance of holding, manipulating, and recalling information in academic achievement (Bayliss & Jarrold, 2014; Burgess & Braver, 2010; Bull, Johnston, & Roy, 1999; St Clair-Thompson & Gathercole, 2006). Specifically, research confirms that good spatial working memory performance was associated with academic success, and that students with internalizing symptoms (anxiety and depression) experienced lowered functioning (Aronen, Vuontela, Steenari, Salmi, & Carlson, 2005). Unfortunately, findings by Alloway (2012) reveal that educators have limited awareness of working memory, but they tend to identify students with working memory deficits through their behavioral concerns. However, behavioral concerns by educators may not be unfounded, given that children with working memory deficits experience more inattention (Alloway, Gathercole, Holmes, Place, Elliott, & Hilton, 2009). Through the use of rating scales and extensive observations, findings indicate that many educators describe children with poor working memory as struggling to follow directions, recalling details of ongoing activities, monitoring progress in multi-step tasks, and completing assignments (Alloway, Gathercole, Kirkwood, & Elliott, 2008). An additional study notes that children with poor comprehension, those at risk for learning disabilities and attention deficit/hyperactivity disorder, struggle with letting go of irrelevant material and demonstrate the weakest verbal working memory performance, when compared with other groups (Palladino & Ferrai, 2013). Additional findings note that younger school-aged children with internalizing symptoms (e.g. anxiety, & depression) also have weaker working memory skills, especially in audio spatial memory (Aronen, Vuontela, Steenan, Salmi, & Calson; 2005). Researchers have developed various theoretical models to define and to explain the complexity and interconnectedness of neural pathways associated with the executive function of working memory. In order to better understand the impact on working memory and learning, Baddeley, Gathercole, & Pagagno (1998) demonstrated that the phonological loop (a component of working memory) has a direct role in language learning by processing unfamiliar speech input.

Although the construct and measurement of working memory have been well studied and documented by research, mindfulness and its practices have remained elusive in definition and assessment. Although there is a better understanding of the importance of working memory, limited methods of improving this executive function have been explored. Associations with mindfulness practices and improvements in working memory and sustained attention have been noted (Jha, Stanley, & Baime, 2010; MacLean et al., 2010). Within some bodies of research, guided imagery may also be referred to as a mindfulness practice. Unfortunately, mindfulness training encompass a diverse range of practices from ancient Buddhist traditions; this complicates the development of effective tools for its measurement and study, given that Western sciences have a limited understanding of unfamiliar languages and spiritual practice (Baer, 2011). Although this research will not attempt to add to the body of studies exploring the efficacy of measuring guided imagery and mindfulness, this study will attempt to operationalize guided imagery in a manner that holds true to basic tenets of the mindful training described in specific Buddhist practice and does assert that guided imagery may have the capacity to affect cognitive processes beyond the well-researched uses such as, stress and pain reduction.

The following section will review the components of working memory, explore the neurological complexity of working memory, state the limitations of effective interventions for working memory, provide a working definition of guided imagery and its connection to mindfulness-based practices, and report the current practices associated with the use of guided imagery.

An effective method for measuring possible growth following the intervention was achieved through baseline and posttest measures in order to gain comparative information. Working memory is often best measured through the use of digit span assessments; however, executive function rating scales that include information regarding working memory have also proven useful in determining overall deficits (Alloway, Gathercole, Holmes, Place, Elliott, & Hilton, 2009). Both forms of measurement have their own limitations. Individually measuring working memory through digit span tasks may be time consuming for the researcher and more invasive to young subjects. Given the fact that this will need to occur at the end of a specific time period, students may potentially perform better due to a learning effect. For example, the repetition of the task for this study in a 30 day period may fail to be a period long enough for students not to consider the task novel. Children may remember initial difficulties or strengths with the task and exhibit more motivation in attending to the activity. Therefore, other variables such as attention to task and motivation may have greater impact on working memory. Rating scale information collection may also be lengthy and fraught with potential bias from individual raters (Alloway et al., 2008). Some scales also may not effectively differentiate between working memory and long-term memory, creating confounds in the results. This study utilizes three standardized subtests from a well-researched intellectual assessment in order to measure working memory. Students were individually administered digit span, spatial span, and the arithmetic subtests by the examiner prior to intervention and immediately following the 30 day intervention time period. Participants were then randomly assigned to an intervention group or a waitlist-control group. Classroom teachers participating in the study had the opportunity to share insight into the effectiveness of the program and express any changes that occurred among students' abilities to achieve the following through a brief open ended interview: retain oral information, complete tasks and assignments, and improve classroom climate.

CHAPTER 2: LITERATURE REVIEW

The ability to follow verbal and visual directions assists students in effectively completing academic tasks and navigating through the school day. When students with weaker cognitive flexibility and working memory become hampered by their inabilities to prioritize, retain, and recall information as they transition through the school day, academic skills can suffer over time (Diamond & Lee, 2011; St. Clair-Thompson & Gathercole, 2006). Cognitive flexibility allows students to shift among activities, filter interference, and problem solve as they navigate through their day. Some younger students have the ability to effectively “let go” of the many facets of their young lives (e.g. thoughts from home, previous conversations or disagreements, and past subjects); however, many primary age students often become preoccupied with their thoughts and lose focus in the classroom during direct instruction. Furthermore, young children do not always know how to prioritize oral information or “let go” of things that are not critical for instruction; they recall all information and fail to initiate tasks due to an inability to determine information relevant to the task. Therefore, schools need to teach students effective skills in “freeing up space” in their young minds so that they may be more successful in maintaining, recalling, and implementing verbal material. Although most educators recognize that primary grade students do not have well developed executive functions, educators provide limited instruction in assisting children in developing executive skills crucial to implementing basic school expectations effectively such as; morning activities, following classroom routines and procedures, and foundational steps for reading, writing, and arithmetic. Although positive classroom management includes teaching routines and procedures, educators provide little direct instruction in preparing young minds to retain oral and visual material. Students who have continued struggles with working memory have difficulty coping multi-level demands of learning activities as they progress in their education (Alloway, Gathercole, Holmes, Place, Elliott, & Hilton, 2009).

Working memory is described as the temporary capacity to store and manipulate information. The working memory system is divided into a short-term storage and “executive process” (Smith & Jonides, 1999). Short-term storage refers to maintaining information temporarily within specific domains; the “executive processes” refers to higher cognitive functions that operate on the material placed in short term process. The ability to process and store information differentiates working memory from short term memory (Baddeley, 2010). The ability to hold and manipulate information not only influences general memory but also facilitates completing tasks successfully. The capacity of working memory has been associated with cognitive skills (i.e. reading, mathematics, language comprehension, and general fluid intelligence) (Bayliss & Jarrold, 2014; Burgess & Braver, 2010; St Clair-Thompson & Gathercole, 2006). Although many cognitive processes assist in the self-regulation, social engagement, and cognitive competence in young children, one cognitive process, working memory, assists in the maintenance of information.

Neurological Findings and Working Memory

A healthy debate in research exists to identify the areas of the brain associated with working memory and other executive skills, as well as the general cognitive skills necessary in task completion. A body of research suggests that executive functions have a developmental trajectory and that working memory develops during middle childhood and adolescence (Best, Miller &Jones, 2005). Findings by Rothbart (2010) suggest that control structures related to executive attention and effortful control may be present in infancy but do not exercise their full control over other networks until later in development. Neurologically, this means activity in frontal areas and lateral parietal areas are more representative in younger children. The construct of executive function has been associated with cortical activity in the prefrontal cortex and anterior cingulate cortex (Miyake et al., 2000). The anterior cingulate cortex has a relationship to self-regulation and executive attention. This structure changes in its connectivity during infant and child development due to maturation. Within this area, working memory and other executive processes interact to implement various higher cognitive functions and visual selective attention (deFockert, Rees, Frith, & Lavie, 2001). Although various executive processes involve cortical activity in the prefrontal cortex (Miyake et al., 2000), Blair, Zelazo, and Greenberg, 2005), imaging studies suggests that the interconnection of the prefrontal, limbic, and brainstem structures play a role in the goal orientated activities of working memory, such as problem solving (Klingberg, 2014).

Tang, Lu, Geng, Stein, Yang, & Posner (2010) studied white matter changes in the anterior cingulate cortex The white matter adjacent to the frontoparietal regions is critical to working memory (Tang et al., 2010). Findings from neuroimaging suggests that white-matter changes following 6 hours to 11 hours of integrative body-mind training. Neurological differences were possibly attributed to increased myelination after training. Their findings provide a means for improving self-regulation, possibly leading to an intervention tool for persons with these deficits. Klingberg (2014) cautions that skill learning simultaneously interacts with maturation, which strengthens the understanding of a developmental trajectory for working memory and may impact the overall effects of training alone on working memory improvement in children. A review of studies utilizing positron emission tomography (PET) and functional magnetic resonance (fMRI) imaging by Smith & Jonides (1999) notes specific areas in the premotor, Boca's area, and prefrontal cortex associated with the rehearsal of phonological information. This rehearsal circuit appears to play a significant role in verbal storage for working memory. However, the brain utilizes various routes for spatial and object storage. For instance, Smith & Jonides (1999) cite that spatial storage activates more of the right premotor cortex, whereas object storage activates ventral regions of the prefrontal cortex. Although this body of research does not focus solely on the neurological aspects of working memory, understanding the researched-based route used by working memory supports the theoretical model utilized within this study.

The Baddeley Model

In understanding the cognitive process of working memory, extensive research by Baddeley and colleagues have sought to understand the complexities of the executive process and provide a framework to account for results in activities purported to measure this executive function. Although research uses several theoretical models for working memory, this study focuses on Baddeley's model of working memory. Baddeley (2010, 2012) asserts that working memory is the combination of the storage and manipulation of information rather than just the storage of information for short term memory. The multicomponent framework for working memory developed by Baddeley and Hitch involved an "articulatory loop", later described as the "phonological loop" (storage of verbal material), visuo-spatial sketchpad (visual and/or spatial material) and a "central executive" (central controller) (Baddeley, 1996; Baddeley, 2012).

The Phonological Loop

Baddley (1996) suggests that being able to maintain information through vocal or subvocal rehearsal becomes an important component to rapid, temporary storage in the phonological loop. His early studies proposed two main features for the phonological loop: speech-like memory traces that diminish after a few seconds and traces reactivated by vocal and subvocal rehearsal (Baddeley, 2012). Baddeley also suggests other plausible explanations for the patterns that could explain their results. One effect involves looking specifically at how individuals store phonetically similar words, which he considers a phonological similarity effect recall. This effect becomes more difficult with similar sounding words and phonemes versus random word groupings because of the speech-like memory feature (e.g. the similar sounding letters C and B are harder to recall than words with the sounds W and K). Word length also can have an effect on recall. For example, five single syllable words are easier to recall than five multisyllabic words and they take less time to rehearse. The study concludes that individuals can recall only as many words as they can articulate, and that the longer time persons spend in rehearsal, the weaker their recall for immediate memory (Baddeley 2012). The suppression of this effect was investigated through the utterances of related and unrelated sounds (both types were effective in suppression).

Other perspectives offer alternative theoretical explanations for individual differences in memory capacity with speech related material. Similar to portions of the Baddeley model, working memory analyzes syntax, establishes meaning and integrates the meaning in the phonological units; however, the memory capacity model emphasizes two basic assumptions: the limitation of resources affecting cognitive functioning and the variation of the resources needed in complexity of tasks (Hasher and Zacks 1988). Early work by Hasher and Zacks (1988) used this model to understand the storage capacity of working memory in older adults for language-based material. In the study, subjects read passages and then responded to words that infer information about the passages read. Their findings suggest that the ability to inhibit irrelevant details affects working memory due to the opportunity to access necessary information from memory. Understanding that inhibition disrupts efficient working memory strengthens the premise of interconnectivity between core executive functions; however, the study does not provide explanations for the reasons why older adults may substitute material with similar sounding information; these may be better explained through the phonological loop subsystem previously described and natural decline in the aging process (Best, Miller, & Jones, 2009).

Visuospatial Sketchpad

The visuospatial sketchpad is believed to have the capacity to maintain and manipulate visual and spatial material (Repovs & Baddeley, 2006). In understanding how individuals use visual imagery in encoding visual material, foundational studies by Baddeley utilized blindfolded participants to track a sound source or to detect increasing brightness in their field (based on the understanding that visual and spatial skills are distinct components). The findings suggest that this portion of the system used more spatial skills than visual skills. However, another colleague working with Baddeley (Robert Logie) determined that some imagery tasks were visual (Baddeley, 2012). By utilizing a visual imagery mnemonic, he demonstrated that unrelated words could be recalled by visual interaction (e.g. visualizing a hat on a dog). This visual tool demonstrates that training has the ability to increase working memory capacity (Klingberg, 2014). Furthermore, Baddeley notes that coding may occur through touching and grasping objects; however, little is known about how the different receptors associated with touch affect short term memory (storage) and ultimately, working memory. The fractionation of the visuospatial system suggests that individuals use various methods in the rehearsal of the sketchpad to hold on to information and in manipulating information; more research needs to be forthcoming in understanding spatial manipulation, temporary visual storage, and visuospatial rehearsal.

The Central Executive

The central executive (a control function of working memory) has been understood through two approaches: neurobiological and psychometrics. The neurobiological approach initially sought to define the central executive within the frontal lobes, based on deficits found in adult patients with frontal lobe damage (Best, Miller, & Jones, 2009). However, neuroimaging studies have expanded this understanding by highlighting the interconnected cortical areas and incorporating a developmental trajectory for working memory. Scherf, Sweeney, & Luna, (2006) utilized a visuospatial working memory task (fixating on a visual areas and recalling the location of a visual stimulus) and noted correlations between structural brain changes and task performance and how these changes become impacted by development in adolescents and adults. Imaging (fMRI) supported the idea that children relied more heavily on ventromedial regions (thalamus and basal ganglia) and shifted to greater activity in frontal regions in adolescence, including the first significant activation of the anterior cingulate in fMRI data (Scherf, Sweeney, & Luna, 2006).These findings imply that as children gain more cognitive efficiency, the brain begins to develop more functional specialization. An additional study indicated the activation of the left ventrolateral cerebral cortex following interference using the verbal subsystem of the WM.

The psychometric model proposed by Baddeley associates the central executive as maintaining all functions outside the two subsystems (phonological loop and visuospatial sketchpad). Most research in this area used concurrent tasks to disrupt working memory with the understanding that highly attentional demands will place stresses on the central executive. Baddeley utilized strategies such as counting backward by threes from a high digit number in order to separate the contributions of the initially proposed systems in working memory (Repovs & Baddeley, 2006). Similar to the neurological developmental trajectory of working memory, the central executive also has a developmental course. Findings by Michalczyk, Malstädt, Worgt, Könen, & Hasselhorn (2013) determined that there was less involvement of the central executive in younger children due to an automatic sub-vocal rehearsal process commonly associated with the phonological loop. In understanding the central executive, Baddeley proposed that an executive needed to be able to focus attention, have the ability to divide attention between stimuli, switch between tasks, and interface with long term memory (Baddeley 1996; 2012). The appreciation that some form of a centralized control mechanism operates in working memory to coordinate the subsystems leads to another larger approach.

Measuring Working Memory

Using the aforementioned framework for understanding working memory, researchers have sought to find effective methods of evaluating frontal lobe activity and executive functions in general. The Corsi block task and other stationary random block boards have been utilized to measure the visual-spatial sketchpad by determining the span length recalled by an individual. In this task, the individual points to sequences of blocks of increasing lengths. The Wisconsin Card Sort Test (WCST) was initially employed for the purpose of evaluating frontal lobe functioning; however, the instrument has a problem of task purity, given its lack of specificity (which area of executive function) and the amount of processes potentially involved in executing the test (Miyake et al., 2000). Early research in working memory involved short term memory activities such as repeating sequences of numbers. Baddeley, Gathercole, & Papagno (1998) note that the digit span measures commonly found in standardized ability tests provide information about the capacity on an individual's phonological loop. Baddeley (1996) found that as sequences increased, performance decreased for participants. The introduction of inhibition to working memory tasks in order to control specific variables allowed for a more integrative approach. Following the Baddeley model, the Random Number Generation (RNG) task explores functioning within the central executive. In a multi-component study, Miyake et al. (2000) utilized a confirmatory factor analysis to determine the relationship between shifting inhibition and updating of working memory with complex executive skills. Data indicated that RNG employs other executive skills (inhibition and updating) to subdue stereotyped and habitual responses.

The exploration and development of working memory and other executive functions initially was limited, due to inadequate measures available to use with young children. Understanding the development and trajectory of working memory in young children may assist in the expansion of more effective interventions in early developing psychopathologies and learning disabilities in children. Work by Garon, Bryson, & Smith (2008) note the progression of executive functions before the age of three years and that changes to executive control may be attributed to the ability to attend with maturation. Epsy, et al. (2005) utilized between-groups approach to exploring working memory with preschoolers with high and low memory spans. Similarly, Carlson (2005) implemented a series of researched-based preschool executive function tasks to determine the sensitivity of these measures to the developmental needs of children. Carlson concluded that the most difficult tasks involved activities with inhibition and working memory (reverse categorization, backward digit span, and Dimensional Change Card Sort). Although the findings produce consistent understandings of how working memory becomes impacted by cognitive load, it also attempted to better operationalize the construct of working memory and add additional insight into the importance of individual differences on working memory.

Although initial research focused extensively on early development of executive skills in preschoolers, interest in more recent information has occurred with regard to school aged populations. Bayliss & Jarrold (2014) explored individual differences in children who completed working memory span tasks that involved processing and storage episodes. Data established that working memory span performance diminishes in children; this involves storage ability, speed of processing and by the rate that they forget material. Similarly, Michalczyk et al. (2013) found fewer structural changes in the organization of working memory throughout childhood. In their study exploring the adequacy of the Baddeley model, data indicated a strong relationship between the central executive and the two subsystems. Consistent with preschool findings, the central executive function (later developing) had less involvement with the phonological loop.

Interventions for Working Memory

Various interventions have been explored to aid in the development of executive functions and specifically working memory. Promising results indicate general improvement in cognitive processing; however, Shipstead, Redick, & Engle (2012) note that most studies fail to use various tasks in the measurement of working memory, vary in the consistency of valid working memory measures, lack the use of control groups in the studies, and report self-report measures of change, leading to questions regarding the efficacy of the interventions utilized. Classroom-based interventions were also explored to assist in minimizing the effects of working memory deficits on long-term academic achievement. Research by Elliott, Gathercole, Alloway, Holmes, & Kirkwood (2010) increased educator awareness and understanding of working memory difficulties in order to decrease the memory load placed on students with established low working memory during instruction and used behavioral approaches for direct instruction in order to improve basic skills in language, reading, and mathematics. Results from the study indicated that these interventions had no significant impact on improving the working memory for children between the ages of 5-6 and 9-10 years.

Furthermore, some studies use simple span tasks which are usually utilized to measure short term memory, omitting the manipulation component required in working memory. Diamond and Lee (2011) reviewed several interventions such as curricula, aerobics, martial arts, and yoga which assist in self-regulation, working memory, cognitive flexibility, shifting and monitoring. The computerized CogMed program was the only program they specified that targeted working memory successfully. Improvement was measured using the Ravens Matrices and found limited success with taxed working memory for children under six. Similarly, Mezzacappa and Buckner (2010) found that ‘RoboMemo,’ a program from CogMed Medical Systems, demonstrated some gains in the working memory of a small sample of students with Attention Deficit Hyperactivity Disorder (ADHD). Findings indicated positive gains through pre and post test data acquired though standardized assessments for verbal working memory, spatial working memory, (e.g. digit span backwards and finger windows) and rating scale information from teacher and parent reports. Similar results were noted by Roughan & Hadwin (2011) through research exploring the use of CogMed training with a small sample of students (N=7 in the training group) with emotional and behavioral difficulties. One of the limitations of the CogMed program for school-based use includes the requirement of users to complete the program at least five days a week, for 30-40 minutes daily, over a five week period. This intervention would impact instruction time.

Mindfulness and Guided Imagery

Mindfulness has been described as a metacognitive process during which individuals use introspection to monitor the quality of attention to task, recognize when attention wanders, and guide attention back to the initial focus; it is paying attention on purpose (Baer, 2003; Kabat-Zinn, 2003). The term mindfulness also has been associated with a wide range of techniques describing this practice such as mindful meditation, guided practice, and guided meditation. Unfortunately, the varied use of the practice in Western science intervention does not assure readers and practitioners that the content of the intervention has a true relationship with mindfulness (Cullen, 2011). Mindfulness-based practices stemming from Buddhism include the following four foundations: an awareness of the body, feeling tone, mental states, and mental contents (Cullen, 2011). Because of the varied understanding of techniques and definitions associated with mindfulness, researchers have struggled to operationalize this concept clearly. Tenets of mindfulness such as awareness, compassion, insight, and wisdom are difficult to measure empirically and the frequency and quality of the practice has affected empirical outcomes (Chiasa, Calati, & Serretti, 2011; Jha et al, 2010).

Because mindfulness encompasses many skills, Baer (2011) suggests that research should focus on the elements directly involved with improvement rather than utilizing multiple components of mindfulness training in order to better focus findings in the specific benefits of mindfulness-based practice. Kabat-Zinn (2003) describes mindfulness meditation as the framework that cultivates and sustains attention. The meditative practice and the importance of consciousness share core components to understanding the concept of mindfulness. Given the efficacy of focusing on one attribute, this study will emphasize the visualization component (guided imagery) of mindfulness-based practices. Although guided imagery holds similar attributes, it also varies with an operational definition, given the fact that other interventions were prescribed by other names to this practice (e.g. psychotherapy visualization and mental imagination).

Traditionally, guided imagery is described as a mental image visualization technique to assist individuals to relax, meditate, gain confidence, improve mood states, reduces distress associated with traumatic memories and to gain understanding, insight and wisdom (Greenberg & Harris, 2011; Metilda & Nalini, 2016). Various types of visualization techniques address specific problems or concerns, such as content for improving depression and/or depressive mood. Visualization can also be used to enable persons to learn to manipulate or change an image in order to aid in diminishing a distressing, intrusive image that can trigger intense emotions of fear, sadness or anger. During a guided imagery intervention, trained practitioners guide participants into a comfortable position (seated or lying down), practice a deep breathing exercise, and move into progressive muscle relaxation before moving into a video or audio guided imagery. Guided imagery encourages individuals to envision mental images or calming activities that stimulate sensory aspects of the senses (Metilda & Nalini, 2016).

Mindfulness and Guided Imagery as an Intervention

The adaptation of mindfulness-based practices from adult use to youth yields a narrow evidence base. Limitations in implementing programs within school settings include: the length of the programs in time of practice and duration, the use of trained and qualified instructors, space within school buildings, and a limited curricula for various age groups (most programs focus on adolescents). Furthermore, the complexity of mindfulness-based practices makes it difficult to determine the specific components responsible for effectiveness and the development of research-based measurement tools for effectiveness. Although programs incorporate guided visualization or guided imagery use as part of mindful practice, most interventions or training do not specifically note the efficacy of guided imagery in overall improvement. Several programs implemented in schools within the United States such as Wellness Works in Schools, Mindful Schools, and MindUP indicate improvement of academic skills, social skills, interpersonal relationships, attention, and working memory (Meiklejohn et al., 2012); however, limited peer reviewed evidence supports which specific components aid in the predicted outcomes.

Developmental maturation presents as a main difficulty for researcher when approaching young children with any imagery work. Work by Rieser, Garing, & Young (1994) purports that children above the age of 8 years have the capacity to change imagined images that is similar to that of adults. This limitation becomes important when practitioners suggest that young students imagine objects or scenarios and require some form of manipulation or change out of the ordinary. Furthermore, the researchers assert that imagery processing incorporates not only the generation of an image through perusal and alteration, but also the maintenance initially achieved through the working memory.

The use of mindfulness and meditative practices has also been studied in the reduction of stressors in school children and teachers (Burke, 2010; Gouda, Luong, Schmidt, & Bauer, 2016) and in the improvement of sustained attention and mind wandering (Morrison et al., 2014; Mrazek et al., 2013), and visual working memory (MacLean et al., 2010; NK & Telles, 2004). Wall (2005) explored the use of Tai Chi with middle school –aged students. Qualitative data indicate that students expressed self-awareness, feelings of well-being and a sense of interconnection with nature following a 5-week course. Current research has documented the fact that the use of guided imagery reduces the effects of stress, anxiety, trauma, and pain for children and adolescents. Flook et al. (2010) completed a school-based mindful awareness practices program with second and third grade students. The randomized control trial utilized pre and posttest rating scale information from teachers' and parents' Behavior Rating Inventory of Executive

Function (BRIEF) reports. Subscale data from the BRIEF demonstrated improved skills in children's ability to shift, initiate, and monitor. Limitations found within the study included the inability to target specific executive skills. Furthermore, work by Zelazo & Lyons (2012) indicates that mindfulness training (e.g. body scanning, breathing exercises, and sitting meditations) suggests consistent positive changes in sustained attention and perspective. They assert that when children are better able to self-regulate, their school readiness may improve, given the fact that strategies used in mindfulness better allow students to adapt more successfully to classroom demands.

Additional support for mindfulness education programs and improvement in executive functioning was noted in a randomized control study by Parker, Kupersmidt, Mathis, Scull, and Sims (2014). Parker and colleagues (2014) proposed that a mindfulness education program focused on substance abuse prevention for 4^{th} and 5^{th} grade students would assist with enhancing self-regulation. The study utilized the Master Mind program, which included daily, 15 minute lessons across a one month period. Findings indicated significant improvement in executive skills (inhibitory control, cognitive flexibility, and working memory) for boys and girls in the intervention group versus the participants in the waitlist control condition.

Research postulates that guided imagery results in positive outcomes when assisting in pain management and emotional regulation; in addition, several studies address the use of guided imagery and mindfulness meditation in potentially improving working memory, specifically. Hudetz, Hudetz, & Klayman (2000) found that guided imagery improved working memory with adults. Working memory was measured using the letter, number sequencing task from the WAIS-III in a pre and posttest manner.

Findings indicated improved skills for participants in the treatment group versus those who engaged in listening to music for the same amount of time. Another study with college students utilized brief mindfulness (20 minute practice for four consecutive days), which improved visuo-spatial processing, working memory, and executive functioning (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). A randomized controlled study utilizing mindfulness meditation, Hatha yoga, and a waitlist control by Quach, Jastrowski Mano, & Alexander (2015) noted benefits of short term mindfulness practice in improving working memory for adolescents. These findings suggests some association of working memory functions with the sustained attention and redirection of attention requirements of mindfulness mediation. Work by NK and Telles (2004) indicates significant improvement in spatial memory for adolescents engaged in a camp yoga program. Because the program included multiple components (physical postures, voluntary regulation and slowing of the breathing, internal cleansing practices, meditation and devotional sessions, guided relaxation, games, and the telling of meaningful stories for fostering values and feelings of responsibility), it is difficult to discern if guided relaxation played an active role in the overall improvement in spatial memory. Similarly, MacLean et al., (2010) explored the effects of intensive meditation training with adults on sustained attention. Although improvements were indicated in visual discrimination, data did not support significant improvement in sustained attention or in the efficiency of metacognitive processes. However, the training did suggest improvements in visual working memory; this is chiefly attributed to observed changes in vigilance by participants.

Work by Ricarte, Ros, Latorre, and Beltrán (2015) attempted to use a short term (6 weeks) mindfulness-based intervention in order to improve mood, attention, and concentration. The research focused on a adapting the Mindfulness Emotional Intelligence Training Program for use in a primary rural school in Spain through exercises in breathing, the senses, and body awareness. Findings indicated a significant increase in forward digit span, a reduction in anxiety, lower anger-sadness scores, and less worry about things for the experimental group following the intervention. The authors' results continued to support the effectiveness of mindfulness training to improve mood and further clarified the scope of the digit span test as a measure of concentration and sustained attention. Treatment provided to 45 children ages 6-13 revealed a positive gain for digit span forward, suggesting that mindfulness training assists with immediate memorization. However, less effect was noted on working memory (digit span backward) for the experimental group.

The present study builds on earlier research by investigating whether or not adult findings generalize to primary school-aged populations. Current research purports the effectiveness of mindfulness-based training for various physical and psychological disorders, but this study also purports that guided imagery, specifically may also be utilized as an intervention tool. Limited evidence supports the use of guided imagery in the improvement of working memory; however, the current study suggests that a guided imagery intervention benefits the development of working memory capacity in young students more than in a waitlist control program (silent reading) in enhancing performance on working memory capacity measures. Most mindfulness based practices require participants to engage in the intervention for 45 to 60 minutes. Benefits of lifelong practice reveals more efficient connectivity within the subregions of the prefrontal cortex during attention-to-task demands (Jha et al., 2010). However, this stipulation would not be conducive to implementation during the school day because of the academic instructional time demands of most school systems for math, English, and language arts. The present study also examines whether or not a time limited practice has any beneficial effect in the classroom. The study also aims to support the theory that consistent guided imagery practice affects working memory capacity even when practiced for 10 minute time periods. Furthermore, this study suggests that guided imagery instruction improves general classroom climate through the focus on attentiveness through teacher perception.

CHAPTER 3: METHODOLOGY

Overview

The study utilized a waitlist control design with three standardized assessment measures taking place before and immediately following a 30 day intervention time period. The assessments captured quantitative data targeting areas of working memory (e.g. auditory, visual- spatial, and central executive) in order to support the Baddeley theoretical model. Participants included a sample of convenience, randomly assigned to a treatment or waitlist control group. Findings from all participants resulted from baseline (pretest) assessment implementation and posttest data after the treatment group completed the guided imagery intervention. After the waitlist control group completed the intervention, teachers in the study provided qualitative data about the intervention and any noticeable changes in the classroom climate, academic performance, and the ability of students to follow directions.

Preparation

Prior to the implementation of the guided imagery study, the examiner met with the school principal to discuss the interest and feasibility of the program within the school. Permission was granted from the Superintendent of Catholic Schools for research to take place within the independent school from non-affiliated staff. Ethical approval for the study was obtained from the Institutional Review Board of the Philadelphia College of Osteopathic Medicine. Following approval, consultation with the school principal continued to identify the eligible classrooms, based on study guidelines. The examiner met with the principal and four classroom teachers in first and second grades. The study was explained, and all staff had the opportunity to practice a lesson from the intervention before providing consent for implementation within their classrooms. Participant consent forms were provided to the school principal for dissemination to the appropriate grades, as well as an accompanying recruitment flyer. After a week, consent forms were re-issued with an opportunity to speak directly with the examiner on a day specified by the school. Teachers also spoke directly to parents who did not return the consent forms. At the end of the two-week recruitment window, the eligible students were randomly selected and three classes were identified for the study.

Participants

The study utilized a sample of convenience, comprising primary grade level students from one elementary school. The intervention was implemented in a suburban mid-Atlantic, parochial elementary school of approximately 300 students. The inclusion criteria determined the involvement of 50 students between the ages of six and eight years placed in the first and second grade. Of the 50 students placed in those grades, 33 were boys, and 17 were girls placed within two first grade classrooms and one second grade class. The study obtained written, informed consent for a total of 24 students in order to complete the assessment portion of the study. The sample (n=24) was allowed to include students with mild developmental disabilities such as speech and language delays and medically controlled attention deficit/ hyperactivity disorders. No students enrolled in the school had significant cognitive or learning delays or required substantial academic support. The sample was randomly assigned into a control and treatment group consisting of 12 students in each group. The treatment group consisted of 6-7 year old students and the wait-list control group included students 6-8 years. All students in the intervention classroom participated in the 30 day intervention; however, only students with parental permission received the assessments for the study. Teachers in the three classrooms implemented the intervention and completed a follow up interview. All parents and legal guardians provided written informed consent and assent was given by all participants.

Assessment

All participants received an individually administered standardized baseline assessment to measure working memory (pretest). Because working memory includes attention, reasoning, concentration, and mental control, multiple measures were administered for the baseline and post-intervention assessment to reflect the current theoretical model. Each student was assessed with the Digit Span (phonological loop) and Arithmetic (central executive) subtests from the Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V) and the Spatial Span (visual-spatial sketchpad) subtest from the WISC-V Integrated. Although an established assessment has not been well studied to measure the central executive, the Arithmetic subtest was selected because of its ability to better tap into key components identified by Baddeley (2010, 2012): the coordination of subsystems, the focusing of attention, the controlling of encoding and decoding strategies, and the retrieval of information from long term memory. Findings in this study were based on standard scaled scores (confidence interval of 3, mean 8-12 as average) versus the index/composite score given the use of the three subtests. The Working Memory Composite for the cognitive measure comprises the Digit Span and Picture Span subtests; however, the Arithmetic subtest (used as a secondary subtest in the Fluid Reasoning composite) was included because of its applied working memory characteristics that most resemble activities performed within a school setting. The

WISC-V utilizes a five-factor model in which the Arithmetic subtest loads on both the Fluid reasoning and Working Memory composite scores. Internal reliability overall average coefficients are as follows: Arithmetic .90, Digit Span .91, and Spatial Span .89 calculated by Fisher's *z* transformation. Confirmatory factor analysis providing evidence of validity indicates Digit Span .78.

Within the WISC-V subtest, digit span comprises three components in order to achieve the scaled score. In Digit Span (DS), participants were read strings of numbers aloud and recalled them in the same order, backward order, and ascending order. The Digit Span Forward task required the repetition of numbers verbatim, with the number of digits in each sequence increasing as the task progressed. This task required working memory when the number of digits exceeds an individual's ability to repeat the digits without the aid of rehearsal. This task represents basic capacity in the phonological loop. The Digit Span Backward task invoked working memory due to the obligation to repeat the digits in a reverse sequence rather than the one that was originally presented (e.g. requiring mental manipulation of information before responding). The final task, Digit Span Sequencing task places additional demands on working memory, as well as attention. This task required students to sequence digits according to value. The Arithmetic subtest required computational ability and measured working memory and quantitative reasoning. The Digit Span subtests represent auditory working memory and may best tap into the Phonological loop in the accepted theoretical model. The Arithmetic subtest has an auditory presentation; however, its cross reference into the fluid reasoning index may confound data in determining if findings were best represented as influencing only auditory working memory. This task has no repetitions in the administration for easier items.

The Spatial Span (SSP) subtest better measures visual-spatial working memory in order to support the current theoretical model. This subtest consists of two tasks in order to achieve a single score reflecting this portion of working memory. The student was initially required to tap a series of blocks in a forward manner, following a demonstration form the examiner. During the second task, SSP Backward, the examiner taps a series of blocks; however, the student was required to demonstrate the reverse order to the blocks tapped. Within the subtest, students must track, rehearse, and reorder visual information in order to demonstrate the spatial location of the visual-motor sequence.

Intervention and waitlist control participants were administered the working memory assessment following the completion of the 30 day intervention period. Waitlist control students then received the guided imagery intervention. The three subtests from the Wechsler subtests were not re-administered the after 30 consecutive days to the waitlist control group I order to reduce a practice effect. However, qualitative data from the classroom teacher included additional information about the any noticeable differences in the waitlist control group.

Following the program, participating classroom teachers provided a brief survey through interviews, in order to add qualitative information about their experiences and any noted changes within the classroom climate, student ability to complete oral directions given, and the effectiveness and ease of completing the intervention.

Intervention

As noted previously, all students in the assigned classrooms received the guided imagery intervention, regardless of study participation. The treatment group participated in auditory guided imagery practice for ten minutes during the homeroom period, following morning announcements for 30 consecutive school days and were tested with the assessment measures. Although guided imagery lessons are traditionally 45-60 minutes in length, the scripted lessons were modified to address the research model and to address the focus of younger aged students. The guided imagery intervention consists of 10 audio exercises recorded by the examiner onto compact disc adapted from published visual mindfulness and guided imagery exercises for children that guide students through deep breathing and muscle relaxation, and a visualization of a relaxing environment or calming activity (Garth, 1994; Murdock, 1987). The scripts were adapted to adjust the contents for school use, the age of the participants in the study, and the length of the practice (no more than 10 minutes). The length of the lessons was shortened to decrease academic interruption and to provide teachers with an activity during a natural transition time period within the school day (e.g. morning routine practices). Typical relaxing visualizations include imagining the warmth of a fuzzy blanket or of floating in water. Appropriate posture and deep breathing exercises were adapted from Metilda and Nalini (2016). All interventions began with the same posture and deep breathing exercises. The 10 guided imagery exercises could be used three times to cover the 30 day consecutive period in the same order of the recording (see Appendix).

Prior to the beginning of the intervention, the school psychologist (examiner) demonstrated and modeled the correct posture and breathing techniques described in the beginning of each guided imagery lesson for the classroom teacher and the participants. The students and teacher were led through a sample guided imagery lesson so that the school psychologist could make corrections, provide feedback, and answer questions or concerns prior to the start of the intervention. Simultaneously with the implementation of the intervention, students in the waitlist control group participated in a 10 minute silent reading from self-selected library material.

Data Analysis

Analyses were completed using SPSS Statistics for Windows Version 24.0 (IBM Corp., Armonk, NY). Each mixed analysis of variance (ANOVA) included group (treatment vs. control) as the between-subjects factor and time (pretest and posttest of the measure) for the within-subjects factor. A global working memory capacity analysis incorporated the sum of all scores. In order to determine initial differences between the treatment and control group, a t-test was performed, comparing the pretest means for each measure. Estimates of effect were conducted through the Fisher’s Exact test for a two-sided test.

Teacher Interview

Following the execution of the intervention, teachers participating in the program provided additional qualitative information regarding general observations and perceptions of the overall program. To guide the interview, each teacher was asked, specifically, the following questions:

1. What were your expectations going into the study and how did your role in the intervention meet those expectations?

2. When you think about the intervention (the recorded guided imagery lessons), what were the strengths and weaknesses of implementing the intervention?
3. Did you notice any specific changes in your students' abilities to follow multi-step directions, high level concepts, or tasks following the intervention?
4. Thinking about your instruction, did you notice any changes in your students' abilities to grasp concepts? Specifically, were there any differences observed in ELA or math subjects (direct instruction and/or assessment)?
5. Class climate and behavior management has a significant impact on instruction and class cohesiveness. During and following the intervention, were there any changes in your class climate (i.e. student mood, motivation, persistence, peer interactions, helpfulness, etc.)?
6. What additional supports did you feel were needed in the implementation of the intervention or throughout the research process?

CHAPTER 4: RESULTS

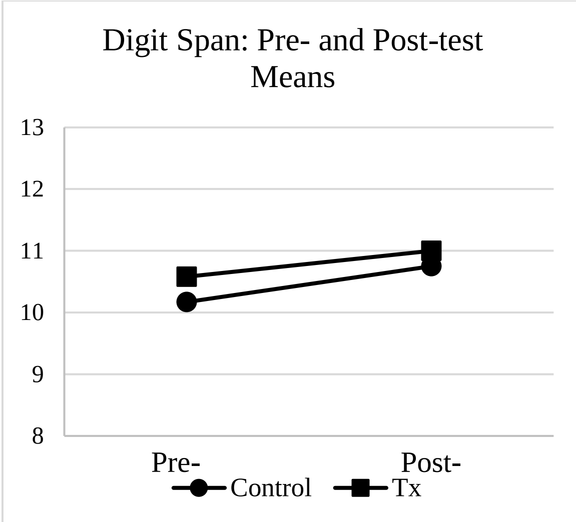
There was no attrition due to an unwillingness of the students to complete the intervention or to participate in the assessment measures. Table 1 provides descriptive statistics for the assessment measures utilized. Preliminary analysis to determine similarities between pretest groups determined no statistically significant difference by t-test (Excel) in the mean scores of the treatment and control group's initial scores. However, the Spatial Span t-score suggests some differences in the groups ($p = 0.05$). Findings represented in Figure 1 suggest that the total means for most of the assessments administered reflected similar initial means. As shown in the figure, the participants in the treatment group ($M = 11.25$) demonstrated stronger skills during the Spatial Span pretest than did the waitlist control group ($M = 9.00$). This difference varies from the initial trends demonstrated by participants during the administration of the remaining assessments. Therefore, later discussed findings may be influenced by this initial observation and any significance and differences between the groups.

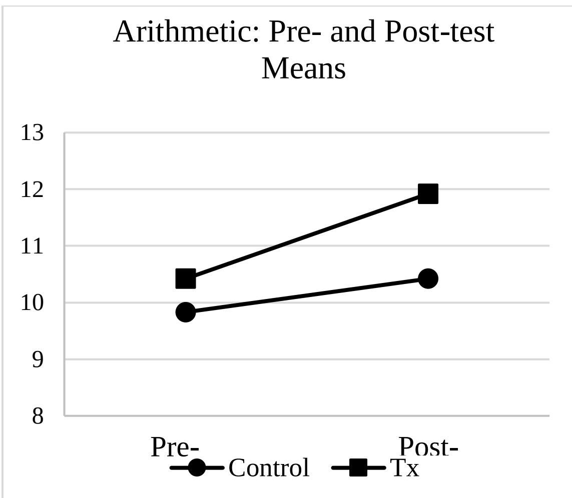
Table 1

Descriptive Statistics for the Dependent Variable Measures

Measure	Treatment		Control		t-statistic
	Mean	SD	Mean	SD	
Digit Span					
pre	10.58	2.43	10.17	2.76	0.70
post	11.00	2.73	10.75	2.22	
Arithmetic					
pre	10.42	3.17	9.83	2.51	0.62
post	11.92	2.19	10.42	1.83	
Spatial Span					
pre	11.25	2.18	9.00	3.13	0.05
post	12.92	1.88	10.75	2.42	
Total					
pre	32.25	5.08	29.00	5.89	0.16
post	35.83	5.34	32.00	3.91	

Note: (groups *n* = 12)


Digit Span: Pre- and Post-test Means
13
12
11
10
9
8
Pre-
Post-
Control
Tx


Arithmetic: Pre- and Post-test Means
13
12
11
10
9
8
Pre-
Post-
Control
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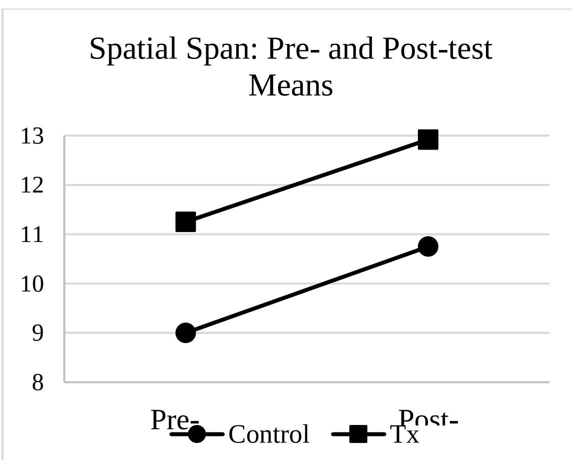
Spatial Span: Pre- and Post-test Means
13
12
11
10
9
8
Pre-
Post-
Control
Tx

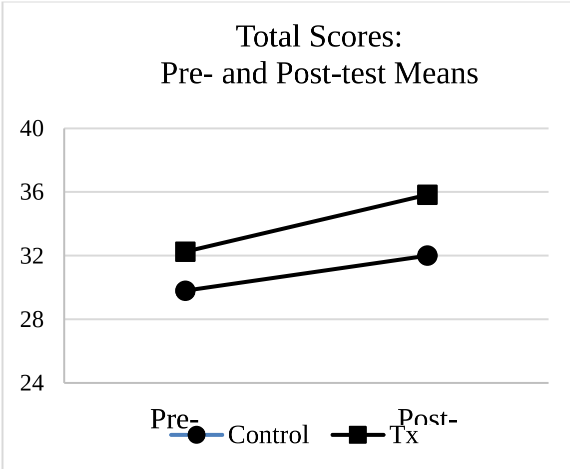

Figure 1. Mean difference values for treatment groups during pretest and posttest administration of assessment measures.

Digit Span

The current research explored whether or not Digit Span performance (phonological loop) improved for the treatment group following a guided imagery intervention. A two way ANOVA examined the effect that time had on the group when presented with the Digit Span measure. There were no significant differences between the treatment group ($F(1,22) = .142$, $p = .710$) and the control group. Contrasts revealed no significant differences over time from baseline to post intervention ($F(1,22) = .847$, $p = .367$) for the digit span measure or in interaction when comparing pretest and posttest administration of the measure to the treatment and control groups ($F(1,22) = .024$, p = .879, $d = .136$). Effect size for the interaction is small.

Arithmetic

The study hypothesized changes in the treatment group through the arithmetic subtests (central executive) following intervention. Data from the two way ANOVA examined the effects that time had within the performance of the treatment group with the arithmetic assessment. There was no significant difference between the treatment group ($F(1,22) = 1.374$, $p = .254$) and the control group. Contrast analysis noted a significant difference between the pretest administration of the arithmetic subtest and the posttest ($F(1,22) = 4.623$, $p = .043$. However, there was no significant difference in the interaction identified between the groups and time of administration although a large effect size occurred ($F(1,22) = .895$, $p = .354$, $d = .829$).

Spatial Span

Spatial Span was administered to determine changes in the treatment group following the intervention affecting visual-spatial working memory. Data from the two way ANOVA examined the effects that time had within the performance of the treatment group with the Spatial Span assessment. A significant difference was noted between the treatment group ($F(1,22) = 9.470$, $p = .006$) and the control group. Contrast analysis noted a significant difference between the pretest administration of the Spatial Span subtest and the posttest ($F(1,22) = 6.045$, $p = .022$). Although there was a large effect, there was no significant difference in the interaction noted between the groups and time of administration ($F(1,22) = .004$, $p = .953$, $d = 828$). As noted previously, the participants in the treatment group ($M = 11.25$) demonstrated stronger skills during the Spatial Span pretest than did the waitlist control group ($M = 9.00$). This difference suggests that the differences presented between the groups may be better attributed to noticeable stronger skills by the treatment group at baseline.

Total score

The final analysis encompassed a total score from each participant to reflect a total working memory capacity. A two way ANOVA examined the effect time had on the groups across the summed tasks. There were no significant differences between the treatment group ($F(1,22) = 3.744$, $p = .066$) and the control group. Significant differences over time from baseline to post intervention were noted ($F(1,22) = 10.857$, $p = .003$) ; however, there were no differences when comparing the effects of time to the treatment and control groups ($F(1,22) = 1.021$, p = .085, $d = .136$).

Effect Sizes for differences in scores

Because of the small sample size, effect sizes were derived from delta scores to determine any differences in the proportions for changes greater than zero (see Table 2) through Fisher's Exact. Analyses indicate that there are no differences between the treatment group and the waitlist control group across the administration of the assessment measures. Additionally, differences were noted for participants when they were administered the Arithmetic and Spatial Span measures. Following the intervention, treatment participants appeared to maintain or gain working memory capacity in the area of visual-spatial skills and through the complex manipulation of numerical information. A closer examination of individual student performance indicated a few students within the treatment and control groups achieved scores differing from the expected trend (see figure.2). Observation gleaned from delta changes support the fact that ten students within the treatment group achieved an increase in the Arithmetic, Spatial Span, and Total score. Further scrutiny reveals that both groups had participants that differed on achieved score from the range of scores. These students achieved scores below or above the expected trend, which could have impacted overall findings in a small sample.

Table 2

Effect of Proportions: Change from Baseline

	No. of Students' Score		
	No Change or Decreased	Increased	Fisher's Exact Score
Digital Span			
Control	7	5	0.413
Treatment	5	7	
Arithmetic			
Control	4	8	0.999
Treatment	2	10	
Spatial Span			
Control	4	8	0.667
Treatment	2	10	
Sum of Scores			
Control	6	6	0.193
Treatment	2	10	

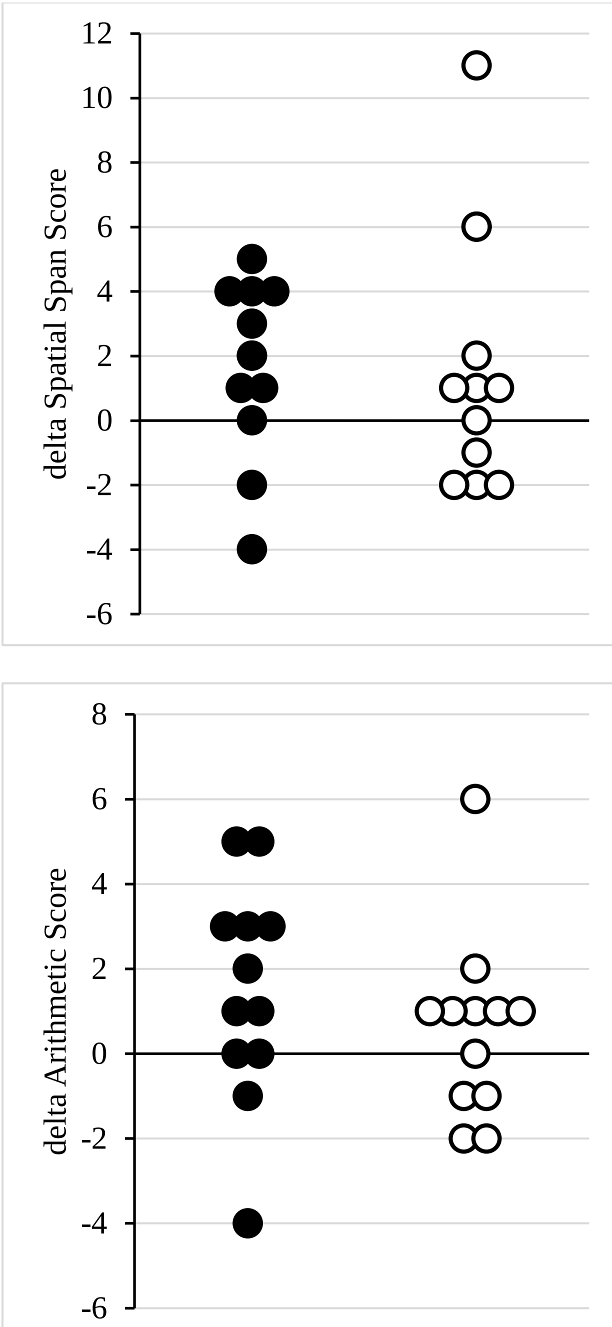

Figure 2. Scatter plot delta scores for treatment and waitlist control groups. Treatment group represented in solid circle and waitlist control in open circle.

Teacher Interview

Teachers participating in the administration of the guided imagery intervention responded to questions in a brief interview. All three teachers came into the study with the expectation that the intervention would assist in calming their students. They noted that the majority of their students were highly active and some experienced anxious behaviors that increased activity and attention in the classroom. Specifically, the educator in the treatment group desired some opportunity to support more anxious students because their nervousness appeared to disrupt the classroom climate. The educators became more flexible when they administered tests during the school day. When the educators noticed their students were becoming calmer following the lessons, they began scheduling tests as close as possible to the completion of the daily guided imagery lessons. The educator with the treatment group expressed the idea that her students were more relaxed and focused on the task at hand as a result. The reduction of stress through mindfulness and imagery practices have been previously supported (Burke, 2010; Gouda, Luong, Schmidt, & Bauer, 2016). All teacher also found that implementing the intervention was easy to complete, non-disruptive, and a necessary, positive addition to their classroom routines.

The educators identified several strengths to implementing the intervention as part of the school day. First, they noted that they were afforded a planned time in the school day to relax. One educator shared that there were very few times throughout the day when the classroom was quiet and when students were not moving. This observation led to her analysis that her students had limited opportunities to learn how and to practice being still and quiet so that they could focus more easily and completely on direct instruction or independent seatwork. The teachers also reported that the lessons were very easy to follow (for the teacher and the students). They noted that they found no added burden on implementing the lessons and that they found the brief time period as relaxing and beneficial to the classroom climate. The only weakness of the intervention that they identified was the volume in some of the tracks; they shared that some lessons had more ambient sounds and others were so quiet that the students initially questioned whether or not the lesson was playing. This observation was crucial because it allowed the teachers and the examiner to identify the shift in attention for the participants from an inattentive state to focusing on the intervention lesson. When the lessons were repeated, the participants knew what to expect and the track volume no longer disrupted the intervention process.

When asked specifically about observed differences on participants' abilities to follow multi-step directions and higher level concepts, all teachers expressed positive responses in this area. The similarity of the responses suggest greater benefit immediately following the intervention. Therefore, there may be some limitation in the staying power of guided imagery's influence on sustained attention, relaxation, and focus as the school day progresses. The educators noticed that immediately following the intervention, students appeared less tense, more focused and had greater capacity to follow through on multi-step assignments (math and English/language arts). Specifically, the educators shared that most students appeared to follow directions more effectively as determined by the diminishment in repetition of directions and the successful completion of seat work without additional teacher support. An exploration of the ability of students to grasp concepts following the intervention also yielded positive responses from the educators.

They expressed their thoughts that some of the children appeared to perform better on assessments immediately following the lessons. However, the treatment group educator expressed improvement in language arts scores for the majority of her students following the intervention. Additionally, information exploring classroom climate and student mood also revealed the expressed positive gains though teacher interviews. All teachers expressed no noticeable changes within the first week of implantation. As the intervention progressed, more students appeared to be in a better mood and had more positive interactions with peers. The students also appeared more actively involved in the intervention by settling down into the intervention sooner (moving immediately into a comfortable position to begin the intervention) and displaying physical movements reflected in the imagery of the lesson (e.g. hands moving to catch things while their eyes were closed). The educators also expressed that as a whole, their classes were quieter and appeared in better control of themselves following the intervention. One teacher noted that a few of her students who were usually highly active, were able to remain still throughout the intervention and immediately following the lesson.

CHAPTER 5: DISCUSSION

The current results did not find compelling evidence to suggest that the guided imagery intervention improved areas of working memory capacity. Specifically, pretest and post test data determined no interaction between the treatment and waitlist control groups and pretest and posttest measures following interaction. However, some changes were identified in working memory capacity related to the interaction with other executive skills (sustained attention, task initiation, shifting, and inhibition) and skills closely associated with visual-spatial memory (motor planning, spatial orientation). Similar to work by Ricarte, Ros, Latorre, and Beltrán (2015), changes in mood and immediate memory were demonstrated and less effect of guided imagery (mindfulness) on working memory was experienced. This study was mindful of the cognitive differences between young children and adolescents in elementary school. Earlier studies established developmental trajectories for working memory (Best, Miller &Jones, 2005); therefore, bias in findings may result when mixing adolescents with younger children in samples, as was done in the Ricarte et al. study (children ranged from 6-13 years). Although the similar study had a larger sample, it is unknown how many in the sample were primary-aged (6-8 years) and if their performances on cognitive measures were similar to the adolescents in the sample. Differences in the findings of the present study may also be attributed to the small sample size, the length of the overall intervention, and the assessment measures utilized.

Previous research with older populations identified growth in working memory following mindfulness and guided meditative practices. Work by Zeidan et al. noted changes in visual spatial processing and working memory for college aged students;

however, an n-back computerized task was used to measure working memory and the Digit Span task measured immediate memory only by lacking a sequencing task to the forward and backward components. Shipstead, Redick, and Engle (2012) note that various studies exploring working memory include inconsistent use of valid working memory tasks. This study attempted to separate and clearly define components of working memory rather than generalizing all aspects of memory (i.e. immediate and short term memory) to the complex nature of working memory. Also, the current research used standardized, individually administered assessment tools rather than rating scale data to address potential issues with bias from adult respondents. Although the tasks were repeated during the posttest, the measures provided a multilevel approach measuring working memory in order to decrease the probability that results were attributed to task specific learning rather than specific gains from the intervention (Shipstead, Redick, and Engle, 2012). Given this distinction, differences in outcome were probable.

Implications

Because of the developmental trajectory of working memory, the present study cannot not establish specifically if the intervention would not have an impact on various components of working memory over a longer span of time. Previous research does not suggest at which age of development young children need to foster working memory in order to assist academic performance and growth. Work by Hudetz, Hudetz, & Klayman (200) note improvement in working memory for an adult sample following a single 10 minute session measured by a Letter-Number Sequencing task. However, no improvement was noted for primary-aged children for Digit Span activities. Data suggested that something was occurring between the assessment periods; however, the design of the current study was unable propose reasons for mild changes beyond simple, possible maturation of students given the 30 day time period. Also, the assessment measures may not be sensitive enough to note small differences in younger children. Although the theoretical model distinguished between three distinct areas of working memory: phonological loop, visual-spatial sketchpad, and central executive function, the various areas appear to interact and take some precedence, depending on the academic demands. For example, most instruction during early development is very verbal which would encourage greater auditory working memory development. However, as children began to explore text and writing, visual spatial working memory becomes more important because of the increasing demands of multi-step directions. Although executive functioning skills increase and improve over a longer time period, the success of auditory and visual-spatial working memory become impacted by the development of executive skills, such as sustained attention, task initiation, shifting, and emotional regulation. Teachers in the study commented that mood appeared to change first for students and then there was an improvement in sustained attention. Following these observed changes in executive skills, participants were then able to develop the ability to complete multistep directions more efficiently.

The trend of participant growth was moving in the hypothesized direction. However, younger children appear to need more time in order for noticeable behavioral changes to occur. The teachers noted that there were limited changes between 10-15 days of implementing the intervention, with the exception of the students becoming accustomed to the routine of the intervention. However within 15-20 days, most students were interacting differently within the classroom; they appeared calmer, and were actively engaged in the guided imagery lessons. Unfortunately, benefits appeared to begin to develop close to the end of the intervention period. This suggests that an extension of time to 45 days may be more appropriate for primary-aged students in order to establish routines, maintenance, and growth.

Although the assessment measures did not yield positive gains, the guided imagery intervention received positive feedback from teachers involved in the study. Several interventions previously implemented in schools related to improving working memory were not only time consuming for participants but also an infringement on the time of educators. To avoid conflict with academic instruction, most occurred after school hours or during special times of interaction. In most cases, teachers or other implementers required extensive training. Because the present study was time limited, teachers noted enjoyment in incorporating the lessons into the school morning routine and found the lack of preparation or need for direct instruction in order to implement the lessons increased their willingness to implement the program. They also expressed the idea that students enjoyed the program and requested to use the lessons later in the day.

Consequently, this study supports feasibility of using a time-limited guided imagery intervention with primary-aged populations during the school day. Previous studies utilized complex and time consuming interventions that would not be compatible with the heavy academic demands within school settings. Previous studies also focused on implementing change for specific populations, such as students with ADHD and anxiety and low socio-economic backgrounds. The study did not specifically measure mood, executive functioning, and classroom climate quantitatively; however, teacher feedback noted changes in these areas following intervention. The current research allowed the educators to utilize an evidence-based intervention in a preventive capacity, potentially benefitting students with milder symptoms of clinical disorders. Therefore, it is prudent to continue the framework of this research, as a preventive effort, in order to provide additional support for students.

Limitations

Although the present study suggests some strengths and positive trends, several factors influence the scope of the findings. The current research was implemented in a parochial school with limited representation. Some diversity was included within the sample; however, the school does not reflect area demographics through cultural, racial, and economic census. Within the treatment group, there were no students of color although school demographics indicates that 48% of the population includes African-American, Asian, Latino/Hispanic, and mixed-race students. However, the waitlist control group was more racially diverse and reflective of school demographics. The sample also did not include an adequate representation of female students in order to determine any potential gains or differences between male and female students. Although the school provides speech and language services and accommodations for students with Attention Deficit/Hyperactivity Disorder, to students with more pervasive disabilities (e.g. learning and emotional disabilities) are not part of the school population. Therefore, the sample excluded students with various disabilities (e.g. students with anxiety disorders and unmedicated ADHD) who may have benefitted from exposure to interventions targeting weaker working memory (Mezzacappa & Buckner, 2010; Roughan & Hadwin, 2011) and the exclusion may also have diminished the scope of the findings. Although the study was not targeting this population specifically, the investigator would be interested if the growth of working memory capacity and executive functioning (central executive) would extend from typically developing students to more decidedly clinical populations when introduced to a short term intervention.

Implementation fidelity was difficult to observe, given the fact that the examiner was off site during the intervention implementation. Although the intervention was initially practiced and observed through a random weekly check in, there was no trained observer present to determine if the intervention was implemented consistently, with all the students in the treatment group actively engaged in the guided imagery practice. There also was not a checklist to determine if the full series of the lessons were implemented three times, or if the teacher chose to complete specific lessons due to time constraints or through class preference, following familiarity. The guided imagery lessons did not require a specific order in which they were implemented or a stipulation that all the lessons needed to be repeated during each cycle. Therefore, the teachers had the ability to repeat the same lessons, some more than others, which could influence student interest.

The study was designed so that all the students in the targeted classrooms would receive the intervention, but only those with consent would participate in the study. However, many parents did not take advantage of the informational meetings or speak directly to the investigator about their concerns. Two returned forms specifically expressed that they did not want their children to participate. Most feedback addressed to the investigator came from African-American (6 parents) who either did not want their children tested or wanted to better understand the use of the assessment within the school building. Although the study specifically stated that data were secure and not the property of the school, there was a mistrust among these parents which should be addressed.

The size of the sample was also a significant limitation. Although the school distributed the permission forms to all first and second grade students, only half of the parents responded. Given the size of the sample, the investigator was able to note differences in the motivation of the students within the treatment group. During the assessment sessions, several treatment students appeared eager to work individually with the examiner. Initially some students appeared nervous, which may have influenced their abilities to perform the assigned tasks during the pretest. These behaviors reflected symptoms of nervousness, including limited eye contact with the examiner, low or quiet responses, wringing of hands, fidgetiness, and quick responses of, “I don’t know.” During the posttest, there were no observed behaviors of internal stressors. The students appeared eager to work with the examiner and took many opportunities to speak with the examiner about her day and provide information about themselves and their families. The investigator admits that these differences may not only be reflective of the internal motivation of the students to do well during the posttest, but also the effects of the guided imagery practice. For the Arithmetic and Spatial Span tasks, most students in the treatment group made gains during posttest.

The design for the current study utilized the repetition of the three standardized measures. It may be uncommon for young children to remember test items; however, there may always be the opportunity for a practice effect following the repetition of subtests 30 school days later. The participants appeared familiar with the tasks; however, they did not appear to recall specific items. Within the Arithmetic subtest for the treatment group, there also is the possibility that the students became more proficient in arithmetic concepts. However, the teachers reported that at the time of year that the study occurred, the students were past many of the computational instructions in the curriculum. For example, the first grade teachers expressed the idea that all students passed addition and subtraction unit tests and worked on geometry and measurement during the study implementation window. Given that the participants were familiar with the tasks at the post test, the examiner was also unable to determine if the treatment group maintained working memory capacity 30 school days after the ending of the waitlist control implementation or to determine if the waitlist control exhibited similar results. The study design boundaries did not incorporate an alternative form to implement further exploration.

Future directions

The use of guided practice and mindfulness programs in elementary school classrooms has demonstrated a positive influence in emotional regulation, mood, and behavior. The potential for these practices to impact cognitive processing positively has been met with inconsistent findings for younger children. This study examined the feasibility of and the effectiveness of a time limited guided imagery program on the working memory of primary aged students. The study differed from other programs by shortening the length of daily practice in the classroom, eliminating cost for implementation, and improving the ease of administration. Goals for the research also examined the benefits of the intervention on specific components of working memory by utilizing common cognitive measures: Digit Span, Arithmetic, and Spatial Span.

Although current findings were unable to demonstrate, specifically, the substantial impact of guided imagery on working memory capacity, outcomes were supportive of the benefits of mindfulness and guided imagery practices in the school setting. Teacher reports noted positive improvement in classroom climate, student mood, sustained attention, following of directions, and academic performance. Key factors could affect this change beyond changes in working memory capacity, such as the alleviation of anxiety symptoms and changes of classroom climate that are more conducive to learning. Although quantitative data were unable to support teacher perception, they are reflective of previously established findings (Burke, 2010; Gouda, Luong, Schmidt, & Bauer, 2016; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010; Ricarte, Ros, Latorre, and Beltrán, 2015).

Future investigations should explore whether or not a larger and an average demographic population of young participants would yield improvement in working memory capacity, given the progression of the data towards the hypothesized direction. It would also be prudent to replicate the results as part of a larger randomized, controlled trial to ensure the generalization of the findings to populations consistent with primary-aged students found within the United States public school system. Although Ricarte, Ros, Latorre, & Beltrán (2015) did not specifically support the connection of mindfulness or guided imagery practices to the improvement of working memory, the larger research study noted changes in immediate auditory memory. The current study also utilized common standardized assessment tools in order to reflect key components in working memory and to create a total working memory composite score reflective of a specific theoretical model. Further exploration is warranted to determine the statistical power of the combined subtests in measuring a total working memory capacity.

The complex components of executive functioning have been associated with the frontal complex. The slow maturation of executive skills suggests that working memory may also experience changes throughout the life span. Because of this span, working memory may be just as vulnerable to adverse environmental factors, as well as, amenable to remediation similar to other executive skills. Neuroimaging has expanded our understanding of brain development and the interconnectedness between the prefrontal cortex and other systems with working memory. The ability to integrate brain imagery work with environmental factors (e.g. trauma and chronic stress) and developmental aspect of working memory, may better assist in planning and developing appropriate interventions for a growing population of young children.

Because mindfulness practice has demonstrated positive gains over longer periods of time and through continuous use and practice, these techniques should be explored longitudinally in a school setting over multiple years to establish the academic and cognitive gains for children. Future direction may wish to explore further the statistical value in this combination to support the Baddeley theoretical model. This study should contribute to emerging research of utilizing intervention for improvement in core cognitive processes such as working memory capacity.

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APPENDIX

Transcript for guided imagery intervention

Posture and Deep Breathing check (initial steps before all sessions)

Step 1. Comfortable position. Sit away from your desk with your feet on the floor. Make sure your clothing is loose and comfortable. Close your eyes.

Step 2. Breathing- We are going to take some deep breathes.

1. Inhale through your nose, expanding your belly, then fill your chest. Counting to 5.

2. Hold and count to 3.

3. Exhale fully from your mouth to the count of 5.

Guided imagery lessons

1. Ayers Rock

There is a feeling of something different. The sun hangs overhead like a rich golden globe, filled with a warm light which is bathing you in its gentle glow. The sky is a rich sapphire blue hung with the merest wisps of cloud.

There are many animals around, but this time they are all native Australian animals. There are koalas, emus, kangaroos, and platypus. There are some baby koalas clinging to the backs of their mothers. And look at the kangaroo-the small joey is popping his head in and out of her pouch. He has now decided to stay looking out and his paws are dangling over the side. Break

The emus are strange looking creatures, aren't they? Their necks are long and their legs are like sticks, but their bodies are big with large feathers. You may get onto the back of an emu and be taken for a ride to a place which is very special to the Aboriginal people of Australia.

The other animals are following along as the emu's long legs take you quickly towards Ayers Rock, the biggest red rock in the world. It is so long and wide that it would take you hours to the rock, be prepared to hold onto the rope, tightly walk around its base. If you decide to climb the rock, be prepared to hold onto their rope tightly as you go up. It is very steep and quite a long way to go.

Ayers Rock changes color at sunrise and sunset. You can see it changing from red to brown as the sun's rays fall on it, and then into delicate purple which becomes stronger as the light alters. Look now and you will see the rock is a brilliant golden yellow standing proudly against the skyline; then shortly it will turn a rich burnished orange. As the light fades or moves, Ayers Rock returns to its natural rich red beauty in a sparse landscape.

As you slide off your emu's back, you will see a group of dark skinned people. They are the Aboriginal people. The men wear a small cloth around their hips and their chests and faces are painted in patterns of white. The men are leaning on their spears as they wait for you to approach. Break

They have been waiting for you, waiting to dress you too with a small red cloth, and to paint you in their ceremonial style.

Ayers Rock or Ulura, in their language, is a sacred place to the Aboriginal people and it is loved by them. There are caves in this rock that no one can enter unless they have been initiated in the ways of the Aboriginal people who live there. Because they have painted you and given you the special red cloth, they consider you their friend and one of them.

They are taking you into one of the caves that is hidden from view by a few bushes. When you go inside and your eyes adjust to the light, they will show you the wall paintings which depict their culture. Some paintings have been there for thousands of years. Perhaps they have some paints made up and would show you how to draw as they do. Would you like to try?

When you feel you would like to come outside, your Aboriginal friends will take you to a special part of Ayers Rock that is called “The Brain.” The tribal elder will show you how this rock is pitted by time and nature and how these marks have formed a pattern which looks very much like the human brain. Break

Each Aboriginal man has a boomerang and a didgeridoo. The tribal elder has two of each and he is offering to show you how to throw the boomerang so that it will return to you, and also how to play the didgeridoo.

Some men may join you in playing the didgeridoo while the native animals sit and watch. Perhaps the children will perform a ceremonial dance. You may like to join them in their dancing. What do you think?

In a moment you will say goodbye to your new aboriginal friends. You will climb back onto the back of your emu and move swiftly away from Ayers Rock. The emu runs closer to the path that will take you back to your school.

Take a moment to say goodbye and thank you to your emu friend. Now it is time to return. I'm going to count to ten so that you can slowly open your eyes.

One…two…three…four…five…six…seven…eight…nine…ten.

2. School

There is a building in front of you which is framed by flowers and has gentle green ivy growing up the walls and around the doorway. This is a place of learning which you will enter. If you walk down the corridors and look into each room, you will find the one that is right for you.

A teacher is at the chalkboard explaining many things about science. She is in a laboratory where you are being taught scientific experiments and you put on a white coat. The teacher is standing behind a big black laboratory table. On the table are many items.

Whatever it is that is being taught, see yourself as an absorbent sponge, able to take in all that is being said. More importantly, not only being able to take in, but understanding exactly what is being said.

Keep listening to your teacher, watching the teacher show you the many items that she has on her laboratory table. She has a bowl filled with leaves and the leaves many colors and shapes. She also has a test tube filled with a purple liquid. She hands you a pair of safety goggles and you carefully place the goggles over your eyes. She encourages you to pick a leaf from her bowl. Which leaf should you chose? You place the leaf in the palm of your hand. Break

The teacher pours a drop of the purple liquid onto your leaf. It smells sweet, like cotton candy. The smell fills the air and your leaf grows until it covers the laboratory table. The teacher invites you to climb on the leaf and you float around the room, moving slowly over all the tables and past the many windows in the classroom. One of the windows is open and a gentle warm breeze moves gently, pushes your leaf back to the top of the laboratory table.

Your mind is analyzing, taking in and examining what you learned in the classroom with the teacher. You stayed focused on all her experiments and gently let go of all the thoughts that were not part of the lesson.

The teacher places her hand on your shoulder and you find yourself safely standing on the floor. You leave the classroom and walk down the corridors. At the end of the corridor you see a large door that will take you away from the school.

Think about the things you would like to do when you leave the school? Will you play with friends? Will you read a book? Do you have a hobby or a sport you like to play? Did you have a home assignment you need to complete or a project? Know that whatever you want is in your reach. You have the ability to take in what your teacher is saying, to absorb, to use, to bring out the best there is in you.

3. Floating

The grass beneath your feet is lovely and soft, yet right in its texture and color. Look at the ground and at your feet and you will notice that slowly, very slowly, Our feet are coming off the ground. There is distance between the soles of your feet and the earth. The distance is increasing so that you are now hovering over the grass. Now you can go deeper into your garden without touching a blade of grass.

Feel yourself gliding forward until you come to the seashore. Because your feet are not touching the ground, you cannot feel the sand beneath them. Go forward until you reach the water and watch the waves get higher; you can raise yourself up further. When they flatten themselves out, you can come down so that you are just above them. Keep doing this and you will ride the waves in and out without getting your feet wet. When you get tired of this, come back across the beach and return to your garden.

Go to a part of your garden which is special to you. Hover for a while as you look round and then, gently, see your feet settling back into the ground. Wriggle your toes into the earth and feel its warmth on the soles of your feet.

Find a grassy spot which is spongy and lie down, feeling your body settling into the grass. The grass is a cushion which supports your body, surrounding it, so that you can sink into it more deeply than before. Relax and enjoy the comfort and the smell of the rich grass…

4. The Grandfather Tree

The air is so fresh and clean, the perfume of the flowers is rich, and the sun a huge golden ball, sending down a very gentle heat. The trees are waving their arms in welcome- they have been waiting for you to come to their special garden, and the trees want to talk to you.

If you listen you can hear them saying: “Come to me, come to me.”

There is one tree that stands out from the others. He is very, very old. He is the grandfather of all the trees, and he is full of knowledge and wisdom. There is nothing this tree doesn’t know. He has been watching what happens around them ever since he was a young sapling.

He has a very thick trunk and big, big roots going out through the earth. As they go down into the depths of the earth, these roots push the earth up, making mounds big enough to sit on. This Grandfather Tree has plenty of branches with beautiful green leaves, so many leaves it’s a wonder he can hold the branches as high in the air as he does.

The breeze is rustling the grass and the leaves on the trees are making sounds that are like the purest music one can imagine. Break

I want you to walk up to the Grandfather Tree. As you approach the trunk of the tree, you will see there is a door with a little handle. I want you to open this door and go inside. Close the door quietly behind you now, and you will find the inside of the tree is lit with a golden glow. In the glow, you can see passageways going through the branches. There is also another pathway going down the trunk into the roots.

Why don’t you go investigate? You have plenty of time to choose which way to go. I wonder what you will find. I think there are rooms off these passageways that hold all sorts of knowledge. Some have lots of toys. There are always people around to keep you company whom you can talk to. They will be able to answer your questions. If you want to remain on your own, you only have to say so and you can go into the room of your choice and do things you most want to do.

I shall now leave you to explore your special tree…

Now it is time to return. I'm going to count to ten. Join me at the count of six, opening your eyes at ten, feeling fully alert and with full recollection of your adventure. One…two…three…four…five…six…seven…eight…nine…ten.

5. The Waterfall and the Cave

Your garden is full of interesting things today. Take high splashing waterfall. Drops of water are flying through the air and catching the suns' path that leads you to a river. You can stop and talk to the deer and rabbits, but don't stay too long. When you reach the river, you can watch the boats sailing by and people swimming as they enjoy themselves in the water.

They are having such a good time. I can hear their laughter. I can hear their happiness. Some of them are playing with a ball. I am sure if you wanted, you could join in too.

The river bank is a rich dark green. A line of weeping willow trees shades it with low slung branches trailing into the water. As you walk along the river's edge, you will come to a bend.

You cannot see around the bend yet, but as you walk on, you will see before you a high splashing waterfall. Drops of water are flying through the air and catching the sun's rays. They look like shining jewels in many colors and shapes. The falling water is creating a musical harmony that is rich and deep. From the bottom of the waterfall rises a cloud of misty spray. Break

If you climb to the other side of the waterfall and look carefully, you will see there is an entrance to a passage behind the wall of water. You need sharp eyes to see the opening. Not many people would be aware it was there. I think you should find out what secrets it holds. (Pause)

As you go behind the spray and into the entrance, you find that you are now in a large light cave. The water is falling down in front of you in a great thundering stream that seems to increase the silence in the cave. You can see through the water to watch what's happening on the other side, though no one else there can see you.

As you look around, you will notice there are drawings on the walls. These have been here for many, many years. They must have been drawn by the waterfall People who lived here such a long time ago.

As you look, you see passageways going off in different directions from the sides and the back of your cave. Why don't you walk down one of these passages to see what you can find? It's like going on a treasure hunt. Explore for a minute…

Now it is time to return. (Pause) Walk back through the passage and, past the drawings to the entrance of the waterfall. The cave and move along the river bend until you reach the path to your garden. When you are back in your garden take a slow deep breath. In a moment I will count to five. When you are ready, open your eyes and come back to your classroom.

One…two…three…four…five.

6. The Clouds

The sky is a deep shade of blue although it is also very bright and clear. The golden sun is high in the heavens warming the earth and all the earth's creatures.

The path in front of you is winding along through the soft dewy grass and up onto a hill that isn't difficult to climb. I want you to go to a soft grassy spot and lie on your back in the sun.

This way you can look at the white clouds in the sky and watch them change shape. Watch them change from little clouds to big and then back again.

Now that you are comfortable, I want you to really watch the clouds, and you will see they form very unusual shapes- if you look at them closely you might be able to see those shapes more clearly- can you see the gym teacher? Or the principal? I can see a little cat up there, and yes, there are other animals around the cat. I think it must be the cat's whole family, all together.

The clouds always keep moving and forming new shapes. Perhaps you can see whole new places that you can't see elsewhere. Sometimes you can see other lands in the sky and, way up above you, other people in these lands. Sometimes you can see mountains or buildings, or different animals. It is very peaceful watching the clouds drifting by, changing, and reappearing as something else.

Take some time to lie there and watch, and see what else is in the sky. Break

We are going to rise now. Slowly picture yourself sitting up. Take a big stretch as you prepare to walk back down the hill. Carefully walk on the path. At the end of the path is a gate that will bring you back to your class. In a moment you will push the gate open and get ready to open your eyes. Now it is time to return. (Pause) Walk back through the gate and slowly open your eyes.

7. The House of Perception (Part I)

Close your eyes and follow your breath in…and…out…of your nostrils. Allow your body to become very relaxed and quiet as you breathe in…and…out. Now imagine that you are walking down a street and you see an interesting house: this is the house of perception, the house of your senses, and as you walk into the house you see that there are many rooms with doors with symbols on them.

The first room you come to has a large eye on the door. You open the door and realize that this is the room of **vision**. It is filled with junk, the garbage that you have put there over the years to prevent you from seeing clearly as you might. In your mind's eye, see all the junk and cobwebs in the room, and begin to clean out the room of vision with cleansers, a broom, a vacuum-whatever you need. If you wish to, actually go through the cleaning motions with your body, knowing as you do, you are improving your vision. (Pause for a minute)

When you are finished, you throw out all the junk and you open the windows and let the room fill with fresh air. See it bright and shining. Look at the window and see the scene outside, noticing all the colors. (Pause 30 seconds).

Now it is time to leave the room of vision.

Proceed now to the room of **hearing**. It has a big ear on the door. As you open the door, you hear a cacophony of disagreeing sounds. The room is filled with trash. There is a lot of wool on the walls and a thick covering of wax all over the place. Clean up the room of hearing, making it as clean as you can, knowing that you are improving the quality of your hearing. (Pause)

When you finish with this cleaning, open the windows and let some fresh air swoosh in. Hear it swoosh in. Listen to the breeze as it whispers past you (Pause)

Now listen to all the sounds around you (Pause 30 seconds)

Listen to your breath. (Pause) And now it is time to leave the room of hearing.

Proceed to the room of **smell**. You know the room of smell because there is a large nose on the door. As you open the door, you smell a combination of terrible scents, including stinky socks and old moldy food. Begin to clean the room of smell, really scrubbing all the corners and cracks in the room. Again, you may wish to go through the movements of cleaning and scrubbing. (Pause one minute).

Now it is time to leave the room of smell. It is also time to leave this house of perception. We will explore others rooms on another day. You close the door, walk down the hallway… past the rooms of the three senses, and leave your cleaning materials in the hall closet. You leave the house of perception and find yourself sitting here. As you slowly open your eyes, become aware of all the colors, sounds, and smells.

8. The House of Perception (Part II)

Close your eyes and follow your breath in…and…out…of your nostrils. Allow your body to become very relaxed and quiet as you breathe in…and…out. Now imagine that you are walking down a street and you see an interesting house: this is the house of perception, the house of your senses, and as you walk into the house you see that there are many rooms with doors with symbols on them.

You have visited some of these rooms before. The first room you come to has a large eye on the door. It is the room of vision; go past this room. The second door has a big ear on the door. It is the room of hearing. That room is now quiet and peaceful. Go past that room. The following door is the room smell; it has a large nose on the door.

We finally come to the room of **taste**. This room has a large tongue on the door. This room is disorderly. All the foods are mixed up, and you begin to taste your least favorite foods; perhaps they are liver, spinach, and Brussel sprouts. As you clean the room of taste, be sure to sort out all the different tastes, separating peanut butter from the pizza, the apples from the oranges. (Pause 30 seconds)

Now that you've cleaned and arranged the room of taste, you begin to taste some of your favorite foods. (Pause 1 minute) It is now time to leave the room of taste.

Proceed to the room of **touch**, which has a large hand on the door. Clean it up thoroughly, throwing out all the junk that prevents you from feeling textures. (Pause)

When you've finished cleaning, move about the room and slowly touch the textured walls. Rub your hands over the wallpaper, which is a mixture of velvet, silk, and sandpaper, ice, and tree bark, and notice how good everything feels to your skin. (Pause 30 seconds)

Now physically rub your hands on your clothes, noticing the textures of your clothes, and then gently feel your face and hair. (Pause) Notice how wonderful you feel. (Pause)

It is now time to leave the room of touch, and when you open your eyes you may wish to touch the textures around you.

There is one more room to clean, and this room is the attic. You walk up an old spiral staircase to the attic, which is full of cobwebs and bats. This is the room of your sixth sense…the room of extrasensory perception…The room of inner vision. And it is very dusty because it has not been used for a long time. You begin to clean the room of the sixth sense, and you notice a circular window at the far end of the room.

It is so dirty that you cannot see out of it. You begin to scrape and wash it clean, and as you do so, a beautiful scene unfolds for you. (Pause 1 minute)

As you continue to look out the circular window, you notice all the colors, sounds, smells, tastes, and textures about this scene (Pause 30 seconds)

It is now time to leave the room of the sixth sense. You close the door walk down the spiral staircase…past the rooms of the five senses, and leave your cleaning materials in the hall closet. You leave the house of perception and find yourself sitting here. As you slowly open your eyes, become aware of all the colors, sounds, smells, textures, and tastes around you.

9. An Undersea Adventure

Close your eyes and focus your attention on your breath. (Pause) Now imagine that you are walking down to the beach. It's a beautiful, sunny day, and you enjoy the sound of the surf. (Pause)

As you walk along the beach, you notice a trap door in the sand. You lift up the trap door, and there is a stone stairway leading down under the sand. You walk down the stairway, feeling perfectly safe, and find yourself in a long tunnelway. You walk through the tunnelway until you come to a room at the end of the tunnel.

You enter the room, which looks like a glass bubble. You realize that you are in a glass room under the sea. Beautiful colored fish are swimming outside. You notice there is a submarine and a diving suit for your use if you chose to venture out into the sea. There is also a pillowed chair in the middle of the room if you wish to sit down.

Now you have a minute of clock time equal to all the time you need to enjoy all the wonders of the sea. (After a minute)

Now it is time to return. (Pause) You walk back through the tunnelway, up the stairs toward the sunlight. You close the trap door, knowing that you can return here whenever you wish. You leave the beach and become aware of sitting here, fully present.

I'm going to count to ten. Join me at the count of six, opening your eyes at ten, feeling fully alert and with full recollection of your adventure.

One…two…three…four…five…six…seven…eight…nine…ten.

10. My Spaceship (adapted, p. 77)

Close your eyes and put your attention on your breath. Breathe in…and … out gently and quietly, and imagine that you are going outside this room to the front of the building, and there you will find your own spaceship that you have designed and built. You climb up into the spaceship and get ready for takeoff. (Pause)

Ten…nine… eight…seven…six…five…four…three…two…one…blast off! You gently take off above the clouds…up above the Earth's atmosphere, way out into space. And as you look back toward Earth, you see it as a ball or sphere that is moving away from you. You look outside your spaceship window and see far out into space.

You choose a planet to investigate and head your spaceship toward it. When you land your spaceship, you decide to investigate this planet and to learn as much as you can about how the creatures live, if there are any. Notice how they communicate, how they live, and what their planet looks like. Notice the smells, sounds, and tastes and how you move on this planet. (Pause)

Now I'm going to give you two minutes of clock time equal to as much time as you need to explore this planet. When you hear my voice again, I will be calling you back to return to Earth. (Pause two minutes)

Now say goodbye to your new friend, climb into your spaceship, and head back to Earth. (Pause)

As you come closer to Earth, it start to look larger and larger to you. You come back into the Earth's atmosphere… back through the clouds… and as you come closer to earth it is easy for you to identify your home and your school. (Pause)

Now you land your spaceship…come back into the room…and become aware of sitting here. In a moment I will count to five. When you are ready, open your eyes, remembering in full detail everything about your experience.

One…two…three…four…five.