Yoga for Anxiety Reduction in Children and Adolescents: A Mixed Methods Effectiveness Study

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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Abstract

Anxiety is the most common psychiatric issue facing children and adolescents. An estimated 10-17% of community samples and up to 45% of children in mental health clinics are affected. Due to legislation, such as the Individuals with Disabilities Education Improvement Act of 2004, and increasing concerns for the mental health and well-being of school-age children, the development and expansion of school-based mental health services has grown. Educators, related service professionals, and communities realize that children are most accessible, and often most comfortable, in the school setting. As a result of a growing demand for school-based mental health services, there is a call for increasing the availability of evidence-based interventions.

Yoga interventions are widely used with child and adolescent populations, and they are intuitively well-suited to address the psychosocial needs of children in a simple, fun, and cost-effective manner. Through increased body awareness and the provision of coping strategies, yoga interventions may address both the physiologic and psychological experiences of anxiety. However, there is a need for systematic examination and appraisal of current yoga research for children, additional well-controlled studies of yoga, and an increase in understanding the processes of change as a result of yoga.

The objective of this dissertation is to 1) consolidate and systematically appraise the rigor of current yoga research for anxiety among youth, 2) determine the effectiveness
of a school-based yoga program for anxious youth, and 3) elucidate important constructs, such as social validity and participant perspectives, through both quantitative and qualitative methods.

Results from Chapter 2: A Systematic Review of Yoga Interventions for Anxiety Among Children and Youth, conclude that yoga interventions show positive effects in reducing anxiety across a variety of populations and meet criteria for a probably efficacious treatment. However, due to limitations (such as heterogeneity in populations, measures, and frequency/durations) there is a need for additional well-controlled, randomized trials, which include physiologic and psychological measures and long-term follow up.

Results from Chapter 3: The Effectiveness of a School-Based Yoga Program for Anxious Youth, suggest improvements across measures of anxiety, self-regulation, and adaptive skills for the yoga group, as compared to the exercise group. However no statistically significant results were observed. Further study is needed to establish the effectiveness of the Move-Into-Learning for Anxiety program (MIL-A).

Results from Chapter 4: Social Validity and Participant Perspectives of a School-Based Yoga Program for Anxious Youth, conclude that student and teacher perceptions of the MIL-A program are positive and support improved outcomes among anxious children. Social validity results show that teachers and students viewed MIL-A as
valuable, feasible, and a moderately effective modality for improving anxiety related variables.
To John, Jack, and Charlie-

For all of the love, joy, and perspective.
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Minor Field: Occupational Therapy
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**Dissertation Structure**

In addition to the requirements of the Graduate School of The Ohio State University, this document has been prepared according to standards set forth by the School of Health and Rehabilitation Sciences handbook (9/2013). Dissertations produced within the Health and Rehabilitation Sciences PhD Program “should be comprised of at least three original, journal level manuscripts” (p.31). The structure and format of this document is as follows:

1. Chapter 1 provides an introduction to the content area.
2. Chapters 2, 3, and 4 contain the required three manuscripts. These chapters are stand-alone manuscripts. As such, repetition may be noted among them.
3. Chapter 5 contains summaries, conclusions, and additional commentary that do not fit within the three, primary manuscripts.
4. APA style is used for this document.
5. References are presented in a single list following Chapter 5.
Chapter 1: Introduction
Overview

It is imperative for school-based professionals to promote positive mental health among school-aged children who are experiencing stress and anxiety. One method for achieving this is by implementing school-based programs that incorporate mental health intervention activities that focus on fostering the development of personal strengths and coping mechanisms, as well as remediating problems. This approach acknowledges the specific needs of children with anxiety in a setting that is safe and familiar to them.

The work contained in this document is focused on determining the effectiveness of a school-based yoga program on improving anxiety and related psychosocial health among children demonstrating signs and symptoms of anxiety. This work also highlights the effectiveness of mental health promotion and interventions in the school setting (Bazyk, 2011). Utilizing a yoga-based approach to help children develop and maintain positive mental health and self-regulation skills presents a unique opportunity for increasing the breadth and depth of school-based mental health efforts.

Mental Health Issues of Childhood & Adolescence

An estimated 21% of children and adolescents in the United States have a diagnosable psychiatric disorder (U.S. Department of Health and Human Services, 1999; Merikangas et al., 2010) resulting in total healthcare expenditures of $8.9 billion dollars per year and even higher lifetime costs (Soni, 2009). These disorders are associated with
decreased independent living skills, academic failure, poor social skills, and suicide/self-harm (U.S. Department of Education, 2001; Shaffer & Craft, 1999). Simultaneously, there is a growing concern regarding the mental health of all school-age children and adolescents, with research indicating that child mental health is worsening as stressors such as social adversity, tenuous peer relations, and school violence persist (Nunn, 2010; Piek, Dworcan, Barrett, & Coleman, 2000; Tiffin, Arnott, Moore, & Summerbell, 2011; Twemlow & Fonagy, 2001). Consequently, the need for innovative ways to nurture children’s mental health and well-being is crucial.

**Anxiety Disorders**

Anxiety disorders are the most prevalent psychiatric disorders occurring in children (Alyahri & Goodman, 2008; Cartwright-Hatton, McNicol, & Doubleday, 2006), with 10-17% of community samples and up to 45% of children in mental health clinics affected (Weiss & Last, 2001; Last, Perrin, Hersen, & Kazdin, 1992). Prevalence data of a representative U.S. sample demonstrated that among adolescents affected by anxiety disorders, 50% had their onset by age 6 (Merikangas et al., 2010) and the median age of onset is age 11 (Kessler et al., 2005). These statistics demonstrate that anxiety disorders occur early and often in children.

Anxiety disorders are a group of conditions characterized by intense, persistent anxiety or fear (Kerig & Wenar, 2006; Keeley & Storch, 2009). Diagnostically, anxiety is categorized as an internalizing disorder, such that distress and suffering are directed
inward. Internalizing symptoms may present as phobias, worrying, stomachaches, withdrawal, nausea, compulsions, insomnia, isolation, depression, and crying (Kerig & Wenar, 2006). Anxiety symptoms often have three components: cognitive (e.g. anxious thoughts), physiological (e.g. hyperarousal), and behavioral (e.g. avoidance, withdrawal) (Beck, 1976; Hoehn-Saric & McLeod, 2000; Keeley & Storch, 2009; Lang, 1968). Taken together, anxiety symptoms disrupt academic, social, and familial functioning (Langley, Bergman, McCracken, & Piacentini, 2004). Additionally, anxiety disorders in children are associated with mood and anxiety disorders in adolescence and adulthood, suicide attempts, and psychiatric hospitalization (Storch, 2005).

Despite the debilitating effects anxiety can elicit, there are often long latency periods between onset of symptoms and the first treatment contact (Wang et al., 2005). The latency period for making first treatment contact is often even slower for those with anxiety (Wang et al., 2005). Anxiety can cause significant disturbances in normative social and academic development (Storch, 2005) and, if left untreated, can lead to increased frequency and severity of episodes, resistance to treatment, and the development of comorbidities such as depression and conduct problems. In particular, delays in treatment among children with PTSD, a type of anxiety disorder, is associated with the development of mood and anxiety disorders in adolescence and adulthood, suicide attempts, psychiatric hospitalization, gastrointestinal problems, decreased sexuality, a heightened fear response, and long-term inability to modulate behavioral and
cognitive responses to stress (Storch, 2005; Nemeroff, 2004; Spinazzola et al., 2011).

Expansion of school-based mental health services may increase early identification and access to programming that assists with anxiety symptoms (Bazyk & Arbesman, 2013).

**School-Based Mental Health Services**

Impoverished children, like the ones in our study, are prone to experience chronic environmental stressors and other trauma, making them especially vulnerable to social and emotional difficulties (Keenan et al., 1997), such as anxiety. As a result, they are more predisposed to poor academic performance, school dropout, negative social outcomes (Reynolds, 2001; Nunn, 2010; Tiffin, Arnott, Moore, & Summerbell, 2011; Twemlow & Fonagy, 2001), and chronic difficulty in function and participation in daily activities. Thus, high rates of anxiety symptoms are likely to be found among inner city and impoverished youth and it can deeply impact their participation and performance in the school setting.

In addition, these youth often lack the resources or family/community supports to identify and treat anxiety early, resulting in a dire need for school-based programming and treatments that facilitate positive mental health and self-regulation skill development in an easily accessible environment. School is reported as the primary source for providing mental health services to approximately 70% of youth with psychopathology, yet this demand exceeds the number of trained professionals and available treatments (DeSocio & Hootman, 2004). The call for the development and expansion of school
mental health services continues to grow and many professionals realize that school-
Based services may be the most efficient and effective way to reach children (Bazyk &
Arbesman, 2013). Thus, there is a need to increase the number and diversity of effective
school-based programs and services.

School-based interventions for anxious children should be informed by a public
health approach to mental health. In 2009, the National Research Council and the
Institute of Medicine (IOM) published a volume of writings dedicated to mental,
emotional, and behavioral disorder prevention as well as positive mental health
promotion. They recommend that the prevention of these disorders and the promotion of
positive mental health development for all youth become a national priority on policy,
research, and practice levels. They define prevention efforts as activities, programs, or
social interactions that reduce exposure to risk factors. Promotion initiatives facilitate
supportive family, school, and community environments while simultaneously
identifying and instilling protective factors in young people. In contrast to the current
model of health care, which is reactive and treatment based in nature, this approach spans
the mental health intervention spectrum in broader ways.

A public health approach operates under three tiers (universal, targeted, and
intensive), each of which matches precisely with the universal, selective, and indicated
typology used by the IOM (Bazyk, 2011; Taras, H. & American Academy of Pediatrics
Committee on School Health, 2004). In the public health framework, Tier 1 services are
geared towards universal promotion and prevention among large groups of youth. Collaborating with school personnel to create positive environments that support positive mental health and programs that increase mental health literacy are examples of Tier 1 strategies. Tier 2 services are directed at students who have learning, emotional, or life experiences that place them at at-risk for the development of mental, emotional, and behavioral difficulties. Tier 2 strategies, such as teaching time-management or relaxation techniques, aim to prevent the development of mental illness while promoting competency in functional domains. Tier 3 services focus on intensive interventions for children with identified disorders that have begun to significantly impact function and participation. These services often include medical and psychosocial interventions as well as school and community wrap-around services that are individualized to the child’s specific diagnosis, resources, and needs (Bazyk, 2011).

As school settings are the primary source for provision of mental health services youth (DeSocio & Hootman, 2004), utilizing school-based programs that integrate a public health approach to addressing the mental health needs of children with and at-risk for anxiety is pragmatic. Programs such as these have the potential to: 1) develop a workforce that has the knowledge and skills to implement interventions in community contexts (IOM, 2009), 2) provide services to those with or at-risk for anxiety under a system of promotion, prevention, and intervention and, 3) manage care in cost-effective, naturalistic ways.
Meanwhile, there is emerging evidence that school-based preventive interventions aimed at improving social and emotional outcomes can also improve academic outcomes (O’Connell, Boat & Warner, 2009), further instilling protective factors essential to maximizing success among these children. Altogether, a public health approach can assist in developing a healthy school environment filled with knowledgeable and caring professionals who can support psychosocial health and self-regulation skill development among children with and at-risk for anxiety. Thus, a public health approach to addressing anxiety informed our work by shaping our conceptualization and application of yoga as a means of building protective factors (coping or self-regulation skills) and maximizing opportunity for positive mental health development (behavior, participation) among children with experiencing anxiety.

**Yoga for Children and Adolescents**

Yoga may be one modality suited to meet the growing need for school-based mental health programming. Successfully implemented yoga programs may also increase the number of professionals who are equipped to engage with anxious students in the school setting and support their psychosocial needs. If yoga interventions are effective and integrated into schools, it could also promote collaboration among school professionals who are involved in the care of children with anxiety. In turn, this collaboration may provide increased opportunity to assess and monitor intervention effectiveness (Case-Smith & Holland, 2009).
**Background**

Yoga is a modality that may provide reasonable benefits to children’s mental health functioning, centralizes around building protective factors, and maximizes opportunity for positive mental and physical health development. Yoga has been increasingly used in universal populations of children as well as those with identified psychopathology. In 2007, upwards of 1.5 million children were participating in yoga programs across the United States (Barnes, Bloom, & Nahin, 2009) and this number continues to increase as these programs are implemented in a growing number of studios, clinical settings, and schools.

Yoga is a subset of mindful and contemplative practices. Mindfulness is a therapeutic technique where one focuses on the present environment, experience or emotional state by observing and describing one’s thoughts, feelings, and physical sensations calmly and without judgment. Yoga is a mindfulness-based practice and includes structured activities (postures, breathing, meditation) that “require individuals to exercise volitional control over their physical and mental activity” (MLERN, 2012), through focus on improving attention, enhancing emotional regulation skills for stress management, and increasing self-knowledge (Greenberg & Harris, 2012). Western use of yoga and, in particular, yoga used with children is generally secular (non-spiritual or religious). Yoga designed for children often incorporates modified versions of body postures and exercises geared toward strength and flexibility, breathing techniques
mental/emotional awareness, and self-regulation skills. It is hypothesized that these practices elicit adaptive neural and mental responses that can result in improved behavior and emotion regulation (Greenberg & Harris, 2012). In colloquial terms, yoga is considered to be a recreational and rehabilitative activity that develops and maintains a healthy body and mind.

Yoga research focused on child and adolescent populations has examined a broad range of psychosocial and physical health outcomes. Methods used in existing yoga research are highly variable and limited in their rigor. However, many studies of yoga in children and adolescents have shown that yoga programs in different settings are feasible and acceptable and can result in improved physical health, perceived stress, affect, and internalizing and externalizing behaviors (Beets & Mitchell, 2010; Noggle & Khalsa, 2009; Stueck & Gloeckner, 2005; Telles, Narendran, & Raghuraj, 1997; Telles & Srinivas, 1998).

**Feasibility & Acceptability**

Recent research supports that yoga interventions are feasible and acceptable in both the clinical and school setting (Steiner et al., 2012; Noggle, Steiner, Minuami, & Khalsa, 2012; Mendelson et al., 2010). Measures of feasibility in a study of yoga for urban youth reported student enthusiasm and no difficulty recruiting participants (Mendelson et al., 2010). In this sample, between 40-77% of students completed three quarters of the intervention classes, with the majority of absences being due to the child...
missing school on the intervention day. Children with emotional and behavioral disorders who participated in a yoga program in an urban school appeared motivated to learn new skills and demonstrated a 90% attendance rate (Steiner et al., 2012). Participants in this study reported high levels of satisfaction with the program (100% of teachers, 62% of parents, and 100% of students), with parents observing increased relaxation, mood, and energy in their children. Mirroring the parents’ comments, the children stated that the intervention assisted with improving their strength, relaxation, mood, and energy.

Another study of yoga in a high school setting demonstrated average attendance (median 64.3%) and moderate to high ratings (on a Likert type scale of 1-10) on the Yoga Evaluation Questionnaire, with the majority of ratings showing that yoga was perceived as somewhat helpful (rating=4) to very helpful (rating=10) (Noggle, Steiner, Minami, & Khalsa, 2012). Lastly, a non-profit organization located in Portland, Oregon has implemented an 8-week (90 minutes, one time per week) yoga course, called Street Yoga, since 2002. The Street Yoga program is focused on youth and families struggling with homelessness, poverty, abuse, addiction, trauma and behavioral challenges. Program evaluations demonstrated that 85% of girls (ages 13-18) participating in one 8-week course reported that yoga made them feel more energetic, happier, more focused, and less nervous and tense (Lilly & Hedlund, 2010). The long-standing nature and positive responses surrounding this program highlight the acceptability of integrating yoga into the care of traumatized youth. Overall, very few studies have reported any adverse effects
of yoga, refusals to participate, or markedly negative responses to the treatment (Carei, Fyfe-Johnson, Breuner, & Brown, 2010).

**Mental Health and Psychosocial Outcomes of Yoga**

Many studies have analyzed yoga as a means to enhance mental health and psychological outcomes such as stress, anxiety, attention, mood, behavior, and overall well-being. A pilot study of a preventive yoga-based stress reduction program called Mind Magic (Jellesma & Cornelis, 2012), reported stress reduction (p<0.01) within the intervention group (n=30) and not the control group (n=24), with the most benefit seen in children with high behavioral inhibition systems (e.g. sensitive to aversive stimuli, increased arousal, avoidance, negative affect). Children with moderate to high behavioral inhibition systems showed a 7.4-9.3% reduction in stress as compared to the 0.0-5.6% decrease seen in children with high behavioral activation systems (e.g. enthusiastic, approach behavior, goal-directed activity). A 12-week yoga intervention among 97 fourth and fifth grade students from four Baltimore City Schools found reduced involuntary stress reactions (according to The Responses to Stress Questionnaire), which were interpreted as improvement in self-regulatory capacities (Mendelson et al., 2010).

An 8-week mindful yoga program conducted in the school setting with fourth and fifth grade girls (n=155) did not reveal reduced stress among participants, however, it did find that the intervention group reported greater appraisals of stress (self-reflection and rating of severity of a stressor) and greater frequency of using coping skills (White,
Superior scores on negative affect (p= .0061), total mood disturbance (p= .015), and tension-anxiety (p= .0020) were noted for high school students participating in a yoga intervention (n=36) versus those who participated in physical education (n=15) class instead (Noggle, Steiner, Minami, & Khalsa, 2012). A semester-long yoga program (30-40 minutes, 1-2 times per week) implemented within the school curriculum identified statistically significant decreases in anger (p= .03) and fatigue (p= .02) and increased resilience (p= .01), among the yoga (n=74) participants versus controls (n=47) who participated in regular physical education class (Khalsa et al., 2012).

A study of the Yoga-Ed program with 37 urban elementary school children with emotional/behavioral disorders (Steiner et al., 2012) yielded improved adaptive skills (p= .03) and internalizing symptoms (p= .04) according to the Behavior Assessment Scale for Children, Teacher Rating Scale (BASC-2 TRS). Another study implemented in an urban elementary school focused on 29 at-risk children in the 3rd grade (Klatt et al., 2013). Following implementation of the 8-week (45 minutes, 1 time per week) Move-Into-Learning yoga program, significant improvements in behavior were noted for the hyperactivity (p= .002) and cognitive/inattentiveness (p= .001) subscales of the Conner’s Teacher Rating Scale-Revised.

Also suggestive of benefit is yoga as a means to improve physiologic measures of health that are often associated with mental health outcomes. As yoga contains a series of controlled breathing exercises it has inspired many research groups and health
professionals to take interest in investigating the cardiopulmonary effects of yoga.
Following six months of daily relaxation yoga, adolescent females (n=14) in a residential setting for socially or emotionally traumatized youth demonstrated decreased and more normalized breath rates (Telles, Narendran, & Raghuraj, 1997), which is suggestive of reduced levels of fear and anxiety (Bloch, Lemeignan, & Aguilera, 1991). Participants in the control condition (n=14) engaged in physical games such as relay races and demonstrated no changes in breath rates.

Finally, there are preliminary findings that yoga interventions are beneficial for youth with eating disorders, which severely impact mental and physical health. One randomized controlled clinical trial has investigated whether yoga can decrease eating and psychological symptoms in adolescents with eating disorders (anorexia nervosa, bulimia nervosa, and eating disorder not otherwise specified). This study included 50 female and 4 male participants who were randomly assigned to either an 8-week trial of standard care or yoga plus standard care (Carei, Fyfe-Johnson, Breuner, & Brown, 2010). The yoga intervention consisted of a manual-based application of Viniyoga specifically tailored to eating disorders (1 hour; 2 times per week for 8 weeks). Analyses indicated that, according to the Beck Depression Inventory and State Trait Anxiety Inventory, there were significant improvements in state anxiety (p= .02, η²=.2), trait anxiety (p< .001, η²= .38) and depression (p= .01, η²=.26). Each of these outcomes suggests potential benefits
on using yoga to improve psychological outcomes such as depression and anxiety. See Table 1 for summary of all studies discussed.

### Table 1. Summary of the Evidence Supporting Yoga for Psychosocial Outcomes Among Children and Youth

<table>
<thead>
<tr>
<th>Study</th>
<th>Objectives</th>
<th>Sample</th>
<th>Outcome Measures</th>
<th>Results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carei et al., 2010</td>
<td>To determine whether yoga can decrease eating and psychological symptoms in adolescents with eating disorders.</td>
<td>Ages 11-21 Yoga Group: (n=26) Treatment as Usual: (n=27)</td>
<td>Intervention: Yoga + Treatment as Usual for 8 weeks Treatment as Usual</td>
<td>Study results show improved EDE, depression, and anxiety scores for the yoga intervention group &amp; acute improvements in food preoccupations.</td>
<td>Preliminary evidence to support the use of yoga intervention among youth with eating disorders. Need power analyses, non-convenience sample.</td>
</tr>
<tr>
<td>Jellesma &amp; Cornelis, 2011</td>
<td>To Examine a mind-body-based preventive intervention program &amp; determine relationships between children’s behavioral inhibition &amp; activation systems (BIS/BAS), stress, &amp; stress reduction.</td>
<td>Ages 8-13 Mind-Body Group: (n=30) Control Group: (n=24)</td>
<td>Intervention: Mind Magic Program (yoga postures, relaxation, breathing).</td>
<td>Stress reduction only seen in intervention group and primarily with high BIS children.</td>
<td>Children with high BIS may be best candidates for this intervention (anxious, fearful, avoidant).</td>
</tr>
<tr>
<td>Khalsa, 2012</td>
<td>To evaluate mental health benefits of yoga for adolescents in secondary school.</td>
<td>11th &amp; 12th Grade Students (Mean age= 16.8) Yoga Group (n= 74) PE Group (n= 47)</td>
<td>Intervention: Yoga-Ed 2-3 sessions/week (30-40 min) for 11 weeks.</td>
<td>-Feasible. -Not difficult to recruit - Anger, resilience, and fatigue were only variables statistically significant for yoga group vs. controls. -Control groups declined on most outcomes.</td>
<td>Feasible Intervention. Yoga may play a role in protective mental health. No blinding.</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Study</th>
<th>Grade or Age</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Klatt & Case-Smith, 2013 | 3rd Grade students (Mean age=8.5; n=41) | Intervention: 8-week (45-minutes 1x/week) Move-Into-Learning Yoga program  
Outcome Measures: Semi-structured interviews; Conner’s Teacher Rating Scale-Revised (CTRS-R) | -Significant improvements in behavior (hyperactivity, cognitive/inattentiveness subscales of CTRS-R).  
-Teacher reported feasibility and acceptability.                                                                                                                                                      | School-based yoga and mindfulness exercises may prevent/improve stress in underserved, low SES youth. Small sample size, no control group, and no blinded assessments. |
| Mendelson, 2010       | 4th & 5th Grade students in Baltimore City Schools (Ages 9-11; n=94)  
Yoga Group (n=51)  
Waitlist Control (n=46) | Intervention: 45-minute mindfulness/yoga sessions 4/x week for 12 weeks.  
Outcome Measures: Responses to Stress Questionnaire (to social stress/coping skills); The Short Mood & Feelings Questionnaire-Child Version; The Emotion Profile Inventory; People in My Life | -No problems with recruitment  
-Enthusiasm  
-Focus groups showed positive experiences and acceptability  
-Only statistically significant differences were improved Involuntary Engagement (rumination, intrusive thoughts, emotional arousal). | Feasible & acceptable. Limited improvement on psychosocial outcomes (decreased some problematic responses to stress). Open treatment, pilot study only. |
| Noggle et al. (2012)  | 11th & 12th Grade Students (n=51)  
Yoga Group: (n= 36)  
PE as Usual Group: (n=15) | Intervention: Modified Yoga-Ed. 2-3 yoga sessions per week for 10 weeks  
PE as Usual 30-40 min, 2-3x/week for 10 weeks.  
Outcome Measures  
The Profile of Mood States-Short Form; The Positive and Negative Affect Schedule for Children; Perceived Stress Scale; The Inventory of Positive Psychological Attitudes: Resiliency Scale; State-Trait Anger Expression Inventory; The Child Acceptance and Mindfulness Measure | -Total mood disturbance & Mood States improved for yoga & worsened in control.  
- Negative affect improved in yoga & worsened in controls.  
- No significance for resilience, anger expression, or mindfulness. | Feasible & students found it beneficial. Suggests positive benefits in psychosocial well-being. Clinical trial without blinding, no power analyses. |
Table 1: Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Population &amp; Setting</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steiner et al. (2012)</td>
<td>Children with EBD (8-11)</td>
<td>Yoga-Ed 2x/week for 3.5 months.</td>
<td>Behavior Assessment Scale for Children, Teacher Rating Scale/Parent Rating Scale (BASC-2 TRS, PRS); Satisfaction with Intervention; State-Trait Anxiety Inventory for Children; Kidscreen-27; BARON (social, emotional, prob. Solving competence); Session attendance &amp; behavior Checklist</td>
<td>Feasible and possibly helpful in reducing symptoms of EBD.</td>
</tr>
<tr>
<td>Telles et al., 1997</td>
<td>Females with history of social and emotional trauma (12-16 years old)</td>
<td>60 minutes of yoga (postures and relaxation)</td>
<td>A 10-channel polygraph (was used to record the electrocardiogram (EKG), respiration, and skin resistance.</td>
<td>These results suggest that a yoga program which includes relaxation, awareness, and graded physical activity is a useful addition to the routine of community home children with a history of trauma.</td>
</tr>
<tr>
<td>White, 2012</td>
<td>4th &amp; 5th Grade Girls Yoga Group (n=70)</td>
<td>8-weeks of mindful movement (Yoga) as part of Mind Body Stress Reduction Program</td>
<td>The Feel Bad Scale; The Schoolagers’ Coping Strategies Inventory; Global Self-Worth subscale; Healthy Self-Regulation Subscale</td>
<td>Increasing awareness of stress may enhance coping, but it may also increase stress as a person is more aware of and thinking about stress (this may be more likely in females who have more ruminative thought processes).</td>
</tr>
</tbody>
</table>


Limitations and Implications

While research into the effects of yoga for children and adolescents is growing, it is marked by significant limitations. First, there is wide variability in the type and method of yoga used for intervention and few studies report the training type/level of their instructors. While this is reflective of the fact that there are several different types of yoga disciplines and practices, it limits the ability to generalize results. There are also a notable variety of outcomes, assessments, and analyses used across studies, again making generalization a problem. Frequency and intensity (weeks, hours) of intervention periods generally fell within the 8-12 week range, however some studies provided intervention for as little as seven days or as long as six months. Comparatively, only a handful of studies reported attendance rates of participants. These disparities negatively impact our conclusions on dose-response relationships. More consistent descriptions of the intervention, instructor training, and frequency and intensity will all elevate the quality of yoga research.

Additionally, the majority of these studies have weak methodological rigor. Lack of RCTs, sufficient power, validated measures, blinding, long term follow up, and little to no rationale for the determination of control group conditions are all noted patterns within this body of research and each need to be considered in future research. Furthermore, qualitative research that elucidates participant perspectives on the processes
of change, strengths, and weaknesses as they relate to yoga is also needed in subsequent studies.

**Move-Into-Learning**

**Preliminary Data**

The Move-Into-Learning program (Klatt, 2008) is an 8-week (1 time per week) mindfulness-based intervention that is augmented with yoga, music, written, and visual arts. It has been studied both quantitatively and qualitatively in school children. One study was completed in an urban elementary school focused on at-risk children in the 3rd grade (Klatt et al., 2013). Following implementation of the 8-week (45 minutes, 1 time per week) Move-Into-Learning program, significant improvements in behavior were noted for the hyperactivity (p= .002) and cognitive/inattentiveness (p= .001) subscales of the Conner’s Teacher Rating Scale-Revised. Another study investigated the perceptions of children who participated in Move-Into-Learning yoga program. In this study, three themes were generated from focus groups: feeling calm and focused, controlling their own behavior, and supporting a positive self-concept (Case-Smith, Sines, & Klatt, 2010). Thus, it appears that the intervention was well received by the children and suggests that yoga programs targeting at-risk students can heighten their self-efficacy and skill in coping with stress.
Move-Into-Learning for Anxiety

The intervention included in this dissertation work consisted of an 8-week version of the Move-Into-Learning (MIL) program specifically tailored to address anxiety symptoms and focused specifically on yoga. Move-Into-Learning for Anxiety (MIL-A) did not include the following elements of MIL: visual arts, CD for daily classroom practice with teacher, or healthy snack preparation. Removal of these elements was carefully considered and based in 1) strengthening the rigor of this study and 2) pragmatics of current study site and design. In order to examine a yoga program specific to anxiety and to assess its outcomes, it was decided that including visual arts and healthy snack preparation made the program multimodal and determining specific elements of program effectiveness would become more difficult. Additionally, MIL-A was provided to specific children and also was being compared to a control group, making use of a CD for daily classroom practice problematic.

The session topics in MIL-A remained the same as the Move-Into-Learning program (e.g. Roller Coaster, Core Support, Healthy Toolbox), but discussion points were specific to signs and symptoms of anxiety, such as physiologic arousal, anxious thoughts, and ways to utilize yoga for anxiety management. Various tracks of instrumental, relaxation music were played via an iPad and speaker dock throughout the yoga sessions. Each session occurred once per week for approximately 45 minutes.
A pediatric mental health occupational therapist designed the Move-Into-Learning for anxiety program (MIL-A), based on the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-V*: American Psychiatric Association, 2013) criteria for generalized anxiety disorder and on current literature outlining psychosocial functioning problems related to anxiety. MIL-A incorporated discussion and yoga to address the following *DSM-V* criteria for generalized anxiety: excessive anxiety and worry about several activities (e.g. school performance), difficulty controlling worry, restlessness or feeling keyed up or on edge, fatigue, irritability, difficulty concentrating, muscle tension, and sleep disturbance (5th ed.; *DSM-V*: American Psychiatric Association, 2013).

The *DSM-V* also states that anxiety can result in social and occupational impairments with research supporting that anxiety symptoms can disrupt academic, social, and familial functioning (Langley, Bergman, McCracken, & Piacentini, 2004). These areas of functioning include relationships with others, social support, and self-regulation needs. Thus, MIL-A discussion and accompanying yoga practice was centered on connecting anxiety symptom recognition and management to assist with occupational participation and performance in daily activities.

Each MIL-A session included yoga and group discussion. The yoga portion (35 minutes) consisted of yoga postures (e.g. downward facing dog, warrior I), controlled breathing activities (e.g. belly or bumblebee breath), and supine meditation (e.g. corpse
pose with guided imagery). The discussion portion (10 minutes) consisted of small group verbal processing that was focused self-regulation, coping, and stress reduction through discussion of the yoga practice (e.g. Is there anything you learned today that might help you when you are nervous?). See Table 7 for a brief outline of Move-Into-Learning for Anxiety and Appendix A for the full 8-week session activities including discussion, anxiety concepts, physical postures, breathing exercises, and relaxation.

**Program Development**

In March of 2014, a 4-week program development trial of MIL-A was conducted. An information session (approximately 10 minutes in length) was provided to all 8th grade students. MIL-A activities and time demands were outlined verbally for students and they were provided with time to ask questions. If they were interested in participating a printed permission form was given to them. A permission form signed by a parent and verbal permission from a student’s homeroom teacher was required. There were no other inclusion/exclusion criteria. No outcomes data were collected. The purpose of this trial was to informally assess:

1) Student and teacher acceptability of intervention

2) Student interest and ease of recruitment

3) Space needs

4) Activity preparation needs (e.g. set-up, clean-up, arrangement of materials)

5) Student ability to complete intervention activities (e.g. modifications, speed)
6) Time management (e.g. locating and directing students to intervention space)

A total of nine students (3 male, 6 female) from the 8th grade class at a Central Ohio charter school participated. All students attended 100% of sessions. All discussion and yoga activities were acceptable to students and teachers. Students were able to complete yoga postures with few modifications. Students verbally reported to enjoy the meditation/relaxation time, as well as the postures. Several male students were interested in how the yoga postures could improve their athletic performance. All students were easily engaged in conversation and appeared open to sharing their thoughts and feelings. All 8th grade teachers were open to allowing their students to participate, including permission to miss class time and wear non-uniform clothing for yoga sessions. All other school personnel (e.g. secretary) and administrators (e.g. principal, vice-principal, dean of students) were agreeable to and supportive of the program development trial.

Conclusion

Anxiety disorders can deter healthy physiological, psychological, and social development in children. A range of biological, individual, family, social, and cultural factors can influence these disorders and difficulties. These factors can make a child more vulnerable to developing a mental illness (risk factors) or can assist in preventing the development and mitigate the associated negative outcomes (protective factors). Approaches that capitalize on protective mechanisms are imperative. A need also exists
for programs or strategies that consider the child holistically through methods that facilitate positive physical, psychological, and social development; areas often impacted by anxiety.

The selected modality for applying this approach is a school-based yoga program. Yoga has demonstrated preliminary benefits on measures of stress, anxiety, mood, behavior, and breathing. Preliminary studies also indicate that it is a feasible and well-received intervention when used in the school setting. As a result, a school-based yoga program has the potential to improve mental health outcomes in anxious youth, while also enacting protective mechanisms through promoting self-efficacy and self-esteem, and opening opportunities for reducing risk impacts.

The objective of this dissertation is to systematically examine current yoga research for anxiety in children, conduct and assess a well-controlled study of yoga for anxiety, and increase understanding of the processes of change as a result of yoga through quantitative and qualitative methods.
Chapter 2: A Systematic Review of Yoga Interventions for Anxiety

Among Children and Adolescents
Abstract

Objective

Anxiety Disorders are the most prevalent psychological disorders among children and youth. Children, families, health professionals, and educators are increasingly interested in treatment options for anxiety. Yoga is widely used in clinical, school, and community settings; however, consolidated sources outlining its effectiveness for reducing anxiety are limited. This paper reviews the evidence for yoga and yoga-based interventions examining anxiety as an outcome measure.

Method

This systematic review examined the evidence base (1990-2014) for yoga and yoga-based interventions addressing anxiety outcomes among children and adolescents (ages 3-18).

Results

A total of 2,147 references were identified and through a multi-step process of elimination (according to inclusion/exclusion criteria), 80 articles were eligible for full-text review and only 16 were included in the final analysis. Six of the studies were randomized controlled trials, two were non-randomized pre-post control group designs, seven were uncontrolled pre-post intervention studies, and one was a case study.
Conclusions

Nearly all studies indicated improvements in anxiety following a yoga intervention. Yoga is a probably efficacious treatment for assisting in decreasing anxiety. However, due to the wide variety of study populations, limitations in some study designs, and variable outcome measures, further research is needed to enhance the ability to generalize and apply yoga for anxiety reduction.
Introduction

Anxiety Disorders

An estimated 21% of children and adolescents in the United States have a diagnosable psychiatric disorder resulting in at least minimal impairment, and upwards of four million youth suffer from serious psychiatric disorders that cause significant functional impairments across social, familial, and community domains (U.S. Department of Health and Human Services, 1999; Merikangas et al., 2010). Anxiety disorders are the most prevalent of these disorders in children (Alyahri & Goodman, 2008; Cartwright-Hatton, McNicol, & Doubleday, 2006), with 10-17% of community samples and up to 45% of children in mental health clinics affected (Weiss & Last, 2001; Last, Perrin, Hersen, & Kazdin, 1992). Prevalence data of a representative U.S. sample demonstrated that among adolescents affected by anxiety disorders, 50% had their onset by age 6 (Merikangas et al., 2010). These statistics demonstrate that anxiety disorders occur early and often in children. Additionally, anxiety disorders in children are associated with mood and anxiety disorders in adolescence and adulthood, suicide attempts, and psychiatric hospitalization (Storch, 2005). Given the high prevalence rates and functional impairment associated with childhood anxiety disorders, the need for innovative ways to nurture these children’s mental health and well-being is imperative.
Yoga for Anxiety

Yoga has been increasingly used with a variety of child populations. In 2007, upwards of 1.5 million children were participating in yoga programs across the United States (Barnes, Bloom, & Nahin, 2009) and this number continues to increase as these programs are implemented in a growing number of community studios, clinical settings, and schools. Yoga, a subset of mindful and contemplative practice, includes structured activities that “require individuals to exercise volitional control over their physical and mental activity” (Davidson, 2012), through focus on improving attention, enhancing emotional regulation skills for stress management, and increasing self-knowledge (Greenberg & Harris, 2012). Yoga designed for children often incorporates modified versions of body postures and exercises geared toward strength and flexibility, breathing techniques, mental/emotional awareness, and self-regulation skills. It is hypothesized that these practices elicit adaptive neural and mental responses that can result in improved behavior and emotion regulation (Greenberg & Harris, 2012). In colloquial terms, yoga is considered to be a recreational and rehabilitative activity that develops and maintains a healthy body and mind through improved responses to stress.

Growing interest in the application of yoga with children stems from its use among the adult population. Adult studies have shown positive effects in training for attention, inhibiting deleterious cognitive and emotional processes, and reducing mood and anxiety disorders, stress, and blood pressure (Brefczynski-Lewis et al., 2007, Arias et
al., 2006; Kirkwood et al., 2005; Ospina et al., 2007; Pilkington et al., 2005; Shapiro et al., 2007). When examining the adult yoga literature specific to anxiety, the results are generally positive. A systematic review of yoga for anxiety among adults yielded eight studies from the 1980s and 1990s (Kirkwood et al., 2005). Each study investigated the effects of various yoga programs on adults with anxiety disorders and showed statistically significant improvements in anxiety when compared to control groups.

More recent research has further validated these earlier findings and continues to demonstrate improvements in anxiety among adults who participate in yoga programs. A 2012 study comparing 60 minutes of yoga three times per week over 12 weeks with a walking group of the same dose/intensity showed significantly decreased anxiety (p=0.04) according to the State Trait Anxiety Inventory (STAI) among yoga participants only (Streeter et al., 2012). These decreases were associated with increased thalamic neurotransmitter gamma-aminobutyric acid (GABA) levels, which act as a counterbalance to excessive glutamate. Reduced GABA levels and excess glutamate are often found in anxiety disordered individuals and can negatively impact regulation and cause unnaturally high brain activity. This study highlighted, for the first time, a positive correlation between self-report and objective physiologic measures of anxiety reduction following yoga.

In an additional study of yoga effects on anxiety among adult women, 34 participants were enrolled in 90 minute Ashtanga yoga sessions twice per week
The yoga program lasted for two months and was implemented at a yoga clinic specifically for women. When compared to the 31 participants enrolled in a waitlist control condition, the yoga group demonstrated significantly decreased state (anxiety about an event) and trait (anxiety level as a personality characteristic) anxiety scores on the STAI, with p-values of 0.03 and <0.001 respectively. Lastly, several studies of short-term yoga have been conducted with individuals who have recently experienced trauma via a tsunami or flood (Telles, Singh, Joshi, & Balkrishna 2010; Telles, Naveen, & Dash, 2007). One of these studies showed that, among 47 survivors of the December 2004 tsunami in the Andaman Islands, there was a significant decrease in self-rated fear, anxiety, sadness and disturbed sleep following 60 minutes of daily yoga for 8 consecutive days (Telles, Naveen, & Dash, 2007). While not exhaustive of the research related to yoga and anxiety among adults, these studies bring attention to potential for anxiety symptom reduction following participation in yoga.

Although less prolific than the adult literature, research regarding the effectiveness of yoga in the child and adolescent population has also examined a broad range of psychosocial outcomes. Methods used in existing yoga research are highly variable and limited in their rigor. However, many studies of yoga in children and adolescents have shown that yoga programs in different settings are feasible and acceptable and can result in improved stress, affect, and internalizing and externalizing
behaviors (Beets & Mitchell, 2010; Noggle & Khalsa, 2009; Stueck & Gloeckner, 2005; Telles, Narendran, & Raghuraj, 1997). For example, a pilot study of a preventive yoga-based stress reduction program called Mind Magic reported stress reduction within the intervention group and not the control group (Jellesma & Cornelis, 2012), with the most benefit seen in children with high behavioral inhibition systems (e.g. sensitive to aversive stimuli, increased arousal, avoidance, negative affect). Additionally, a 12-week yoga intervention among 97 fourth and fifth grade students from four Baltimore City Schools found reduced involuntary stress reactions (according to The Responses to Stress Questionnaire), which were interpreted as improvement in self-regulatory capacities (Mendelson et al., 2010).

While the positive effects of yoga on anxiety among adults and preliminary studies of yoga with children appear promising there is a lack of consolidated evidence on the effectiveness of yoga on anxiety among children and adolescents. There is a clear need for systematic examination and appraisal of yoga interventions to reduce anxiety in children and adolescents.

**Purpose of this study**

Given the evidence for anxiety prevalence among children and youth and the need to identify the evidence base for yoga and yoga-based interventions used to address anxiety, this systematic review examined the following research question: What is the evidence
for the effectiveness of yoga interventions, as defined by controlled breathing, postures, and meditation, to improve anxiety among children and youth?

**Methods**

The first author and an experienced medical librarian at The Ohio State University’s Prior Health Sciences Library developed search terms. Databases and sites searched included PubMed, CINAHL, ERIC, PsychINFO, AltWatch, Clinical Key, Cochrane Database of Systematic Reviews, Natural Medicines Comprehensive Database, Natural Standard, Mindfulness Research Guide, and Traditional Chinese Medicine Information Database. In addition, reference lists from articles were hand searched to ensure that all applicable articles were considered.

A variety of key word and search term combinations were used to identify relevant articles. They included: children, youth, adolescents, anxiety, anxious, anxiety disorders, obsessive compulsive disorder, posttraumatic stress disorder, separation anxiety, performance anxiety, stress, yoga, yoga interventions, mind-body, mindfulness, and meditation. Inclusion criteria were: (1) peer-reviewed studies published in English; (2) use of a yoga or a mind-body intervention that included physical postures, controlled breathing, and meditation; (3) participants were youth aged 3 to 18 years; (4) an anxiety outcome measure was included. The review excluded data from presentations, conference proceedings, non–peer-reviewed research literature, dissertations, and theses.
For our research question there were 2,147 references identified (see Figure 1). The first author completed the initial steps of eliminating references, based on study titles and abstracts that did not meet criteria #1-4. Then, both authors completed the next step of retrieving full-text versions of potential articles and determining final inclusion in the review based on inclusion and exclusion criteria.

A total of 16 articles were included in the final review. The two authors reviewed the articles according to their quality (scientific rigor and lack of bias) and levels of evidence. Each article included in the review was then abstracted using an evidence table that provides a summary of the methods and findings of the article.

**Analysis**

The authors analyzed the studies that met inclusion criteria and extracted these data: (1) study objectives; (2) research design; 3) participant characteristics; (4) intervention type; (5) outcome measures and (6) results. Studies included in the final review were published in the medical, education and psychology literature. Thus, the authors utilized a method applied by the first author in a previous systematic review (Case-Smith, Weaver, & Fristad, 2013). This method uses criteria developed for both rehabilitation and psychology research to appraise each study’s methodology, rigor, and levels of evidence. First, the psychology guidelines for evidence-based treatments (Chambless & Hollon, 1998; Nathan & Gorman, 2007) were used to rate rigor of each study (Type 1-6). Additionally, overall rigor of each study’s methodology was rated
according to the PEDro scale (Morton, 2009), a tool commonly used in occupational and physical therapy to determine the rigor of clinical trials (Physiotherapy Evidence Database [www.pedro.org.au]). The PEDro scale has 10 criteria that are scored 1 if the item is present or 0 if it is not; all 10 criteria are then summed as x/10.

Lastly, the Center for Evidence-Based Medicine Levels of Evidence (CEBM) guidelines [www.cebm.net] were used to categorize the strength and level of the study design according to a hierarchy of Levels I-V. Both authors rated the studies independently, compared and discussed scores, and agreed on consensus scores. Table 2 (Case-Smith, Weaver, & Fristad, 2013) presents the criteria used to analyze the studies.

**Results**

Sixteen studies met all inclusion criteria and were appraised according to the psychology guidelines for evidence-based treatments, PEDro scale, and the CEBM guidelines. These ratings, along with each study’s objectives, design, participants, measures, and results are summarized in full in Table 3.

Six of the studies were randomized controlled trials (RCTs), two were non-randomized pre-post control group designs, seven were uncontrolled pre-post intervention studies, and one was a case study.

**Randomized Controlled Trials**

Among the RCTs, a wide range of populations experiencing anxiety was examined. One of examined anxiety in eating disorders (ED), one for adolescents with 35
irritable bowel syndrome (IBS), one with trauma-exposed females, one with children with visual impairments (VI), and two examined mental health and well-being in high school students.

The RCT conducted by Carei et al. (2010) included 54 youth (50 female, 4 male) who were randomly assigned to either an 8-week trial of standard care or yoga plus standard care. The yoga intervention consisted of a manual-based application of Viniyoga specifically tailored to eating disorders (1 hour; 2 times per week for 8 weeks). A battery of assessments was administered at three time points: baseline, end of trial, and 1-month follow-up. The Eating Disorder Examination (EDE), Body Mass Index (BMI), Beck Depression Inventory, State-Trait Anxiety Inventory (STAI), and Food Preoccupation questionnaire were used as outcome measures. Study results indicated that there were significant decreases in eating disorder symptoms in the yoga group as compared to the non-yoga group, suggesting potential benefits on their physical health. Improvements in anxiety and depression occurred across both groups, with no main effects for group or interactions, thus indicating no superiority of yoga as an adjunct to standard care.

Adolescents with IBS who completed a one hour instructional yoga session (poses targeting abdominal and bowel relaxation, deep breathing, and mental/body awareness), followed by 4 weeks of home-based daily practice guided by a standardized video (Kuttner et al., 2006), reported significantly decreased anxiety (p=0.09) as compared to a no yoga control group. Participants reported an average yoga practice rating of 6.81 (on a
Likert Scale of ‘0’=never and ‘10’= everyday), indicating that the group practiced fairly frequently at home. Additionally, twelve participants spontaneously reported increased feelings of relaxation and calm from the yoga practice.

For the two RCTs (Khalsa et al., 2012; Noggle et al., 2012) examining mental health among 11th and 12th grade students, yoga programs were integrated into the high school curriculum and a variety of measures assessing mental health were administered pre- and post-intervention for both the yoga group and physical exercise controls. Both Khalsa et al., 2012 and Noggle et al., 2012 implemented Yoga-Ed, a manualized yoga program specific for schools that includes simple yoga postures, breathing exercises, visualization, and games. Khalsa et al. (2012) showed no significant improvements in anxiety on the Behavior Assessment System for Children, Second Edition (BASC-2). However, anger (p= .03), resilience (p= .01), and fatigue (p= .02) were statistically significant, indicating that yoga may have protective mental health benefits in others critical areas. The yoga group in the Noggle et al. (2012) study, showed significant improvements in overall total mood disturbance (p= .015; d=0.689) and tension-anxiety (p= .002; d=0.870) on the Profile of Mood States-Short Form. These medium to large effect sizes on measures of overall mood and anxiety indicate that an intensive (2-3 times per week for 10 weeks) school-based yoga program can improve anxiety and generalized mood disturbances among high school students.
Two RCTs utilized physiologic measures to assess indicators of fear and anxiety (Telles et al., 1997; Telles et al., 1998). Physiologic variables examined included rate of respiration, heart rate, and skin resistance. These are controlled by the autonomic nervous system and are physiological signs that have been correlated with psychological states such as anxiety or fear (Rauhala et al., 1990). Telles et al. (1997) randomly assigned 28 girls (ages 12-16) to either a yoga or games group. The yoga group consisted of Yin Yoga-type postures that are held in a relaxed state for an extended period of time and supine relaxation. Both the yoga and games group were offered five days per week for 50 minutes and 40 minutes, respectively. At a six month follow up, the young girls in the yoga group demonstrated decreased rate of respiration (p< .001), with no significant changes among the games group. Heart rate and skin resistance were not different among the groups.

Similarly, in a study of youth with visual impairments (Telles et al., 1998), 24 children (ages 12-17) were randomly assigned to a yoga or physical activity (gardening/stretching) group. Simple yoga postures, breathing exercises, and guided relaxation were included in the yoga sessions. Following three weeks of participation (60 minutes each day, 5 days per week), results indicated that children in the yoga group had decreased rates of respiration (p< .05). These two studies are unique in their utilization of physiologic measures and show that yoga participation may result in more regular breathing patterns, a potential indicator of reduced anxiety. However, no psychological
measures were administered to compare the physiologic responses to, so the application and interpretation of results is limited.

Results of the RCTs show positive effects of yoga interventions on improving anxiety among children and youth. Five of the six RCTs showed preliminary evidence that yoga interventions can decrease anxiety or indicators of anxiety. There was limited consistency in study population and outcome measures among the studies, thus making it difficult to generalize the results to all youth with anxiety symptoms.

Non-randomized Pre-Post Control Group Studies

Two non-randomized pre-post control group studies were included in this review (Khalsa et al., 2013; Maheshananda et al., 2012). Khalsa et al. (2013) assessed the effect of yoga on music performance anxiety in young musicians. The 135 musicians (76 female, 59 male) were divided into a yoga group (n=84) or control group (n=51). The yoga group participated in three, 60-minute yoga classes per week for 6 weeks. Yoga sessions were taught using Kripalu yoga, which includes classic yoga postures, breathing techniques, and meditation, with a particular focus on coordinating breathing with movement. As compared to the control group, those who participated in yoga reported decreased anxiety scores on the Performance Anxiety Questionnaire (p< .01) and Music Performance Anxiety Inventory for Adolescents, and no changes on the State Trait Anxiety Inventory.
Maheshananda et al. (2012) examined a yoga program experienced by adolescents in India with identified suicidal tendencies. The 90 youth (39 male, 51 female) ages 17-23 were matched into two groups. The control group (n=52) returned to their home life as usual, while the experimental group (n=38) attended a residential yoga institute for one month. Yoga sessions occurred for two hours per day, six times per week, and included physical postures, breathing exercises, and om recitations. In addition to yoga, the residency also included nutrition, counseling, and education sessions. The adolescents reported significantly decreased tension and anxiety (p< 0.001) on the Personality Profile. However, the inclusion of other interventions to support mental health and well-being, as well as being removed from the typical home or community environment, makes it is difficult to attribute these results to the yoga alone.

The results of these non-randomized pre-post control group studies showed reductions on anxiety measures for youth experiencing performance anxiety and those who had suicidal tendencies. The outcomes of these studies are favorable, but highly limited in broad application and generalization. For those experiencing more acute and specific types of anxiety (such as music performance anxiety), a tailored yoga program may be helpful in managing their specific type of anxiety. Among those with co-morbid mental health concerns, as with the suicidal tendency youth, it may be more difficult to
apply yoga a sole intervention and determine its effects, as these youth need more intensive and critical care to manage their mental health and offset the risk of harm.

**Uncontrolled Pre-Post Intervention Studies**

Seven studies examined outcomes before and after a yoga intervention. As with the previous literature, the studies targeted a variety of populations and occurred in a variety of settings. Benavides & Caballero (2008) sought to determine the effects of yoga on pediatric and adolescent weight management, self-concept, and psychiatric symptoms among youth at-risk for developing Type 2 diabetes. Following 12 weeks of a modified Ashtanga yoga program (less strenuous Ashtanga sequence, breathing, and meditation 1 hour 15 minutes sessions; 3 days/week), anxiety was measured using the Beck Anxiety Inventory for Youth (BAI-Y). At baseline, 12 out of 14 participants demonstrated average anxiety levels and no changes were noted at post-intervention measurement. Two participants showed elevated anxiety at baseline and these individuals did show improved anxiety scores on the BAI-Y after the 12-week intervention, suggesting that when anxiety is present yoga may be a useful tool for decreasing its intensity.

Thygeson et al. (2010) examined anxiety among youth with cancer or blood disorders, along with their parents. This study is unique in its approach to assessing both child and caregiver anxiety in serious health conditions, which are often highly stressful events for the entire family unit. Youth and their parents participated in one, 45-minute yoga session in the oncology/hematology inpatient unit playroom. The session was led by
a registered yoga teacher and consisted of seated meditation, physical postures, and a final resting pose. Five adolescents (13-18 years), 11 children (6-12 years), and 33 parents participated over the course of the study. Pre- and post-class measures were taken using the Spielberg State Trait Anxiety Inventory (STAI) for adolescents and adults and State Trait Anxiety Inventory for Children (STAI-C). No changes in anxiety were noted for the children, although significant reductions in anxiety were reported for both adolescents (p=0.04) and parents (p≤ 0.01). These results may reflect differences in age-related cognitive understanding of anxiety or ability to consciously appraise it. It may also be possible that younger children are less able to perceive the benefits of yoga or may need more intensive models of it to impact mental health, especially during a time of overall stress and decreased physical health.

A multimodal program, including yoga, was provided to 24 children (ages 3-16) with Autism Spectrum Disorder (ASD) receiving tertiary care at a medical school teaching hospital (Rosenblatt et al., 2011). The program is based upon the relaxation response theory (RR) and included yoga, dance, and music therapy. Sessions occurred once per week (45-minutes) for 8 consecutive weeks, and included breathing for RR, yoga postures, music/dance, and yoga relaxation. The Behavioral Assessment System for Children, Second Edition (BASC-2) and Aberrant Behavioral Checklist (ABC) were used pre- and post-intervention. Both of these scales include measures of anxiety, often categorized under internalization or internalized symptoms. Results showed significant
changes among the children ages 5-12 years only (n=16), with decreased mean scores on the BASC-2 behavioral symptom index (p=0.013) and internalization (p=0.04). No significant changes were noted on the ABC for any participant. While these results indicate lower anxiety related symptoms among younger children with ASD, the results are weak in support of yoga a primary contributor to these decreases. The program included a variety of relaxation-based interventions, any of which could have contributed to anxiety reduction. Additionally, as no older participants (ages 13-16) demonstrated changes, making it questionable how effective the program would be for a range of children with ASD.

Moemeni et al. (2012), Steiner et al. (2012), and Frank et al. (2014) all examined anxiety among school-age children. Moemeni et al. (2012) enrolled 135 Kindergarten children in Tehran in 30-minute yoga sessions (3 times each week for 12-weeks). The Revised Children’s Manifest Anxiety Scale (RCMAS) was used at pre- and post-intervention time points. Significant decreases (p=. 0001) in average anxiety scores on RCMAS were reported. The researchers also sought to determine any differences in anxiety among males and females, but no sex-related differences were noted.

Steiner et al. (2012) implemented a well-known yoga program, called Yoga-Ed, at an urban elementary school for children with emotional and behavioral disorders (EBD). A total of 37 students (16 female, 21 male; ages 8-11) were included in the study. Students participated in the Yoga-Ed program twice per week for approximately 3.5
months. While a wide variety of measures were used to assess mental health and overall well-being, the primary measures assessing anxiety were the BASC-2 and STAI-C. The children showed improvement across several psychosocial variables, but the most relevant to anxiety was the decrease in internalizing symptoms (p=. 04).

Frank et al. (2014) assessed the effect of a yoga-based wellness promotion program on the mental health of 49 (22 male, 7 female) high school students attending an alternative school for at-risk youth in California. Researchers administered the Transformative Life Skills (TLS) curriculum to all 49 students. The TLS is manualized program for middle and high school students, which includes yoga postures, breathing, and meditation. The TLS was integrated into the classroom curriculum 3-4 days per week, 30 minutes each, for the duration of one semester. Anxiety reduction (p=0.01), with a small effect size of d=. 23, was reported on the Brief Symptom Inventory-18. The program was found to be feasible, effective, and meaningful in reducing a variety of psychosocial variables among a high-risk sample.

Lastly, Stueck & Gloeckner (2005) investigated the effects of the Training of Relaxation with Elements of Yoga for Children (TorweY-C) technique among 5th grade children with abnormal examination anxiety (n=48; ages 11-12). The TorweY-C technique was developed and performed over a four year period (1994-1998) at The Institute of Applied Psychology at Leipzig University. TorweY-C consists of 15 meetings, each 60 minutes in length, which included relaxation, breathing, yoga postures,
and other activities such as guided imagery, massage techniques, and sensory exercises. Outcomes were determined by unspecified measures of feelings of relaxation, concentration, well-being, physical complaints, emotional regulation, control convictions, working motivation, and psycho-physiological stress-coping abilities, examination anxiety, social abilities, self-effectiveness, and electrodermal activity. Post-intervention, there were significant (p ≤ .05) decreases in aggression and physical complaints, and notable increases in stress-coping abilities. At the three-month follow up, significant (p ≤ .05) increases in emotional balance and decreases in anxiety were maintained.

Each of the pre-post-intervention studies included a measure of anxiety that demonstrated decreases in anxiety among their target population. These results are positive and do suggest that yoga can improve anxiety in a variety of child populations (ASD, EBD, cancer). However, these results should be interpreted carefully as the study populations, outcome measures, settings, and intervention dosages were highly variable. Additionally, all of the studies were marked by limitations such as lack of a control group, blinding, and power analyses.

**Case Study**

One case study (Williams-Orlando, 2013) was included in this review. Typically, studies of this level are not included in a review of this kind. However, due to the lack of higher-level evidence and this study’s very specific application to anxiety, it was considered highly contributory to understanding yoga use as an intervention for severe
anxiety and panic attacks. In this case study, a 17-year old female with anxiety disorder and recurrent panic attacks participated in 4 weeks of individual yoga sessions (60 minute session once per week) and 6 weeks of group yoga sessions (90 minute session once per week), each focused on different aspects of yogic breathing, physical postures, and deep relaxation. She also participated in a daily home practice where she utilized an audio CD that provided guided instruction on techniques taught in sessions.

Each week, the participant reported steady decreases in anxiety to her therapist. Over the course of the yoga therapy, she reported 1) decreased anxiety 2) increased confidence/ability to manage anxiety and panic attacks through breathing and, 3) reductions in frequency and duration of panic attacks. These results indicate that an individualized, intensive yoga program that is monitored and supported by a mental health professional may be helpful in managing anxiety.

**Discussion**

The purpose of this study was to examine the evidence for the effectiveness of yoga interventions, as defined by controlled breathing, postures, and meditation, to improve anxiety among children and youth. Children with anxiety often experience both physiologic and psychological symptoms; interventions that reduce these symptoms and integrate cognitive, behavioral, and physical modalities are needed. Additionally, interventions that can be applied in a variety of settings, such as home, school, clinic, and community, will allow for children to have greater access to these interventions in the
places they frequent most. Yoga is an intervention that intuitively embodies all of these characteristics and is a widely used modality for promoting mental health and self-regulation skill development among children and adolescents. Its effect on improving anxiety has been examined across many studies and spans a wide variety of physical, emotional, and behavioral conditions.

Overall, the results from these studies are positive and illustrate that yoga (postures, controlled breathing, and meditation) can be effective in reducing anxiety and anxiety related symptoms or behaviors (e.g. nervousness, worry, fatigue, sleep disturbance). Given the results from the RCTs included in this review and the further supporting evidence provided by the pre-post control group studies and uncontrolled pre-post-intervention studies, yoga is a “probably efficacious” treatment (Chambless & Hollon, 1998) for anxiety reduction among children and youth. Studies that demonstrated significant decreases in anxiety had one of two things in common. Studies were either targeted at a very specific population or the intervention was provided at high frequencies. Carei et al. (2010) implemented yoga with youth with eating disorders and had large effects in decreasing both state ($\eta^2=.2$) and trait ($\eta^2=.38$) anxiety on the State Trait Anxiety Inventory. Similarly, Khalsa et al. (2013) addressed music performance anxiety in young musicians and found significantly decreased anxiety on the Performance Anxiety Questionnaire ($p<=0.01$).
High frequency interventions also demonstrated some of the more impressive outcomes. Stueck & Gloeckner (2007) showed short and long term effects (pre-Post and at 3 months follow up) of reduced anxiety (p<=0.05) and their intervention was 15 sessions lasting 60 minutes each. Noggle et al. (2012) provided yoga session 2-3 times per week for ten weeks, resulting in decreased tension-anxiety (p=.0020) on Profile of Mood States-Short Form with a large effect size (Cohen’s d=0.689). Khalsa et al. (2012) produced significant decreases on anxiety-related outcomes such as resilience (p=0.01) and fatigue (p=0.02) with their curriculum embedded yoga offered 2-3 times per week for 11 weeks. Lastly, Maheshananda et al. (2012) had the most intensive model of intervention, providing the intervention at a residential yoga institute two hours per day, six days per week for one month; results showed decreased anxiety (p<0.001) on the Personality Factor Questionnaire.

A general strength of the included studies is the use of well-validated and widely used assessments such as the Beck Anxiety Inventory for Youth, State-Trait Anxiety Inventory, Behavior Assessment System for Children, and the Perceived Stress Scale. Also, three of the studies applied a manualized intervention (Yoga-Ed) and most offered a high frequency intervention (2-3 times per week) over a sustained period of time (ranged from six to 14 weeks).

Yet, additional studies are needed to increase the overall strength of this body of literature. First, measurements of intervention fidelity are scarce in yoga research, yet
they will be critical to determining the extent to which yoga reduces anxiety and in preserving the credibility of results across repeated implementation (Faulkner, 2012). Second, analysis of dose/response relationships is necessary as there is vast heterogeneity in the frequency/duration of the interventions and a lack of investigation into these factors. Additionally, this review suggests that higher frequency interventions potentially produce more pronounced effects, but further study is needed to establish specific recommendations for intervention length and intensity. Lastly, we need to incur a greater understanding of the physiologic and psychological mechanisms that may underlie change following yoga interventions (Greenberg & Harris, 2012; Larun et al., 2009). This information will provide the opportunity to triangulate results across multiple levels of data, such as biomarkers, measures of physical and psychological health, and participant perspectives. It will also provide a deeper understanding of how yoga impacts the physiological and psychological processes in an anxious child.

Based on the limitations of existing yoga research for youth, future trials should include control groups, randomization, physiologic and psychological measures of anxiety, multiple informants, large sample sizes, and long-term follow up. Lastly, it is recommended that future trials of yoga should include control groups that involve well-established psychological treatments such as cognitive-behavioral therapy to examine to effects of yoga as an adjunct to these types of traditional treatments.
While yoga is a “probably efficacious” treatment for anxiety reduction, its application should be theory-based and data driven in order use it in the most thoughtful and systematic manner. When possible, a manualized treatment protocol should be used and intervention fidelity should be assessed. Many studies have been unclear in outlining the training and expertise of the individuals implementing the yoga interventions; studies should be explicit in this area so that implications of outcomes, transferability, and replication are apparent. Also, the environment should support the child’s ability to understand, practice, and apply the yoga to his/her specific needs (Foster et al., 1999). Few studies corroborated or compared standardized assessments with qualitative data. Future trials would benefit from collecting and analyzing qualitative data in order to expand knowledge of child specific perceptions, needs, and outcomes.

Conclusions

Anxiety disorders are prevalent among children and adolescents, and associated problems can persist into adulthood and impact functioning in daily life. This review concludes that yoga interventions show positive effects in reducing anxiety across a variety of populations and meet criteria for a probably efficacious treatment. Large scale, randomized trials, with physiologic and psychological measures, and long-term follow up are still needed to enhance this body of evidence (Greenberg & Harris, 2012; Galantino et al., 2008; Birdee et al., 2009).
Limitations

This review had strict inclusion/exclusion criteria, which may have impacted the number and types of studies included; the evidence for yoga and anxiety may differ if using a broader search, less restrictive criteria, or alternative definitions of yoga and yoga-based interventions. While the review contained some strong studies, there were several studies that lacked methodological rigor and the overall body of evidence was quite small. Lastly, a meta-analysis was not completed for this review as not all studies reported effect sizes.

A risk of bias analysis was completed for each of the included studies. The results of this analysis are intended to assist readers in evaluating intervention effectiveness in a more salient manner, and can be compared to the results in Table 3. The risk of bias analysis for each article included in this review can be found in Table 4.

Conflict of Interest

The authors declare no conflicts of interest with respect to the authorship and/or publication of this article.

Funding, Protocol, & Registration

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Figure 1. PRISMA Flow Diagram of Published Literature Search and Included Studies

- **Titles/Abstracts identified and assessed for inclusion**
  
  (n=2147)

- **Abstracts eligible for review**
  
  (n=283)

- **Excluded**
  
  (n=1864)
  Did not meet inclusion criterion #1 or #2:
  - Peer-reviewed
  - Yoga or Mind-Body Intervention that includes postures, controlled breathing, and meditation.

- **Excluded**
  
  (n=203)
  Did not meet inclusion criterion #3 or #4:
  - Ages 3-18
  - Anxiety outcome measure

- **Full-Text Review**
  
  (n=80)

- **Excluded**
  
  (n=64)
  Upon Full-Text Review did not meet inclusion criterion #2, #3, or #4:
  - Yoga or Mind-Body Intervention that includes postures, controlled breathing, and meditation.
  - Ages 3-18
  - Anxiety outcome measure

- **Included in Final Analysis**
  
  (n=16)
  - Met all inclusion criteria
### Table 2. Common Systems to Describe Levels of Evidence and Criteria Used to Analyze Studies in Psychology and Occupational Therapy

<table>
<thead>
<tr>
<th>Randomized Clinical Trial (RCT) Criteria (Chambless &amp; Hollon, 1998; Nathan &amp; Gorman, 2007)</th>
<th>Types of Studies (Chambless &amp; Hollon, 1998; Nathan &amp; Gorman, 2007)</th>
<th>PEDro Scale (Physiotherapy Evidence Database) Scores range from 0-10</th>
<th>Levels of Evidence (Center for Evidence Based Medicine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should include:</td>
<td>• Type 1: Most rigorous, randomized, prospective clinical trial that meets all criteria</td>
<td>• Random allocation used</td>
<td>• Level I: Systematic review (of RCTs) or RCT conducted</td>
</tr>
<tr>
<td>• Comparison groups with random assignment</td>
<td>• Type 2: Clinical trial, at least one aspect of the Type 1 study is missing</td>
<td>• Allocation concealed</td>
<td>• Level II: Systematic review of cohort studies; Low quality RCT; Individual cohort study; Outcomes research</td>
</tr>
<tr>
<td>• Blinded assessments</td>
<td>• Type 3: Clinical trial that is methodologically limited, e.g., a pilot study or open trial</td>
<td>• Groups comparable at baseline</td>
<td>• Level III: Systematic review of case-control studies; Individual Case control study</td>
</tr>
<tr>
<td>• Clear inclusion and exclusion criteria</td>
<td>• Type 4: Review of published data, e.g., meta-analyses</td>
<td>• Blinding of participants</td>
<td>• Level IV: Case series; Poor quality case-control studies</td>
</tr>
<tr>
<td>• Standardized assessment</td>
<td>• Type 5: Reviews that do not include secondary data analyses</td>
<td>• Blinding of all study therapists</td>
<td>• Level V: Expert opinion without explicit critical appraisal</td>
</tr>
<tr>
<td>• Adequate sample size for statistical power</td>
<td>• Type 6: Case studies, essays, and opinion papers</td>
<td>• Blinding of all assessors who measured at least one key outcome</td>
<td></td>
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<tr>
<td>• Intervention manual</td>
<td></td>
<td>• Outcome measures obtained from more than 85% of the initial sample</td>
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<tr>
<td>• Fidelity measure</td>
<td></td>
<td>• Intent-to-treat analyses used</td>
<td></td>
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<tr>
<td>• Clearly described statistical methods</td>
<td></td>
<td>• Between-group statistical comparisons reported</td>
<td></td>
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<tr>
<td>• Follow up measures</td>
<td></td>
<td>• Pre/post measures and measures of variability reported (or effect sizes reported)</td>
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</table>

Center for Evidence Based Medicine (www.cebm.net); Chambless & Hollon (1998); Nathan & Gorman (2007); Physiotherapy Evidence Database PEDro Scale (www.pedro.org.au)
Table 3. Summary of the Evidence Examining the Efficacy of Yoga & Yoga-Based Interventions for Anxiety Among Children & Adolescents

<table>
<thead>
<tr>
<th>Study</th>
<th>Objectives</th>
<th>Rating/Design/Participants</th>
<th>Intervention and Outcome Measures</th>
<th>Results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benavides &amp; Caballero (2008)</td>
<td>To determine the effects of Ashtanga yoga on pediatric and adolescent weight management, self-concept, and psychiatric symptoms.</td>
<td>Type 3: Uncontrolled Open Pilot Study; PEDro Score: 4/10; CEBM Level III</td>
<td>Intervention: Modified Ashtanga Yoga, 3 days/week for 12 weeks; 1 hour 15 minutes sessions. Outcome Measures: Beck Anxiety Inventory for Youth (BAI-Y)</td>
<td>12 of 14 participants had average baseline anxiety scores and no post-intervention changes were noted. Two participants had elevated baseline anxiety scores and anxiety decreased post-intervention.</td>
<td>Low effects. Modified Ashtanga yoga may produce reduced anxiety for those presenting with symptoms. Study design included clear inclusion/exclusion criteria. Limitations include: no blinding, no control group, small sample size.</td>
</tr>
<tr>
<td>Carei et al. (2010)</td>
<td>To determine whether yoga can decrease eating and psychological symptoms in adolescents with eating disorders.</td>
<td>Type 2: RCT; PEDro Score: 6/10; CEBM Level I</td>
<td>Intervention: Yoga + Treatment as usual for 8 weeks. Treatment as Usual Outcome Measures: The Eating Disorder Examination (EDE), Body Mass Index (BMI), Beck Depression Inventory, State-Trait Anxiety Inventory, and Food Preoccupation questionnaire</td>
<td>Study results show significantly better improvements on EDE for yoga group. Decreased depression, anxiety, and acute improvements in food preoccupations were noted for both groups.</td>
<td>Strong effects. Preliminary evidence to support the use of yoga intervention among youth with eating disorders. Limitations include: non-convenience sample, no blinding, fidelity or power analyses.</td>
</tr>
<tr>
<td>Frank et al. (2014)</td>
<td>To assess the effect of a yoga-based wellness promotion program on adolescent mental health.</td>
<td>Type 3: pre-post design; PEDro Score 3/10; CEBM Level III</td>
<td>Intervention: Transformative Life Skills curriculum, which includes yoga postures, breathing, and meditation. Outcome Measures: Affect Valance Scale Brief Symptom Inventory (BSI-18) Responses to Stress Questionnaire Transgression-related interpersonal motivations scale-12 item (TRIM-12)</td>
<td>Anxiety was reduced following participation in the program (p=0.01). Small effect size reported (d=.23)</td>
<td>Low effects. Need to compare with control group. No random assignment, no blinding.</td>
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Table 3: Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Results</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khalsa et al. (2013)</td>
<td>Type 3: pre-test, post-test control group quasi-experimental design; PEDro Score 4/10; CEBM Level II</td>
<td>Intervention: Yoga intervention: Three, 60 minute classes/week for 6 weeks Control group</td>
<td>Anxiety was lower at post-test in yoga group (compared to control) on PAQ (p&lt;0.01) and MPAI-A (p = 0.001), but not STAI</td>
<td>Moderate effects. Yoga may assist with performance anxiety reduction in adolescents. Limitations are no random assignment or blinding; participants self-selected into yoga group; more females in yoga than male.</td>
<td></td>
</tr>
<tr>
<td>Khalsa (2012)</td>
<td>Type 2: Preliminary Randomized Controlled Trial; PEDro Score: 5/10; CEBM Level II 11th &amp; 12th Grade Students; N=121 (51 female, 70 male); Mean age =16</td>
<td>Intervention: Yoga-Ed 2-3 sessions/week (30-40 min) for 11 weeks. Regular Physical Education classes</td>
<td>Intervention was feasible. Anger (p=.03), resilience (p=.01), and fatigue (p=.02) were only variables statistically significant for yoga group vs. controls. Control groups declined on most outcomes.</td>
<td>Moderate effects. Feasible Intervention. Yoga may play a role in protective mental health. Limitations include: no blinding.</td>
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### Table 3: Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Results</th>
<th>Limitations</th>
</tr>
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<tbody>
<tr>
<td><strong>Kuttner et al. (2006)</strong></td>
<td>To conduct a randomized study of yoga as a treatment for adolescents with irritable bowel syndrome (IBS).</td>
<td><strong>Type 2:</strong> Preliminary Randomized Controlled Trial; PEDro Score: 6/10; CEBM Level II</td>
<td><strong>Outcome Measures:</strong> Revised Child Manifest Anxiety Scale</td>
<td>Participants in the yoga group reported lower levels of anxiety (p=0.09) than those in the control group. No group differences were noted in depression, coping, or gastrointestinal symptoms.</td>
<td>Low effects. Study design included randomization. Results indicate that among adolescents with IBS, yoga may assist in improving health related anxiety. Limitations: no blinding.</td>
</tr>
<tr>
<td><strong>Maheshananda et al. (2012)</strong></td>
<td>To assess the effect of a one-month residential yoga training on suicidal tendency in adolescents.</td>
<td><strong>Type 3</strong> Pre-post control group design, PEDro Score 3/10; CEBM Level II</td>
<td><strong>Outcome Measures:</strong> Suicidal Tendency Questionnaire (STQ); Word Association Test (WAT); Personality Profile (16 Personality Factor Questionnaire) – includes anxiety; Locus of Control Test of Rotter; Kaivalyadhama Yoga Attitude Scale of Kocher (KYAS)</td>
<td>Anxiety reduced in experimental group at one month follow up (p&lt;0.001), but not immediately following 4-weeks of intervention.</td>
<td>Low/Moderate effects. Residential program seems to reduce anxiety at one month follow up. Limitations: no blinding, random assignment, findings cannot be attributed to yoga only given one month residency that included yoga, diet, counseling, education, and removal from previous environment.</td>
</tr>
</tbody>
</table>
### Table 3: Continued

| **Moemeni et al. (2012)** | To investigate the effects of yoga on attention and anxiety among preschool children. | **Type 3: Open Clinical Trial; PEDro Score: 4/10; CEBM Level II** | **Intervention:** Yoga: 3 sessions per week for 12 weeks, 30 minutes each session. | **Outcome Measures:** Orzetski-Lincoln maze subtest, Revised Children’s Manifest Anxiety Scale (RCMAS). | **Significant decreases (p=.0001) in average anxiety scores on RCMAS. No significant interaction effects between gender and anxiety. Low effects. Suggests positive benefits for anxiety reduction among young children. Limitations include: no blinding, no power analyses, and no control group. |
| **Noggle et al. (2012)** | To test feasibility of yoga in HS curriculum & evaluate preventive efficacy for psychosocial well-being. | **Type 2: Group-randomized Controlled Trial; PEDro Score: 6/10; CEBM Level I** | **Intervention:** Modified Yoga-Ed. 2-3 yoga sessions per week for 10 weeks. PE as Usual 30-40 min, 2-3x/week for 10 weeks. | **Outcome Measures:** The Profile of Mood States-Short Form; The Positive and Negative Affect Schedule for Children; Perceived Stress Scale; The Inventory of Positive Psychological Attitudes: Resiliency Scale; State-Trait Anger Expression Inventory; The Child Acceptance and Mindfulness Measure | **Total mood disturbance (p=.015) and Mood States (p=.002) improved for yoga and worsened in control. Negative affect improved in yoga and worsened in controls (p=.006). No significance for resilience, anger expression, or mindfulness. Moderate effects. Feasible & students found it beneficial. Suggests positive benefits in psychosocial well-being. Limitations: no blinding, no power analyses. |
### Table 3: Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Intervention Details</th>
<th>Outcome Measures</th>
<th>Limitations</th>
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</thead>
<tbody>
<tr>
<td><strong>Rosenblatt et al. (2011)</strong></td>
<td>Pilot</td>
<td>To develop and assess a yoga, music, and dance-based approach for children with autism spectrum disorder (ASD).</td>
<td><strong>Intervention:</strong> 8-week multimodal yoga, dance, and music therapy program, 1x/week for 45 minutes each session. <strong>Outcome Measures:</strong> Behavioral Assessment System for Children, Second Edition (BASC-2) and Aberrant Behavioral Checklist (ABC).</td>
<td>Low effects. Suggests that a yoga, dance, and music-based program may be helpful in improving psychosocial outcomes among school age children with ASD. Limitations include: no control group, evaluation was not blinded, and no fidelity measure.</td>
</tr>
<tr>
<td><strong>Steiner et al. (2012)</strong></td>
<td>Open</td>
<td>To examine the feasibility and effects of yoga sessions within a school setting for children with Emotional/Behavioral Disorders (EBD) at an urban elementary school.</td>
<td><strong>Intervention:</strong> Yoga-Ed 2x/week for 3.5 months. <strong>Outcome Measures:</strong> Behavior Assessment Scale for Children, Teacher Rating Scale/Parent Rating Scale (BASC-2 TRS, PRS); SKAMP (attn./social interaction); Satisfaction with Intervention; State-Trait Anxiety Inventory for Children; Kidscreen-27; BARON (social, emotional, prob. Solving competence); Session attendance &amp; behavior Checklist</td>
<td>Low effects. Feasible and possibly helpful in reducing symptoms of EBD. Limitations include: open treatment, pilot study, no blinded.</td>
</tr>
</tbody>
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Table 3: Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Type 3: Non-Randomized Clinical Trial; PEDro Score: 3/10; CEBM Level II</th>
<th>Intervention: Training of Relaxation with Elements of Yoga for Children (TorweY-C) technique, 15 meetings, 60 minutes each.</th>
<th>Outcome Measures: Unspecified measures of feelings of relaxation, concentration, well-being, physical complaints, emotional regulation, control convictions, working motivation, and psycho-physiological stress-coping abilities, examination anxiety, social abilities, self-effectiveness, and electrodendral activity.</th>
<th>Following 15 sessions, significant differences (p ≤.05) noted in decreased aggression, physical complaints, and increased stress-coping abilities. At three-month follow up, significant (p ≤.05) increases in emotional balance and decreased anxiety was maintained.</th>
<th>Moderate effects. These results suggest that a yoga and relaxation program can impact short and long term psychological variables among children with anxiety. Limitations include: incomplete description of study design, outcome measures, and statistical methods.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stueck &amp; Gloeckner, (2005)</td>
<td>To determine if the Training of Relaxation with Elements of Yoga for Children (TorweY-C) technique effects personality and reduces stress and anxiety among children.</td>
<td>5th grade children with abnormal examination anxiety (ages 11-12)</td>
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<tr>
<td>Thygeson et al. (2010)</td>
<td>To explore the feasibility and effects on anxiety of a single yoga session on children and adolescents, and their parents, on anxiety.</td>
<td>Children (n=11) and adolescents (n=5) with cancer or other blood disorder (children 7 – 12 years; adolescents 13-18 years) and parents (n=33)</td>
<td>Intervention: 45 minute class included opening seated meditation, warm-up and centering poses, standing poses, balance poses, cool down/spinal twists, and final resting pose. Modifications as needed.</td>
<td>Outcome Measures: Spielberger State Trait Anxiety Inventory for Children for children 7-12; Spielberger Adult State Trait Anxiety Inventory for adults used for adolescents 13-18 and parents.</td>
<td>Children (n=11) reported no change in anxiety pre to post (p = 0.31).</td>
<td>Low effects (children) and moderate effects (adolescents + parents), but did establish feasibility. The results suggest that a single yoga session is feasible and can decrease anxiety in older children and parents, but not younger children. Limitations include no comparison group, limited to one session, only 5 adolescents, no blinding, pilot study.</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Intervention</td>
<td>Outcome Measures</td>
<td>Results</td>
<td>Limitations</td>
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<td>Telles et al. (1997)</td>
<td>Type 2: Randomized Controlled Trial; PEDro Score 5/10; CEBM Level II</td>
<td>60 minutes of yoga (postures and relaxation)</td>
<td>Outcome Measures: A 10-channel polygraph was used to record the electrocardiogram (EKG), respiration, and skin resistance.</td>
<td>Only the yoga group showed a significant reduction ($p&lt;0.001$) in the rate of respiration after 6 mos. The spirometer also showed that breathing was more regular in this group after 6 mos; each of these outcomes indicates decreased anxiety. The skin resistance did not change significantly for either group</td>
<td>Low effects. These results suggest that a yoga program which includes relaxation, awareness, and graded physical activity is a useful addition to the routine of community home children with a history of trauma. Limitations include: small sample size, no psychosocial measures to compare to physiologic measures.</td>
<td></td>
</tr>
<tr>
<td>Telles &amp; Srinivas (1998)</td>
<td>Type 2: Randomized Controlled Trial; PEDro Score: 6/10; CEBM Level II</td>
<td>60 minutes of yoga (postures, breathing, meditation), 5 days/week, for 3 weeks</td>
<td>Outcome Measures: Heart rate (HR), Rate of Respiration (RR), and Skin Resistance (SR).</td>
<td>Measured physiological indicators of fear/anxiety. Results indicated no differences between groups on HR or SR; decreased RR ($p&lt;0.05$) for yoga group.</td>
<td>Low effects. Results suggest that a yoga program for individuals with higher physiologic indicators of fear/anxiety (as observed in youth with VI) may decrease rates of respiration, indicating a possibly decrease in anxiety or physiologic arousal. Limitations include: small sample size, no blinding, no psychosocial measures to compare to physiologic measures.</td>
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<tr>
<td>Williams-Orlando (2013)</td>
<td>Type 6: Case Study; PEDro Score: 1/10; CEBM Level V</td>
<td>Intervention: 4 weeks of individual yoga sessions (60 minute session per week) and 6 weeks of group yoga sessions (90 minute session per week).</td>
<td>Outcome Measures: Self-reported appraisal of anxiety and self-regulation skills.</td>
<td>Participant reported decreased anxiety, increased confidence/ability to manage anxiety and panic attacks through breathing, and reductions in frequency and duration of panic attacks.</td>
<td>Low effects. Single subject, case study design. Limitations include: no standardized or formal outcome measures presented (although author does state use of psychiatric evaluation of anxiety/panic attacks).</td>
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Table 4. Risk of Bias Analysis

<table>
<thead>
<tr>
<th>Citation</th>
<th>Random sequence generation (selection bias)</th>
<th>Allocation concealment (selection bias)</th>
<th>Blinding of participants and personnel (performance bias)</th>
<th>Blinding of outcome assessment (detection bias) (patient-reported outcomes)</th>
<th>Blinding of outcome assessment (detection bias) (all-cause mortality)</th>
<th>Incomplete outcome data (attrition bias) (short-term [2-6 weeks])</th>
<th>Incomplete outcome data (attrition bias) (long-term [&gt; 6 weeks])</th>
<th>Selective reporting (reporting bias)</th>
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<tr>
<td>Benavides &amp; Caballero (2008)</td>
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<td>Carei et al. (2010)</td>
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<td>Williams-Orlando (2013)</td>
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Categories for risk of bias: Low risk of bias (+), unclear risk of bias (?), high risk of bias (-)
Chapter 3: The Effectiveness of a School-Based Yoga Program for Anxious Youth
Abstract

Objective

Anxiety Disorders are the most prevalent psychological disorders among children and youth. Children, families, health professionals, and educators are increasingly interested in therapeutic strategies for managing anxiety. Yoga is widely used in clinical, school, and community settings, and often purported to assist in reducing anxiety. Yet, there continues to be a need for randomized controlled trials of yoga use for anxiety among youth to support its continued use in practice and as an effective strategy for reducing and managing anxiety among children and adolescents.

Method

This study is a randomized controlled trial examining the effects of an 8-week school-based yoga program, as compared to an 8-week exercise control, on measures of anxiety, stress, self-efficacy for self-regulation, adaptive skills, and sensory responses.

Results

Students in the yoga group showed decreased overall anxiety, social stress, and school problems and improved self-efficacy for self-regulation and adaptability.

Conclusions

Study results suggest improvements in target areas among the yoga group, as compared to the exercise group, however no statistically significant results were
observed. Further study is needed to establish the effectiveness of the Move-Into-Learning for Anxiety program.
Introduction

Anxiety disorders are the most frequently occurring psychiatric issues experienced by children (Alyahri & Goodman, 2008; Cartwright-Hatton, McNicol, & Doubleday, 2006). Anxiety Disorders are a grouping of diagnoses, which includes conditions such as post-traumatic stress disorder, generalized anxiety disorder, separation anxiety, specific phobias, and panic disorder. These disorders often have an early age of onset and are associated with lifelong difficulties with mood and psychosocial functioning (Merikangas et al., 2010; Storch, 2005).

These anxiety disorders are characterized by intense, persistent anxiety or fear (Kerig & Wenar, 2006; Keeley & Storch, 2009). Diagnostically, anxiety is categorized as an internalizing disorder, such that distress and suffering are directed inward. Internalizing symptoms may present as phobias, worrying, stomachaches, withdrawal, nausea, compulsions, insomnia, isolation, and crying (Kerig & Wenar, 2006). Furthermore, anxiety symptoms often have three components: cognitive (anxious thoughts), physiological (hyperarousal), and behavioral (avoidance, withdrawal) (Beck, 1976; Hoehn-Saric & McLeod, 2000; Keeley & Storch, 2009; Lang, 1968).

Taken together, anxiety symptoms can disrupt academic, social, and familial functioning (Langley, Bergman, McCracken, & Piacentini, 2004) and there is a need for additional modalities that provide children with strategies for recognizing, managing, and reducing their anxiety. In turn, these strategies may serve as a conduit for improving their
self-efficacy for emotional regulation during periods of stress. Intuitively, yoga is a fitting modality, as it targets the cognitive, physiological and behavioral reactions that are causing maladaptive stress responses in children with anxiety.

To elucidate this point, a typical stress response “involves the interaction between an automatic physiological reaction and a conscious volitional coping response” (White, 2012). Individuals who respond adaptively to stress will experience a physiological reaction (e.g. increased heart rate, fatigue) to stress and will then consciously select a coping or behavioral strategy (e.g. talking to a friend, taking a break) to effectively manage the stressor. Children with anxiety experience difficulty identifying the automatic physiological reactions and managing volitional coping responses to stress.

Additionally, stress is known to induce an imbalance in the autonomic nervous system, and is characterized by decreased parasympathetic nervous system and increased sympathetic nervous system activity (Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012). In children with anxiety, this imbalance can be long lasting and may result in somatic complaints (e.g. stomach/headaches), sleep disturbances, and changes in blood pressure, heart rate, and respiratory patterns. Atop these negative physiological reactions to stress, emotional self-regulation and coping skills are often impaired in children with anxiety. Children with anxiety are often overwhelmed by anxious thoughts and attempt to manage them through maladaptive coping strategies such as withdrawal, avoidance, crying, or compulsions.
Yoga emphasizes recognition of physiological responses to stress by increasing body and emotional awareness. It also provides coping strategies, such as controlled breathing and body postures, which can help an anxious child manage stress and reduce anxiety. Controlled breathing may lead to more normalized breath rates (Telles, Narendran, & Raghuraj, 1997), which are suggestive of reduced levels of fear and anxiety (Bloch, Lemeignan, & Aguilera, 1991). Therefore, we propose that yoga has the potential to improve patterns of stress responses and, in turn, assist in improving physiological arousal, self-regulation, and adaptive responses to stress and anxiety. See Figure 2 below.

**Figure 2. Proposed Model of How Yoga Targets and Improves Stress Responses in Anxiety**
Yoga is a type of mindful and contemplative practice, and is widely practiced among children and adolescents in community studios, clinical settings, and schools (Barnes, Bloom, & Nahin, 2009). Yoga has been used to promote general health and well-being among youth, as well as to target a range of physical (e.g. asthma, cancer), psychological (e.g. anxiety, depression), and developmental (e.g. autism, motor skill delays) conditions. While the evidence to support the use of yoga is generally positive, research with children remains limited and there is a need for well-controlled studies of its application with specific populations.

In our systematic review on yoga interventions for anxiety among children and youth (Weaver et al., 2015), it was recommended that future trials include control groups, randomization, physiologic and psychological measures of anxiety, multiple informants, large sample sizes, and long-term follow up (Weaver & Darragh, 2015). This coincides with recommendations from other literature reviews on yoga for children (Greenberg & Harris, 2012). Thus, this study examined the application of yoga with a specific population (children and adolescents with anxiety) with a research design that includes an active control group, randomization, physiologic and psychological measures, multiple informants, and blind scoring of outcome measures.

**Research Aims and Questions**

This study examined the effectiveness of an 8-week, school-based yoga program designed for children ages 10-15 that demonstrated signs or symptoms of anxiety.
Anxiety and self-regulation were the primary outcomes of interest. In order to determine whether yoga affects changes in physiologic arousal as well as daily life skills, secondary outcomes examining adaptive skills and sensory responses were measured.

This study was guided by the following research questions:

1. As compared to an 8-week structured exercise control group, does an 8-week school-based yoga program improve anxiety symptoms and self-efficacy for self-regulation of anxiety among youth?

2. What are the mediators and moderators that explain the relationship between yoga and the dependent variables?

3. As compared to an 8-week structured exercise control group, does an 8-week school-based yoga program improve adaptive skills and sensory responses among youth demonstrating anxiety symptoms?

**Research Design**

A randomized controlled trial design was used for this study. Potential participants were recruited from the 6th, 7th, and 8th grade classes at a K-8 charter school in Central Ohio. The 6th-8th-grade intervention specialist (study external key personnel) identified potential participants. Participants were either known to the intervention specialist or recommended by teachers (as part of normal job duties) to the intervention specialist. Each parent and child dyad recruited was asked to provide permission and
assent. Following completion of permission and assent documents, the parent, child, or teacher completed a demographic form and anxiety questionnaire to determine eligibility for participation in the intervention portion of the study. The demographic form included child’s age, sex, if they had participated in a formal yoga program before, and if the child had any medical condition that placed him/her at risk for injury or increases in illness symptoms (e.g. juvenile arthritis, neck or spine injuries, pregnancy).

Parents and teachers completed the anxiety questionnaires, with the purpose of screening for anxiety signs or symptoms. The anxiety questionnaire contains 12 items relevant to physiological, emotional, cognitive, and behavioral signs of anxiety, that were based on the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-V) criteria for a variety of anxiety disorders. (See Table 5 for items). Those students who had at least one of the anxiety screening questions marked yes were eligible for randomization to the yoga or exercise group and completed pre-and post-intervention measures. See Figure 3 for summary of recruitment and eligibility process.
Table 5. Anxiety Screen

1. Does the child present with intense, persistent anxiety or fear?
2. Does the child demonstrate any of the following (mark all that apply): phobias, worrying, stomachaches, withdrawal, nausea, compulsions, insomnia, isolation, depression, or crying?
3. Does the child express general fears and worries?
4. Does the child express anxious thoughts?
5. Does the child express anxious behaviors (jumpy, over-stimulated, restless)?
6. Does the child avoid or withdraw from tasks, people, or environments that make them feel nervous?
7. Does the child appear to be stressed?
8. Does the child demonstrate difficulty falling or staying asleep, irritability, or poor concentration?
9. Does the child demonstrate scanning of his/her environment for potential threats or is on high alert in order to be certain danger is not near?
10. Does the child demonstrate an exaggerated startle response?
11. Does the child demonstrate aggression?
12. Does the child express repetitive thoughts?

Figure 3. Recruitment and Eligibility Process

Sample

The G*Power 3.2 power analysis tool (Faul, Erdfelder, Lang, & Buchner, 2007) was used to estimate sample size. To achieve 80% power and a moderate effect size
(d=.50), at least 26 students (total) were needed. Our goal was to recruit 40 students total, with 20 assigned to each group, ensuring achievement of the estimated sample size of 26 students at 80% power and allowing for power to be maintained even with a 20% attrition rate. However, of the 30 potential participants who were identified and contacted via telephone by the intervention specialist, 11 of them either declined further contact from study members or were non-responsive in answering or returning calls. Thus, a total of 19 were enrolled in the study.

Study Site

Participants were recruited from a charter school located in Central Ohio. This urban charter school has been operating for 10 years and currently serves approximately 852 students in grades K-8. Student to teacher ratio is 24:1, which is higher than the state average of 18:1. Distribution of ethnicity among students is as follows: 38.86% African American, 36.89% Caucasian, 18.91% Hispanic, 2.67% more than one race, 1.51% Asian, and 1.16% American Indian. Approximately 82% of the student body is eligible for free lunch and 7% for reduced lunch, indicating that the majority of families are at or below 130 percent of the national poverty level.

The school’s curriculum is based on national Common Core State Standards and several approaches/programs are used for specific instruction. These include: Scholastic Balanced Literacy, Scholastic Guided Reading, Title-1 Services and Reading Rediscovery, enVisions MATH, and Connected Math. The school also utilizes Imagine
Schools Standards Based Curriculum, Imagine Schools Academic Framework, and state standards for Science and Social Studies. Physical education, art, music, library and technology classes are also offered as part of the curriculum.

The school’s 2011-2012 state rating (based on standardized test performance, attendance and graduation rates) was a C; performance index (based on how well each student does on all tested subjects in grades 3-8) was 83.8; value added (measure that shows how much students learn in a given year and whether they meet federal No Child Left Behind standards) was “above”, meaning that students in the district showed more than a year’s worth of academic achievement within the given report year.

Students

Thirty potential student participants were identified, with a final set of 19 student/parent dyads that met full criteria for participation in the study. Student participants were randomized to either an active control (physical exercise) or active treatment condition (yoga). Randomization resulted in 10 students in the physical exercise group and 9 students in the yoga group.

All students included in this study were eligible for free and reduced lunch. This indicates that their household income was either 1) at or below 130 percent of the poverty level for free meals or 2) between 130 percent and 185 percent of the poverty for reduced
price meals. Fifty percent (n=9) of participants were Caucasian, 22% (n=4) Bi-Racial, 17% (n=3) African American, 11% Hispanic (n=2).

Table 6. Summary of Student Demographics

<table>
<thead>
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<th>Race</th>
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<td>Caucasian</td>
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<td>African American</td>
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<td>17%</td>
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<td>Hispanic/Latino</td>
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<td>11%</td>
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<td>More than one race</td>
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<td>22%</td>
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<table>
<thead>
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<th>Gender</th>
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<tr>
<td>Male</td>
<td>7</td>
<td>39%</td>
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<tr>
<td>Female</td>
<td>11</td>
<td>61%</td>
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<th>Grade</th>
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<td>28%</td>
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<td>7th</td>
<td>7</td>
<td>39%</td>
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<tr>
<td>8th</td>
<td>6</td>
<td>33%</td>
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</table>

The entire student sample included seven males and 11 females. Among those who were randomized to the yoga group, four were male and five female. The exercise group had three males, seven females. Five students in the yoga group were in the 6th grade and seven were in the 7th and 8th grades. Five weeks into the intervention, one female participant in the exercise group dropped out and no post-intervention data were collected. Her data were not included in the analyses.
Teachers

Seven homeroom teachers who were actively instructing student participants were enrolled in the study to provide pre- and post-intervention outcome measure data; three were male and four were female. Teacher experience ranged from 1-10 years.

Parents

Each student participant had a caregiver enrolled in the study to complete pre- and post-intervention outcome measures. Among the parent participants, 15 were mothers, 2 were fathers, and 1 was another legal guardian (i.e. grandmother).

Move-Into-Learning for Anxiety

The intervention group was the Move-Into-Learning for Anxiety (MIL-A) program, a modified version of Move-Into-Learning (Klatt, 2008). The original Move-Into-Learning program is an 8-week (1 time per week) mindfulness-based intervention (augmented with yoga, music, written, and visual arts) that has been effective in improving behavior among at-risk elementary students (Klatt et al., 2013). MIL-A contains the original topics from MIL, but is specifically tailored to address anxiety symptoms. Move-Into-Learning for Anxiety (MIL-A) did not include the following elements of MIL: visual arts, CD for daily classroom practice with teacher, or healthy snack preparation. Removal of these elements was carefully considered and based in 1)
strengthening the rigor of this study and 2) pragmatics of current study site and design. In order to examine a yoga program specific to anxiety and to assess its outcomes, it was decided that including visual arts and healthy snack preparation made the program multimodal and determining specific elements of program effectiveness would become more difficult. Additionally, MIL-A was provided to specific children and also was being compared to a control group, making use of a CD for daily classroom practice problematic.

A pediatric mental health occupational therapist designed the Move-Into-Learning for anxiety program (MIL-A), based on the *Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-V: American Psychiatric Association, 2013)* criteria for generalized anxiety disorder and on current literature outlining functional problems related to anxiety. MIL-A incorporated discussion and yoga to address the following *DSM-V* criteria for generalized anxiety: excessive anxiety and worry about several activities (e.g. school performance), difficulty controlling worry, restlessness or feeling keyed up or on edge, fatigue, irritability, difficulty concentrating, muscle tension, and sleep disturbance (*5th ed.; DSM-V: American Psychiatric Association, 2013*).

The *DSM-V* also states that anxiety can result in social and occupational impairments with research supporting that anxiety symptoms can disrupt academic, social, and familial functioning (Langley, Bergman, McCracken, & Piacentini, 2004). These areas of functioning include relationships with others, social support, and self-
regulation needs. Thus, MIL-A discussion and accompanying yoga practice was centered on connecting anxiety symptom recognition and management to assist with occupational participation and performance in daily activities.

The pediatric occupational therapist that designed MIL-A taught it to students at the school site. The occupational therapist completed 200 hours of yoga teacher training at a Registered Yoga Teacher (RYT®) training program located in Central Ohio and has over 6 years experience working with children ages 3-18 with emotional and behavioral disorders. Additionally, a masters of occupational therapy student, specializing in pediatrics, assisted participants with attention, alignment, and safety during the sessions.

As previously mentioned, the session topics in MIL-A remained the same as the Move-Into-Learning program (e.g. Roller Coaster, Core Support, Healthy Toolbox), but discussion points were specific to signs and symptoms of anxiety, such as physiologic arousal, anxious thoughts, and ways to utilize yoga for anxiety management. Various tracks of instrumental, relaxation music were played via an iPad and speaker dock throughout the yoga sessions. Students participated in the intervention one time per week for 45 minutes during “specials” (i.e. music, art, and computer).

Each MIL-A session included yoga and group discussion. The yoga portion (35 minutes) consisted of yoga postures (asanas), controlled breathing activities (pranayama), and supine meditation (dhyana). Yoga postures such as warrior I and II, cat and cow, and tree were frequently used. For each posture, multiple adaptations were demonstrated and
offered to students (e.g. alternate foot placement, using table or wall for balance). Controlled breathing activities were focused on increasing awareness and control over breathing patterns; belly or diaphragmatic breathing, bumblebee breath, and lion’s breath are among some of the breathing techniques practiced in MIL-A. Supine meditation or relaxation, often referred to as savasana (corpse pose) ended each yoga session. Students were provided with guided imagery, reflection of activities/topics, mental body scans, or quiet time during supine meditation/relaxation.

The discussion portion (10 minutes) consisted of small group verbal processing that was focused self-regulation, coping, and stress reduction through discussion of the yoga practice (Table 7). The instructor would ask questions on anxiety related topics (e.g. What did you learn that might help you with your anxiety?) in order to facilitate conversation and connect the practice to student’s anxiety experiences. The discussion portion was influenced by strategies taught in dialectical behavior therapy, a specific type of cognitive-behavioral therapy that emphasizes mindfulness, interpersonal effectiveness, distress tolerance, and emotion regulation among individuals who may exhibit high emotional stimulation and physiologic arousal.

Specifically, the discussion portion was focused on improving students emotion regulation by connecting the yoga practice to their anxiety by 1) encouraging students to identify and label their anxious thoughts and feelings (cognitive-based emotion regulation), 2) increasing mindfulness in observing and describing physiologic feelings of...
anxiety in a non-judgmental manner (mindfulness skills), 3) identifying breathing techniques and physical postures to distract or self-soothe to assist with tolerating anxiety (distress tolerance skills).

Table 7. Outline of Move-Into-Learning for Anxiety Program

<table>
<thead>
<tr>
<th>Week</th>
<th>Activity</th>
<th>Focus</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>(1) Yoga (2) Breathing</td>
<td>Introduction to yoga breathing and postures</td>
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<td>Week 2</td>
<td>(1) Yoga (2) Roller Coaster Part 1</td>
<td>Stress and Anxiety</td>
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<tr>
<td>Week 3</td>
<td>(1) Yoga (2) Roller Coaster Part 2</td>
<td>Physiological Arousal &amp; how to regulate</td>
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<tr>
<td>Week 4</td>
<td>(1) Yoga (2) Core Support System Part 1</td>
<td>External Support System (people, community)</td>
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<tr>
<td>Week 5</td>
<td>(1) Yoga (2) Core Support System Part 2</td>
<td>Internal Support System (coping skills, personality)</td>
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<tr>
<td>Week 6</td>
<td>(1) Yoga (2) What are you strong in?</td>
<td>Strengths, Skills</td>
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<tr>
<td>Week 7</td>
<td>(1) Yoga (2) What are you good at?</td>
<td>Leisure participation &amp; interests</td>
</tr>
<tr>
<td>Week 8</td>
<td>(1) Yoga (2) Healthy Toolbox</td>
<td>Coping Skills, Life Balance, Sleep, &amp; future application</td>
</tr>
</tbody>
</table>

Physical Exercise

Physical activity alone has been associated with improved health outcomes (Field, 2012), so in order to rule out benefits of yoga that may be strictly due to physical activity, an active control condition of exercise was selected. The active control group condition consisted of physical exercise (without mindfulness or contemplative components). Students participated in the exercise group one time per week for 45 minutes during “specials” (i.e. music, art, and computer). Each week students participated in a new physical activity (35 minutes) that was of low to moderate intensity level (minimal cardiovascular and muscular demand) in order to match the relative intensity level of the yoga group. Some of the physical activities were completed while seated (e.g. chair
volleyball, chair hockey), others were in stationary standing positions (e.g. bridge ball, aerobics), and some involved moving around a classroom and traversing approximately 4-15 feet (e.g. line races, relay races, dance).

Physical exercise sessions included a 10-minute discussion portion focused on generalized (i.e. not specific to anxiety) reflection and appraisal of how students were feeling. The instructor asked questions such as “How are you feeling today?” “How has your week been?” “What are you looking forward to over the weekend?” or “Did you have fun today?” The discussion portion also included an instructor-led introduction to activity set up and rules and some education on recognizing fatigue or pain during specific activities. Students were encouraged to take breaks from activities or slow down pace if needed.

Table 8 provides a brief outline of the 8-week exercise group activities. Appendix B includes a full session sample for one of the exercise groups. The exercise groups occurred on a different day than the yoga groups (see Appendix C for study schedule). The occupational therapist taught the exercise group at the school site. A master of occupational therapy student assisted with attention, material set-up, and safety during each session.

Students continued to participate in their regularly schedule physical education (PE) class included in the school curriculum. Sixth grade students participate in a schedule where all of the “specials” are on a rotation throughout the semester, such that
they cycle through art, gym, computer, library, music, and character building every six days. Thus, 6th grade students missed 1-2 regular PE sessions due to the study. Eighth grade students take specials in seven-week modules, such that every seven weeks they begin a new “special”. During the time of the study one third of the 8th grade class had PE class every morning, one third had art, and remainder had music. Thus, two 8th grade students in the study missed PE class once per week during the yoga intervention.

Table 8. Outline of Physical Exercise Control Group

<table>
<thead>
<tr>
<th>Week</th>
<th>Activity</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Relay Races</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 2</td>
<td>Chair Hockey</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 3</td>
<td>Bridge Ball</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 4</td>
<td>Dance</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 5</td>
<td>Calisthenics</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 6</td>
<td>Chair Volleyball</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 7</td>
<td>Aerobics</td>
<td>Physical Exercise</td>
</tr>
<tr>
<td>Week 8</td>
<td>Line Races</td>
<td>Physical Exercise</td>
</tr>
</tbody>
</table>

Measures

Students, teachers, and parents completed measures at pre- and post-intervention time points (within two weeks pre- and two weeks post-intervention). Each student completed the Behavior Assessment System for Children, Second Edition (BASC-2) self-report, State-Trait Anxiety Inventory for Children (STAIC), Perceived Stress Scale (PSS), and the Self-efficacy for Self-Regulation of School-aged Children (Barnes, 2004).
Teachers completed the BASC-2 teacher rating scales and the Teacher’s Perception of Student’s Efficacy in Self-Regulation form. Parents completed the BASC-2 parent rating scales and Sensory Profile Caregiver Questionnaire (SP).

Anxiety symptoms were measured using the internalizing/externalizing behavior sections of the BASC-2 forms and the STAIC. For the BASC-2, the clinical scales of focus were aggression, anxiety, depression, somatization, withdrawal, and learning problems. Self-perceptions of stress were measured using the PSS. Self-efficacy was measured using the Self-Efficacy for Self-Regulation of School-aged Children and Teacher’s Perception of Student’s Efficacy in Self-Regulation forms. Emotional responses to and modulation of sensory stimuli were measured using the Sensory Profile, in order to examine sensory processing as it relates to physiologic reactions to stress and anxiety.

**Behavior Assessment System for Children**

The Behavior Assessment System for Children, Second Edition (BASC-2), is a tool that evaluates self-perceptions, behavior, and personality across multiple dimensions. It is designed for youth ages 2 through 25 years of age and utilizes a triangulated perspective of behavior problems through parent, teacher, and self-report scales (Reynolds & Kamphaus, 2004). The original BASC (Reynolds & Kamphaus, 1994) was in use for 10 years prior to the revised second edition and was the most commonly used behavior scale in US schools and had was included in over 125 research studies. The
BASC-2 has now been in use for over 10 years and is demonstrating similar uses and is available in both English and Spanish languages. Norms in the BASC-2 are based on 2001 US Census Bureau representative samples of children (2-21 years old). Scores can be interpreted either based on sex specific norms or combined sex norms.

The BASC-2 has been approved for use in research studies and is sensitive to identifying child progress over time or in response to a specific intervention (Reynolds & Kamphaus, 2002). Changes can be measured individually or at a program level. High internal consistency and test-retest reliability of the BASC-2 forms has been demonstrated, with most alpha coefficients above 0.80 for subscales and composites scores. Internal consistency for the parent rated internalizing problem scale is from .89 to .95; for teacher ratings it is from .90 to .92; for self-reported ratings it is from .95 to .96. There is also a validity check index for each respondent. These indexes provide an indicator of whether 1) a particular rater is especially biased, negative, or inconsistent in rating a child or 2) a child creates an overly positive self-perception or has marked “implausible statements” as true (e.g. I have never seen a car before). These indexes are labeled to indicate taking “Caution” or “Extreme Caution” when interpreting results.

The teacher and parent report scales are comprised of 4 response ratings (N-Never, S-Sometimes, O-Often, A-Almost Always), while self-reports have a both a 2-point response (T-True, F-False) and a 4-point response (N- Never, S-Sometimes, O-Often, A-Almost Always). Points are summed to create a raw score, which is then
transformed into a normative T-score. T-scores demonstrate a child’s distance from group mean norms. BASC-2 ASSIST computer software was used to calculate all raw and normative scores in this study.

State Trait Anxiety Inventory for Children

The STAIC has been referenced in over 200 studies globally and is available in more than a dozen different languages. The STAIC consists of 20-items that assess levels of transitory anxiety (state) and 20-items that assess stable tendencies to experience anxiety (trait). The STAIC has Cronbach’s alpha estimates of .82 to .87 for internal consistency. The mean score for children without psychological problems is $x= 31,\ SD=5.71$ (Spielberger et al., 1973).

State anxiety items all begin with the common stem “I feel” and the child selects the feeling closest to their current state. For example, “I feel…very nervous, nervous, or not nervous.” The value of responses are weighted such that $\text{very nervous} = 3; \text{nervous} = 2; \text{and not nervous} = 1$. Reversed weighting is used for test items that indicate an absence of anxiety. For example, “I feel…very calm, calm, or not calm” would be weighted as $\text{very calm}=1, \text{calm}=2, \text{not calm}=3$.

The trait items present a series of statements (e.g. I get a funny feeling in my stomach, I am secretly afraid) that prompt the child to select one of the following descriptors: hardly-ever, sometimes, or often. Value of responses are weighted such that $\text{hardly ever}=1, \text{sometimes}=2, \text{and often}=3$. All STAIC test items are on a 3-point rating
scale, with total scores ranging from 20-60, with higher scores indicating higher levels of state or trait anxiety.

**Perceived Stress Scale**

The Perceived Stress Scale is considered one of the most widely used measures of perceived stress. The PSS is a 10-item scale with answers being rated on a 5-point scale (0=Never, 1=Almost Never, 2= Sometimes, 3= Fairly Often, 4=Very Often). The scale is related to feelings and thoughts from the past month only and it presents general questions to gauge stress levels and appraisal of stress in one’s life. It is based on a two-factor structure, comprised of four positively stated items (e.g. In the last month, how often have you been able to control irritations in your life?) and six negatively stated items (e.g. In the last month, how often have you felt nervous and stressed?).

Using confirmatory factor analysis the construct validity of the two-factor (negative and positive aspects of stress) structure of the PSS was confirmed (Andreou et al., 2011). The PSS has demonstrated a Cronbach’s alpha of .82, indicating satisfactory reliability, and has also shown strong, positive correlations (p < 0.001) with perceived stress levels and self-reported anxiety symptoms.

The PSS is recommended for use with individuals at a junior high level of education and higher, but has not been validated in adolescents. It has been used in previous studies of yoga research (Khalsa et al., 2011) with youth and is the best available measure of perceived stress available at this time.
Self-Efficacy for Self-Regulation Checklists

The self-efficacy for self-regulation checklist includes self-regulation items that capture the children’s abilities to regulate their behaviors within the environment. This measure has children and teachers assess self-regulation from both a cognitive and sensory perspective, which may be useful in addressing how a child with anxiety is responding both psychologically and physiologically to stressors. These instruments were developed by an occupational therapy researcher for use in a study on self-regulation for young children with emotional disturbance (Barnes, 2008). These instruments are not commercially available; however the instrument creator provided copies of the checklists and written permission to use them for the purposes of this study.

Question formation was based on the seminal self-efficacy research of Albert Bandura (1989), which is driven by principles of self-efficacy as a key factor in “human motivation, affect, and action” (p. 1175). Instrument development included assessments of content validity, item usability, and inter-rater agreement. Both checklists were rated on item relevance and importance by 12 occupational therapists experienced in treating children with emotional disturbance. Intraclass correlation coefficients (ICC) for similarities between raters showed an ICC of 0.75 for relevance and 0.80 for importance, indicating strong content validity.

Usability of the items was tested with four children outside of the study. Children were asked to comment on understanding of questions and to make recommendations for
possible word changes for enhanced comprehension. Their feedback was included in the final version of the instrument. Lastly, three separate raters completed the instruments on seven children outside of the study. Inter-rater agreement was calculated as 98.7% agreement across all three raters.

**Sensory Profile**

The Sensory Profile Caregiver questionnaire is intended for children 3-10 years of age. It consists of 125-items that create a profile of a child’s sensory responses across the following domains: Sensory processing, modulation, behavioral, and emotional responses. Specific subscales include: auditory processing, visual processing, vestibular processing, touch processing, and multi-sensory processing, oral processing, sensory processing related to endurance and tone, modulation related to body position and movement, modulation of movement affecting activity level, modulation of sensory input affecting emotional responses, modulation of visual input affecting emotional responses and activity level, emotional/social responses, behavioral outcomes of sensory processing, items indicating threshold for response.

A Likert scale of scoring is used where always = 1, frequently = 2, occasionally = 3, seldom = 4, and never = 5. Scores for each item are summed to yield a raw score for each subscale. Raw scores are then converted into scale scores which compares a child to what is typical for a given age range. Internal consistency of items ranges from .47 to .91
across the various subscales. Content validity was established during instrument development and demonstrated 80% agreement on 63% of test items, across 155 raters.

**Data Analysis**

To answer research questions #1 and #3, a repeated-measures, multivariate analysis of variance (MANOVA), two-group between subjects design was used to compare pre- and posttest group mean scores across all measures of anxiety, self-efficacy, adaptive skills, and sensory processing. MANOVA is used when multiple dependent variables are compared across groups. In this study, we were interested in assessing the between–subjects effects of treatment type (yoga, exercise) on anxiety symptoms, self-efficacy for self-regulation, adaptive skills, and sensory processing. Each of the dependent variables are likely indicators of general or latent variables of “social-emotional health” and “self-regulation,” thus by examining multiple dependent variables we are better able to explore several aspects of anxiety. A Bonferroni correction for significance was applied when appropriate.

Our second research question was to determine mediators and moderators that explain the relationship between yoga and the dependent variables. However, based on statistical results, descriptive analyses of the data were used to explore trends that may provide insight into the different factors influencing how various groups of students respond to the yoga and exercise interventions.
Anxiety Results

Anxiety can present in different ways among children. A number of clinical scales of interest were analyzed from the BASC-2 to explore facets of anxiety presentation and change over time. Anxiety, somatization, and withdrawal clinical scales were used for the parent and teacher analysis, along with internalizing composite scores. The anxiety clinical scale and internalizing composite scores were used for child analysis. The difference in the scales used is due to minor differences in categorizations on the self-report form. BASC-2 results are reported as T-scores. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. In order to account for group assignment, baseline scores, and uneven sample sizes on some of the measures, our analyses involved comparing the marginal means of BASC-2 T-scores at pre-and post-intervention.

BASC-2 Parent Rating Scales: Anxiety

A total of 12 (6 yoga, 6 exercise) parent’s pre- and post-test scores were included in this analysis. Both groups were similar in terms of baseline anxiety scores and at post-intervention both showed significant time effects for anxiety \( F (1, 10) = 11.82; p = 0.006 \) and internalizing symptoms \( F (1, 10) = 8.82; p = 0.014 \). However, there were no statistically significant differences between the groups on anxiety, somatization, withdrawal, or internalizing symptoms.
Table 9. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Parent Rating Scales: Anxiety, Somatization, Withdrawal, and Internalizing (n=12)

<table>
<thead>
<tr>
<th></th>
<th>Marginal Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
</tr>
<tr>
<td>Somatization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
</tr>
<tr>
<td>Withdrawal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
</tr>
<tr>
<td>Internalizing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
</tr>
</tbody>
</table>

Note: Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N = number of parent respondents for each scale.

Figure 4. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Parent Rated Anxiety Clinical Scale (n=12)

Note: Each bar represents the BASC-2 T-Scores for the parent rated anxiety clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of parent respondents. Error bars represent 95% confidence intervals.
BASC-2 Self-Report: Anxiety

A total of 18 (9 yoga, 9 exercise) student’s pre- and post-test scores were included in this analysis. Results for self-reported anxiety (F (2, 14) = 0.02; p=0.15) and internalizing symptoms (F (1, 15) = 2.39; p=0.14) were not statistically significant. However, the yoga group demonstrated decreased anxiety scores, while the exercise group’s scores remained the same. For overall internalizing symptoms, the yoga group’s scores decreased by five points (moving from a “high average” T-score to an “average T-score) while the exercise group scores remained the same.

Table 10. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Self-Report Scales: Anxiety and Internalizing

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anxiety</strong></td>
<td>Yoga</td>
<td>9</td>
<td>58.5</td>
<td>55.8</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>9</td>
<td>53.7</td>
<td>53.4</td>
</tr>
<tr>
<td><strong>Internalizing</strong></td>
<td>Yoga</td>
<td>9</td>
<td>59.3</td>
<td>54.2</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>9</td>
<td>53.6</td>
<td>53</td>
</tr>
</tbody>
</table>

*Note:* Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N= number of student respondents for each scale.
Figure 5. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Self-Reported Anxiety Clinical Scale (n=18)

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Yoga (n=9)</th>
<th>Exercise (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Each bar represents the BASC-2 T-Scores for the self-reported anxiety clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of student respondents. Error bars represent 95% confidence intervals.
Figure 6. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Self-Reported Internalizing Symptoms

Yoga (n=9)                                     Exercise (n=9)

Note: Each bar represents the BASC-2 T-Scores for the self-reported internalizing symptom composite scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of student respondents. Error bars represent 95% confidence intervals.

BASC-2 Teacher Rating Scales: Anxiety

A total of 11 (6 yoga, 5 exercise) student’s pre- and post-test scores were included in this analysis. Both groups had significant time effects (F (1, 9) =6.98; p= 0.027) for anxiety. Between group analyses show no group interaction effects for teacher rated anxiety (F (1, 9) = 0.13; p=0.72), somatization (F (1, 9) =0.42; p=0.84), withdrawal (F (1, 9) =0.11; p=0.74), or internalizing (F (1, 9) = 0.23; p=0.63) scores. Interestingly, anxiety scores for both groups increased from pre- to post-intervention, but overall internalizing
symptoms decreased for the yoga group while remaining static for the exercise group. Of particular interest are the dramatic decreases in reported withdrawal behavior observed by teachers, with the yoga group mean T-scores decreasing by nearly seven points (moving from “elevated withdrawal” to “average”) and the exercise group by nine points (moving from high “elevated withdrawal” to low “elevated withdrawal”).

**Figure 7. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Teacher Reported Withdrawal Clinical Scale (n=11)**

![Bar chart showing pre-post comparisons of mean T-scores on BASC-2 Teacher Reported Withdrawal Clinical Scale.](image)

*Note:* Each bar represents the BASC-2 T-Scores for the teacher-reported withdrawal clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of teacher respondents. Error bars represent 95% confidence intervals.
Table 11. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Teacher Rating Scales: Anxiety, Somatization, Withdrawal, and Internalizing (n=11)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yoga</td>
<td>6</td>
<td>71.1</td>
<td>73.1</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>48.1</td>
<td>52</td>
</tr>
<tr>
<td>F (1, 9)= 0.13; p=0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Somatization</strong></td>
<td>Yoga</td>
<td>6</td>
<td>58.8</td>
<td>54.5</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>50.4</td>
<td>48</td>
</tr>
<tr>
<td>F (1, 9)=0.42; p=0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Withdrawal</strong></td>
<td>Yoga</td>
<td>6</td>
<td>61.1</td>
<td>54.5</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>69.6</td>
<td>60.2</td>
</tr>
<tr>
<td>F (1, 9)=0.11; p=0.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internalizing</strong></td>
<td>Yoga</td>
<td>6</td>
<td>67.8</td>
<td>65.3</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>52.6</td>
<td>52.8</td>
</tr>
<tr>
<td>F (1, 9)= 0.23; p=0.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N= number of teacher respondents for each scale.

**State-Trait Anxiety Inventory for Children**

A total of 18 (9 yoga, 9 exercise) student’s pre- and post-test scores were included in this analysis. The STAIC yields two summed scores, one indicating levels of state anxiety and one for trait anxiety. No statistically significant difference was noted between groups for state or trait anxiety (F (1, 16) = 3.18; p=0.09). Estimated marginal means of state anxiety among the yoga group was higher at baseline and rapidly decreased, while the exercise group had state anxiety that increased slightly over time. Both groups have pre-and post-intervention trait anxiety scores that are marginally above average (>38) and they both showed decreases over time.
Table 12. Pre-Post Group Comparisons of Mean Raw Scores on State-Trait Anxiety Inventory for Children

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Anxiety</strong></td>
<td>Yoga</td>
<td>9</td>
<td>31.8</td>
<td>27.1</td>
</tr>
<tr>
<td>F (1, 16)= 3.18; p=0.09</td>
<td>Exercise</td>
<td>9</td>
<td>29.4</td>
<td>30</td>
</tr>
<tr>
<td><strong>Trait Anxiety</strong></td>
<td>Yoga</td>
<td>9</td>
<td>41.7</td>
<td>37.6</td>
</tr>
<tr>
<td>F (1, 9)=0.42; p=0.84</td>
<td>Exercise</td>
<td>9</td>
<td>38.2</td>
<td>37.1</td>
</tr>
</tbody>
</table>

*Note: Each column mean represents STAIC raw scores averaged across all students in the yoga or exercise group. Normative score for state anxiety among male children is 31; 30.7 for female children. Normative score for trait anxiety among male children is 36.7; 38 for female children. N= number of student respondents for each scale.*

Figure 8. Pre-Post Group Comparisons of Mean Raw Scores on STAIC State Anxiety

**Yoga (n=9)**

**Exercise (n=9)**

*Note: Each bar represents STAIC State Anxiety raw scores averaged across all students in the yoga or exercise group. Normative score for male children is 31; 30.7 for female children. Blue bars are pre-intervention means and purple are post-intervention means. N= number of student respondents. Error bars represent 95% confidence intervals.*

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Figure 9. Pre-Post Group Comparison of Effects of Time on STAIC State Anxiety

Note: Each dot represents STAIC State Anxiety raw scores averaged across all students in the yoga or exercise group at pre- and post-intervention time points. Normative score for male children is 31; 30.7 for female children. Blue line represents exercise change in state anxiety for exercise group and purple line represents changes for the yoga group. N= number of student respondents.
Figure 10. Pre-Post Group Comparisons of Mean Raw Scores on STAIC Trait Anxiety

![Graph showing pre-post group comparisons of mean raw scores on STAIC Trait Anxiety for yoga and exercise groups.](image)

**Note:** Each bar represents STAIC Trait Anxiety raw scores averaged across all students in the yoga or exercise group. Normative score for trait anxiety among male children is 36.7; 38 for female children. Blue bars are pre-intervention means and purple are post-intervention means. N= number of student respondents. Error bars represent 95% confidence intervals.

**Perceived Stress Scale**

A total of 18 (9 yoga, 9 exercise) student’s pre- and post-test mean raw scores were included in this analysis. Mean scores of perceived stress were compared between the yoga and exercise group at pre- and post-intervention. No statistically significant difference was noted between groups for perceived stress (F (1, 16) =0.011; p=0.91).
Both groups decreased in average perceived stress, with the yoga group mean decreasing less than the exercise group.

**Adaptive Skills Results**

**BASC-2 Parent Rating Scales: Adaptive Skills**

A total of 12 (6 yoga, 6 exercise) parent’s pre- and post-test mean T-scores were included in this analysis. Both groups had significant time effects for activities of daily living ($F (1, 10) = 4.87; p=0.052$) only. Between group analyses for parent rated adaptive skills ($F (1, 10) = 0.134; p=0.72$), adaptability ($F (1, 10) = 0.281; p=0.60$), activities of daily living ($F (1, 10) = 0.216; p=0.65$), and social skills ($F (1, 10) = 0.106; p=0.75$) were not statistically significant. However, on measures of adaptability, the yoga group demonstrated greater improvement as compared to the exercise group.
Table 13. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Parent Rating Scales: Adaptive Skills, Adaptability, Social Skills (n=12)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Skills</td>
<td>Yoga</td>
<td>6</td>
<td>44.1</td>
<td>46.3</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>6</td>
<td>40.8</td>
<td>44.1</td>
</tr>
<tr>
<td>Adaptability</td>
<td>Yoga</td>
<td>6</td>
<td>42.5</td>
<td>48.8</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>6</td>
<td>41.6</td>
<td>45.1</td>
</tr>
<tr>
<td>Activities of Daily Living</td>
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<td>49.6</td>
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</tr>
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<td></td>
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<td>47</td>
<td>47.8</td>
</tr>
<tr>
<td>Social Skills</td>
<td>Yoga</td>
<td>6</td>
<td>39</td>
<td>44.8</td>
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<tr>
<td></td>
<td>Exercise</td>
<td>6</td>
<td>39.6</td>
<td>44</td>
</tr>
</tbody>
</table>

Note: Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N= number of parent respondents for each scale.

Figure 11. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Parent Rated Adaptability Scale (n=12)

Note: Each bar represents the BASC-2 T-Scores for the parent-reported adaptability clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of parent respondents. Error bars represent 95% confidence intervals.
BASC-2 Self-Report: Adaptive Skills

A total of 18 (9 yoga, 9 exercise) student’s pre- and post-test scores were included in this analysis. Results for school problems (F (1, 15) =0.989; p=0.33) and social stress (F (1, 15) =0.822; p=0.37) were not statistically significant. For school problems, the yoga group showed a small decrease and the exercise group a small increase. For social stress, the yoga group reported higher levels of social stress. By post-intervention the yoga group had largely decreased score and became much closer in scores to the exercise group.

Table 14. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Self-Reported: Adaptive Skills (n=18)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Problems</td>
<td>Yoga</td>
<td>9</td>
<td>51.1</td>
<td>50.3</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>9</td>
<td>49.5</td>
<td>50.6</td>
</tr>
<tr>
<td>Social Stress</td>
<td>Yoga</td>
<td>9</td>
<td>57</td>
<td>52.3</td>
</tr>
<tr>
<td></td>
<td>Exercise</td>
<td>9</td>
<td>52.5</td>
<td>51</td>
</tr>
</tbody>
</table>

Note: Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N= number of student respondents for each scale.
Figure 12. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Self-Reported Social Stress (n=18)

Note: Each bar represents the BASC-2 T-Scores for the self-reported social stress clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of student respondents. Error bars represent 95% confidence intervals.

BASC-2 Teacher Rating Scales: Adaptive Skills

A total of 11 (6 yoga, 5 exercise) student’s pre- and post-test scores were included in this analysis. Results for teacher rated adaptive skills, adaptability, study skills, and social skills were not statistically significant. According to teachers, both groups made
gains in all areas from pre-to post-intervention time points. These results indicate that perhaps just by participating in a group activity with peers there is an impact on social, study, and adaptive skills.

Table 15. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Teacher Rating Scales: Adaptive Skills (n=11)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>N</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adaptive Skills</strong></td>
<td>F (1,9)=0.11; p=0.74</td>
<td>Yoga</td>
<td>6</td>
<td>50.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td><strong>Adaptability</strong></td>
<td>F (1,9)=0.11; p=0.74</td>
<td>Yoga</td>
<td>6</td>
<td>50.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>48.6</td>
</tr>
<tr>
<td><strong>Study Skills</strong></td>
<td>F (1,9)=0.11; p=0.74</td>
<td>Yoga</td>
<td>6</td>
<td>50.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>47.4</td>
</tr>
<tr>
<td><strong>Social Skills</strong></td>
<td>F (1,9)=0.003; p=0.95</td>
<td>Yoga</td>
<td>6</td>
<td>54.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise</td>
<td>5</td>
<td>49.6</td>
</tr>
</tbody>
</table>

**Note:** Each column mean represents the BASC-2 T-Scores for each clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. N= number of teacher respondents for each scale.
Figure 13. Pre-Post Group Comparisons of Mean T-Scores on BASC-2 Teacher Rated Social Skills

**Yoga (n=6)**

**Exercise (n=5)**

*Note:* Each bar represents the BASC-2 T-Scores for the teacher-reported social skills clinical scale averaged across all students in the yoga or exercise group. T-Scores from 41-59 are in the average range; between 60-69 are in the at-risk range; 70+ indicate clinically significant levels of maladaptive behavior. Blue bars are pre-intervention means and purple are post-intervention means. N= number of teacher respondents. Error bars represent 95% confidence intervals.

**Self-Efficacy for Self-Regulation**

**Self-Report**

A total of 17 (8 yoga, 9 exercise) student’s pre-and post-test mean raw scores were included in this analysis. The yoga group demonstrated a less than 1-point increase in mean self-efficacy for self-regulation scores ($x=3.8$ pre, $x=3.9$ post), which was similar to the exercise group decrease. Thus, there was no statistically significant
difference was noted between groups for mean self-efficacy for self-regulation (\(F (1, 15) = 0.929; p=0.35\)). These results indicate that student’s remained borderline between feeling “not sure” (rating of 3) and “good” (rating of 4) about their overall self-efficacy for self-regulation.

This measure was used to gain insight into how yoga may have impacted the physiologic arousal and coping with these sensations among the children with anxiety. Thus, we were particularly interested in the subtest of self-efficacy for self-regulation as it relates to sensory coping (e.g. getting upset when it is too noisy, paying attention when it is quiet). For this subtest there was no statistically significant difference among the groups (\(F (1, 15) =2.08; p=0.170\)). However, the yoga group began with lower rates of self-efficacy for self-regulation utilizing sensory coping strategies (\(x=3.5\); not sure) and demonstrated higher levels post-intervention (\(x=3.9\); borderline not sure/good). The exercise group showed a slight increase in self-efficacy for self-regulation using sensory coping strategies over time (\(x= 3.6\) pre- and \(x=3.7\) post; borderline not sure/good).

**Teacher Perceptions**

A total of 9 (4 yoga, 5 exercise) student’s pre-and post-test mean raw scores of teacher perceptions of self-efficacy for self-regulation were included in this analysis. There was no statistically significant difference between the groups (\(F (1, 7) = 0.00; p=0.98\)).
Sensory Processing Results

At total of 12 (6 yoga, 6 exercise) parents pre- and post-test mean raw score responses on the Sensory Profile were included in this analysis. The modulation and behavioral and emotional responses domains of the Sensory Profile were of particular interest in this study, due to their indications of how a child might perceive, process, and respond to sensory stimuli in the environment as well as within the body. Specific subscales examined were modulation of sensory input affecting emotional responses (F (1, 10) = 3; p=0.11), modulation of visual input affecting emotional responses and activity level (F (1, 10) = 1.2; p=0.29, and behavioral and emotional responses (F (1, 10) = 1.5; p=0.24). There were no statistically significant differences observed between the groups from pre- to post-intervention.

Discussion

The purpose of this study was to examine the effects of an 8-week school-based yoga program, as compared to an 8-week exercise control, on measures of anxiety, stress, self-efficacy for self-regulation, adaptive skills, and sensory responses. While thorough in its study design and data analysis, the results did not yield any statistically significant differences between the yoga and exercise groups. However, examination of the descriptive data indicates directionality of positive change.
Students in the yoga group demonstrated a trend toward decreased scores in social stress and school problems. The data also suggest greater decreases in anxiety, as compared to the exercise group, on both BASC-2 parent and self-reports and they showed a large decrease in state anxiety on the STAIC and a greater decrease in overall trait anxiety. While these results must be interpreted with caution, taken together, they suggest that the yoga intervention may be helpful in reducing overall anxiety. It appears, too, that children in the yoga group experienced decreased encounters with or perceptions of social stress and school problems. Lastly, parents of children who participated in the yoga program reported increased adaptability in their children. This indicates that the children had less resistance or stubbornness, and had increased ability to adjust well to changes in a variety of situations.

While the exercise group also demonstrated directionality of positive change as well, this study did not find a statistically significant relationship between exercise and anxiety. Exercise has been shown to favorably impact psychosocial health and decrease self-reported anxiety in healthy adolescents (Larun et al., 2006) and whether this exercise is of low or high intensity is of little consequence to outcomes. Studies that produced these effects provided high frequencies of intervention (at least 3 times per week), with duration varying from six to twenty weeks. Many of these studies included activities youth were already participating in as part of athletic training or sports practice in their measure of physical exercise frequency. Our study included an exercise intervention of
low to moderate intensity one time per week for eight weeks. The results of our study did not support a statistically significant relationship between exercise and self-reported anxiety. One explanation could be that a higher frequency of exercise is needed (≥ 3 times per week) or that embedding it into already existing physical activities should be considered. In the current study, two students attended 6 out of 8 sessions (75%), four attended 7 out of 8 sessions (87.5%), and three attended 8 out of 8 (100%). Accounting for typical school-age concerns such as periodic illness, other school obligations, and holidays, it appears necessary to increase the frequency and duration of the physical exercise control group in order to produce significant improvements. Overall, our study may have offered too low frequency or repetition of activities to observe benefits to psychosocial health.

While participants appeared to experience benefits, the lack of statistically significant differences between and within the groups does not provide evidence that the yoga intervention is any more effective than the exercise control group, or that either condition has a significant effect on self-reported anxiety. There are several explanations for these results. First, our study may not have had enough participants to detect any difference within or between the groups. A priori power calculations required 26 participants for observed 80% power and we only had 18 participants (35% observed power). Also, four previous studies that have demonstrated significant differences between yoga and exercise groups had larger sample sizes and a greater intensity of
treatment. A study of mental health benefits of yoga for adolescents in high school (Khalsa, 2012) enrolled over 100 participants and embedded the intervention into the school physical activity curriculum 2-3 times per week for 11 weeks. Similarly, a study evaluating psychosocial well-being among 11th and 12th grade students taking regular physical education versus yoga classes had 51 participants and provided yoga 2-3 times per week for 10 weeks (Noggle et al., 2012).

Comparatively, MIL-A was offered once per week for 8-weeks. In the current study, five students attended 6 out of 8 sessions (75%), three attended 7 out of 8 sessions (87.5%), and one attended 8 out of 8 (100%). Overall, we provided a very modest level of intervention. Accounting for typical school-age concerns such as periodic illness, other school obligations, and holidays, it appears necessary to increase the frequency and duration of MIL-A. It is also important to consider that the original MIL was provided to a large grouping of at-risk youth, not a population with specific symptoms as in this study. Thus, for symptomatic youth, higher frequency or duration may be necessary to observe significantly improved psychosocial health. Anxiety can be a daily struggle and young students benefit from repetition and practice of strategies for more effective application.

In terms of feasibility, ease of participation, and access, integrating sessions into the school curriculum via whole class instruction or as part of the physical education curriculum is likely necessary. It would be beneficial and innovative for collaboration
and co-teaching to occur in the delivery of yoga within the school curriculum. In fact, interdisciplinary teaming and collaboration are essential to applying yoga with anxious youth in the school setting. In the care and education of children, collaboration among school professionals is “a foundational element in offering high-quality services to children with special needs” (Conoley & Conoley, 2010) as collaboration promotes strong professional relationships, maximizes child outcomes, allows intervention strategies to be embedded into the natural environment, and provides increased opportunity to assess and monitor intervention effectiveness (Case-Smith & Holland, 2009; Conoley & Conoley, 2010). A co-taught, school-based yoga program would be helpful in disseminating a child friendly, fun, and occupation-based approach to anxiety and would strengthen the assessment, instruction, and supports provided to these students in the school-setting.

Limitations

Due to decreased parent and teacher responses, there were missing data in each of the analyses examining parent and teacher assessment of children’s emotional, behavioral, and functional performance. An additional limitation was that one 6th grade teacher (who provided pre-intervention measures on three 6th grade students) took another job partway through the study and the new classroom teacher was then enrolled to provide post-intervention data for those students. Many of these response rate issues and staff turnover may reflect the constraints of this particular school site and the
difficulties many of these students, parents, and teachers encounter. As mentioned in the introduction, the vast majority of the student body was living in poverty. Poverty is associated with decreased parental resources and time as well as with increased household food insecurity and maternal stress, each of which can influence ability to participate in activities and may also increase stress and anxiety. Future studies should carefully consider methods for improving caregiver involvement and supporting families as well as methods for controlling for these variables in the analyses.

As demonstrated by our power analysis, a larger sample (n=26) was needed for observed 80% power. Many of the outcome measures resulted in the yoga group showing improved scores, as compared to the exercise group, yet the ability to detect statistically significant effects were impacted by decreased power.

**Conclusions**

This study was thorough and purposeful in identifying youth with signs of symptoms of anxiety and provided a targeted intervention to address their needs. Strengths of the study include an active control group, randomization, physiologic-related and psychological measures, multiple informants, and blind scoring of outcome measures. Overall, the study suggests that the Move-Into-Learning for Anxiety Program (MIL-A) has the potential to improve anxiety and anxiety related difficulties.

While the study lacked statistically significant between-group results, further study of MIL-A is warranted. Results from the current study indicate that there is
potential for both exercise and yoga in improving anxiety among children and youth, but there is still uncertainty regarding superiority of intervention, as well as what mechanisms underlie change or lack of change in anxiety symptoms. While directionality of change was indicated for the yoga group in the current study, it appears that a larger sample size is needed to accurately assess the outcomes MIL-A produces. Additionally, gaps in the research regarding frequency/duration thresholds, dose/response relationships, and physiologic mechanisms of yoga and exercise remain.

There is a continued call in the medical, educational, and psychological literature for further examination of yoga use with children, as well as the need to establish its effectiveness with specific populations. Anxiety is one of the most prevalent disorders experienced by children, and it is one of the most common co-morbidities among those with other medical or psychiatric conditions. Yet, few studies have applied yoga to this population with a program that is focused on core symptoms and difficulties experienced by a person with anxiety. In a recent systematic review of yoga and anxiety among children (Weaver & Darragh, 2015), only four out of 16 studies had anxiety as the target population or as a primary outcome measure.

Additionally, there is the need for yoga studies that combine physiologic, psychological, and behavioral outcomes. In this study, various surveys were used to examine the physiologic symptoms and issues that often accompany anxiety. However, it is likely that surveys and self-report measures are not good surrogates for determining
how yoga impacts the ability to detect and manage the physical symptoms of anxiety. Future studies utilizing measures, such as heart rate variability and cortisol levels are needed. Additional data, such as patient tracking or logs indicating physical symptom onset, duration, and management would be helpful as well.

MIL-A is designed specifically for anxiety and has shown success in implementation and modest positive outcomes. The MIL-A program and this research team are well suited to fulfill the aforementioned research and clinical needs, in order to broaden and strengthen the evidence for school-based yoga programs for anxiety. In future trials, MIL-A should consider increased frequency and duration, co-teaching and collaboration, physiologic measures (e.g. heart rate, cortisol), larger sample sizes, and integration into the school setting and curriculum.

**Conflict of Interest**

The authors declare no conflicts of interest with respect to the authorship and/or publication of this article.

**Funding, Protocol, & Registration**

The Ohio State University’s Social and Behavioral Sciences Institutional Review Board approved this research. The authors received no financial support for the research and/or authorship of this article.
Chapter 4: Social Validity and Participant Perspectives of a School-Based Yoga Program for Anxious Youth
Abstract

Objective

Anxiety Disorders are the most prevalent psychological disorders among children and youth. Children, families, and the professionals working with them are interested in the effectiveness and limitations of therapeutic use of yoga for managing anxiety, particularly in the school setting. In order to have broad insight into these areas, there is a need for both quantitative and qualitative research that provides practitioners and families with useful information on the social validity of school-based yoga programs and also participant thoughts and perceptions of such programs.

Method

This was a mixed-methods convergent design study. It analyzes and discusses the results of the 8-week Move-Into-Learning for Anxiety (MIL-A) program on measures of anxiety, stress, self-efficacy for self-regulation, and adaptive skills. Standardized assessment measures and statistical analyses were used for quantitative data. For the qualitative data, group and individual interviews and social validity surveys were analyzed using a case study approach.
Results

Students and teachers express positive perceptions of the MIL-A program as they relate to stress relief, enjoyment, social interaction, self-regulation skills, and improved behavior. There were minimal negative perceptions of the program. Students and teachers report good overall social validity of MIL-A program implementation in the schools.

Conclusions

Participant perceptions of the MIL-A program are positive and support improved outcomes among anxious children, however, further study is needed.
Introduction

Little is known about child and adolescent yoga participants’ perspectives about the way yoga affects them emotionally and behaviorally. Insight into the collective thoughts and actions of young yoga participants, and those adults involved in their development, could lead to a better understanding of the interplay between yoga, behavior, and self-regulation. It may also illuminate factors that influence yoga program planning and implementation, as well as identify barriers and future directions for enhancing school-based yoga program success.

Social Validity

Social validity was conceptualized within the field of applied behavior analysis (ABA). At the height of ABA’s success, many reports were emerging that questioned the meaningfulness and feasibility of implementing ABA interventions (Wolf, 1978). Researchers and theorists responded by developing a rubric of social validity (Kazdin, 1977; Wolf, 1978). When evaluating social validity clinical scientists are urged to demonstrate that an intervention will 1) be acceptable and viable in a community setting (Schwartz & Baer, 1991), 2) address meaningful or important issues in the client’s life and 3) produce clinically important changes. Thus, assessment of social validity is assessed via subjective evaluation of social acceptability and applied importance of goals, procedures, and outcomes of a particular intervention (Gresham & Lopez, 1996).
Assessments of social validity are considered complementary to objective measures and are hypothesized to analyze intervention effectiveness on a level that traditional quantitative analyses and comparisons cannot (Kazdin, 1977, Wolf, 1978).

Measures of social validity are particularly important in the study of school-based interventions due to the complexity of implementation (e.g. scheduling, performance standards, space) and the number of stakeholders involved (e.g. teachers, parents, intervention specialists, administration). Stakeholders need to view school-based mental health service options as easy to implement, low demand, and effective or they may view these ancillary supports as distracting, overwhelming, or less valuable than academic curricula (Daunic et al., 2006).

Measures of social validity have been successfully used in a number of school-based interventions that support positive social and mental health development in children. A study of social competence goals assessed social validity by using the Q-sort technique (Hurley, Wehby, & Feurer, 2010), a methodology of studying participant viewpoints by ranking and sorting a series of statements or phrases. They found that early childhood special and regular educators and administrators valued social competence goals that were pro-social and centered on reduction of negative behaviors and overall communication and good manners. Using a different method, a study of a classroom-based cognitive-behavioral intervention to prevent aggression (Daunic et al., 2006),
utilized a 22-item social validity questionnaire to gain feedback on ease of use, appeal/utility, and effectiveness.

To fully illustrate the power of social validity measures, Strain & Barton (2012) provided examples from their research on behavior skill training, treating severe behavior problems, increasing play behaviors, and reducing challenging childhood behaviors to demonstrate the important link between evidence-based practice and social validity. They establish that social validity was critical in shaping their service delivery designs, increasing participant willingness to implement complex and novel strategies, improving ability to reveal unanticipated effects, and guiding future research (Strain & Barton, 2012).

Health care professionals, teachers, and physical education instructors frequently integrate yoga-based strategies into children’s daily routines. Yet, little is known about the social validity of these strategies among children with mental health issues. Formal evaluation of the social validity of yoga programs is crucial for characterizing the role of yoga in mental health promotion. Attainment of such knowledge is critical to the implementation and assessment of, and will contribute to evidence for, interventions available to children with psychiatric disorders in the school setting.

**Participant Perspectives**

Qualitative analyses of yoga programs implemented in the school setting are scant. The majority of qualitative studies involve brief post-intervention surveys or
informal questioning for satisfaction or helpfulness of the programs as a small subset of the primary study aims (Steiner et al., 2012; Noggle, Steiner, Minami, & Khalsa, 2012). Although few, studies focused on qualitative analysis of school-based yoga programs have been generally positive. One study conducted small focus groups and utilized art techniques and open-ended questions to elicit student explanations and perceptions of the program finding that students reported increased calmness, behavioral control, and positive self-identification (Case-Smith, Sines, & Klatt, 2010). Another study conducted semi-structured student interviews and completion of a representativeness tool (7-item program evaluation form), and found that many students had improved self-image, stress reduction, emotion management, and felt yoga had the potential to promote social bonds with others (Conboy et al., 2010). These results were helpful in informing researchers of how the yoga affected youth and the various social and behavioral outcomes essential to their daily functioning.

Expanding the availability of these analyses will broaden understanding of perceptions and experiences of participants involved in the implementation of school-based yoga programs. Qualitative approaches complement traditional inquiries, by simply focusing on learning from individual and group experiences and using them to inform improved practice and research.
Research Questions

In order to address the gaps in qualitative research on yoga for youth and to further understand participant perspectives, the purposes of this study were to assess the social validity of the Move-Into-Learning for Anxiety (MIL-A) program, examine its effects on anxiety and function, and explore barriers and facilitators of yoga for anxiety reduction within MIL-A. In order to achieve these objectives, our analyses involved examination and comparison of both quantitative and qualitative data from a randomized controlled trial implementing MIL-A. To our knowledge, this is one of the only studies examining social validity and participant perspectives following a yoga program for anxiety.

The research questions were as follows:

1. Does an 8-week school-based yoga program 1) appear acceptable and feasible in a school setting 2) address meaningful or important issues in the student’s life and 3) produce clinically important changes?

2. What are the participant’s perspectives on how an 8-week school-based yoga program affected internalizing/externalizing behavior, self-regulation, adaptive skills, and sensory processing?
Research Design

The study used a mixed methods design in order to answer each of our research questions accurately, and extend the breadth and range of inquiry. (Greene, Caracelli, & Graham, 1989). A convergent design was selected because it allows for the use of different methods to answer each of the research questions. The underlying purpose of a convergent design is to fulfill a need for a more complete understanding of a topic, which is clearly needed in yoga research. Concurrent quantitative and qualitative data collection, separate quantitative and qualitative data analyses, and the merging of the two data sets for interpretation are characteristics of this type of design (Creswell & Plano Clark, 2011).

An independent level of interaction occurred between the quantitative and qualitative strands in this study; such that all research questions, data collection, and data analyses were kept separate (Creswell & Plano Clark, 2011). Quantitative and qualitative strands were only mixed for making overall interpretations at the end of the study (Creswell & Plano Clark, 2011).

Participants

Participants were recruited from the 6th, 7th, and 8th grade classes at a K-8 charter school in Central Ohio. A total of nine students were included in these analyses. Student distributions across grades were as follows: 6th grade (n= 3; 2 male, 1 female) and 7th-8th
grade (n=6; 2 male, 4 female). The students ranged in age from 11.2-13.5 years old, with a mean age of 12.4. Five participants were Caucasian, two were African American, one was Bi-Racial, and one was Hispanic. All of the students in this sample were eligible for free and reduced lunch. All students signed assent forms and all parents provided parental permission for participation in the study. The Ohio State University Institutional Review Board approved this research.

**Measures and Procedure**

**Quantitative Data Collection & Analysis**

Students participated in a 45-minute long yoga session once per week for 8 weeks. Students were evaluated individually at baseline and within two weeks after the intervention using the following assessments: Behavior Assessment System for Children, Second Edition (BASC-2) self-report, State-Trait Anxiety Inventory for Children (STAIC), Perceived Stress Scale (PSS), and the Self-efficacy for Self-Regulation of School-aged Children (Barnes, 2004). Teachers working with the students also completed measures at baseline and within two weeks post-intervention using the BASC-2 teacher rating scales and Teacher’s Perception of Student’s Efficacy in Self- Regulation form. Parents completed the BASC-2 parent rating scales. The assessors were graduate research assistants who were blinded to group when scoring pre- and post-intervention measures.
We conducted repeated measures on a single sample and the data were not assumed to be normally distributed. Thus, non-parametric testing was conducted using the Wilcoxon Signed Rank Test for the BASC-2, STAIC, and PSS. All analyses were performed using IBM SPSS Statistics (Version 19.0; IBM Corporation, NY).

Additionally, each student and teacher participant completed a 9-item post-intervention social validity survey. This survey was created for this study by the primary researcher. While this measure was designed as a program evaluation tool and as a measure of critical elements of effective programming, it did not undergo reliability or validity testing prior to its use in this study. However, instrument items are specifically tied to outcomes related to anxiety, stress, self-efficacy for self-regulation, behavior, and daily life (i.e. those constructs measured on the standardized assessments) and is similar in structure to other measures of social validity for school-based interventions. Question format and structure are based on the core concept that social validity should measure the meaningfulness of a program or intervention’s structure, goals, and participation (Foster, 1999; Gresham & Lopez, 1996).

Items #1-8 included questions that participants rated on a scale of 1 to 6 (1-Strongly Disagree, 6-Strongly Agree); item #9 was open ended (i.e. Please list any other thoughts or problems you have about the yoga program). Descriptive statistics (frequency distribution, measures of central tendency) were generated for each survey question ( #1-
8), to represent the overall social validity of the program from both student and teacher perspectives. See Table 20 for survey questions.

**Qualitative Data Collection & Analysis**

Each of the yoga group students participated in a group interview at the end of the 8-week yoga program. Due to school scheduling and in order to maximize child responses, there was one group interview for the 6th graders and one for the 7th-8th graders; each lasted approximately one hour. Additionally, four of the homeroom teachers working with the students completed individual post-intervention interviews; each lasted approximately 10-15 minutes. Several attempts were made (e.g. teacher verbal requests, text message, phone calls) to engage parents in post-intervention interviews, but researchers were unsuccessful in obtaining responses.

Student and teacher interviews were facilitated using a pre-established interview guide. To improve credibility, questions were designed to reflect constructs measured in the study’s standardized measures. As such, each question presented to the participants directly focused on an aspect of our quantitative measures, specifically how the yoga program affected internalizing/externalizing behavior, anxiety, self-regulation, and adaptive skills. Additionally, the interviewee was very familiar with the culture of the school and had “prolonged engagement” (Shenton, 2004) with students and teachers, and
had established a trusting relationship in which open expressions of self and opinions were welcomed.

In regards to transferability, all students who participated in the yoga program completed end interviews and a sample of involved teachers did as well. We include information on the study site, participant demographics, sample sizes, data collection methods, and length of interview sessions in order to provide the reader with all relevant contextual information needed to consider the transferability of results (Shenton, 2004). Investigator and methodological triangulation were central to this study. As previously discussed, multiple methods of data collection were employed to provide a detailed summary of outcomes and to cross-check across multiple informants. Two investigators (primary author and a graduate research assistant) were involved in the analysis of interviews and their final thematic structure resulted in inter-rater reliability kappa level of 0.94 (Miles & Huberman, 1994).

Audio recordings of the two student group interviews and four teacher interviews were collected and transcribed in preparation for analysis. Transcripts of group interviews and individual teacher interviews were analyzed using a qualitative case study approach. Two members of the research team completed the initial analysis by systematically coding the data. First, the data from one of the teacher interview transcripts was used to develop initial codes. Specifically, each analyst read the teacher interview transcript and wrote down key phrases that summarized the meaning of each comment. Next, the two
analysts met to discuss and compare initial codes. These initial codes were then collapsed into overarching categories that defined broad concepts present in the data (Miles & Huberman, 1994). Following this step, each reviewer then read the transcribed interviews again and coded them according to the defined codes. The two analysts met again to review codes and identify any areas of disagreement. If disagreement occurred, consensus was achieved through discussion and revision of codes.

Using the same category codes, the two analysts coded the student group interviews. It was necessary to generate one additional category code to accurately capture different responses that occurred in these data. Finally, the category codes identified in both the student group and teacher individual interviews were used to identify a framework that outlined the essential perceptions of MIL-A (Miles & Huberman, 1994).

**Results**

**Quantitative Analyses**

**Anxiety**

According to the BASC-2 student self-report, they demonstrated the following levels of anxiety:

- **Low Anxiety (T-Scores 41-59):** 4 students (1 male, 3 female)
- **Moderate Anxiety (T-Scores 60-69):** 5 students (3 male, 2 female)
- **High Anxiety (T-Score >70):** 0 students
Eight of the nine students in the yoga group had stable or decreased anxiety scores from pre- to post-intervention time points. Two students who had moderate anxiety at pre-intervention decreased to low anxiety by post-intervention (Students 3 and 5). One student reported increased anxiety, being in the low anxiety category at pre-intervention and moving into the moderate anxiety category by post-intervention (Student 9). Both the student and teacher reported distressing family dynamics were occurring, which may have been a contributing factor to this increase.

While not statistically significant, many parents, teachers, and students reported decreases in anxiety and improvements in daily functioning. On the Perceived Stress Scale, students had overall lower score ranges at post-intervention as compared to pre-intervention (Pre=19-24.5; Post=13-23). On the State-Trait Anxiety Inventory for Children (STAIC) the yoga group demonstrated decreases in overall state and trait anxiety scores. Additionally, students reported overall decreases in social stress and school problems and increases in self-efficacy for self-regulation and for self-regulation of environmental sensory challenges.
Table 16. Individual Student T-Scores for BASC-2 Self-Reported Anxiety

<table>
<thead>
<tr>
<th>Student</th>
<th>Pre-Intervention T-Score</th>
<th>Post-Intervention T-Score</th>
<th>Point Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>51</td>
<td>49</td>
<td>-10</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>61</td>
<td>58</td>
<td>-4</td>
</tr>
<tr>
<td>4</td>
<td>67</td>
<td>66</td>
<td>-1</td>
</tr>
<tr>
<td>5</td>
<td>63</td>
<td>56</td>
<td>-7</td>
</tr>
<tr>
<td>6</td>
<td>66</td>
<td>63</td>
<td>-3</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>51</td>
<td>-2</td>
</tr>
<tr>
<td>8</td>
<td>65</td>
<td>62</td>
<td>-3</td>
</tr>
<tr>
<td>9</td>
<td>47</td>
<td>60</td>
<td>+13</td>
</tr>
</tbody>
</table>

*Note: Point change column represents the amount and direction of change in scores. (-) indicates decreased points and (+) represents increased points. Decreased points indicate reduced anxiety.*

Table 17. Pre-Post Yoga Group Mean T-Scores for Anxiety on STAIC

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Anxiety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z=1.781, p=0.075</td>
<td>31.8</td>
<td>27.1</td>
</tr>
<tr>
<td><strong>Trait Anxiety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z= -2.106, p=0.035</td>
<td>41.7</td>
<td>37.6</td>
</tr>
</tbody>
</table>

Adaptive Skills

Adaptive skills are defined in the BASC-2 as those areas that focus on positive psychological features and skills. These include: activities of daily living, adaptability, functional communication, leadership, social skills, and study skills. Pre- and post-
intervention data for activities of daily living, adaptability, social skills, study skills, school problems and social stress were analyzed. Parent reports showed increased adaptability among children in the yoga group, suggesting improved ability to adapt well to change and new situations. Students reported decreased levels of social stress and stable levels of school problems, and teachers rated lower levels of withdrawal (e.g. isolation, decreased social engagement) behavior by post-intervention.

Table 18. Pre-Yoga Intervention Median and Interquartile Ranges for BASC-2

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Pre-Intervention Median</th>
<th>Q1</th>
<th>Q3</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptability</td>
<td>43.5</td>
<td>34.75</td>
<td>49.75</td>
<td>15</td>
</tr>
<tr>
<td>Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Stress</td>
<td>60</td>
<td>44</td>
<td>64</td>
<td>20</td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>56</td>
<td>43.75</td>
<td>82.5</td>
<td>38.75</td>
</tr>
</tbody>
</table>

Note: Q1=quartile 1. Q2= quartile 2. IQR=interquartile range.

Table 19. Post-Yoga Intervention Median and Interquartile Ranges for BASC-2

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Post-Intervention Median</th>
<th>Q1</th>
<th>Q3</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptability</td>
<td>49.5</td>
<td>42.75</td>
<td>49.75</td>
<td>7</td>
</tr>
<tr>
<td>Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Stress</td>
<td>55</td>
<td>42</td>
<td>62.25</td>
<td>20</td>
</tr>
<tr>
<td>Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>57</td>
<td>38.75</td>
<td>66.25</td>
<td>27.5</td>
</tr>
</tbody>
</table>

Note: Q1=quartile 1. Q2= quartile 2. IQR=interquartile range.
**Self-Efficacy for Self-Regulation**

The self-report form of the Self-Efficacy for Self-Regulation for Children (Barnes, 2004) indicated that the students improved their overall self-efficacy for self-regulation. Particularly, students had higher post-intervention levels ($\text{Mdn}=3.75$) of self-efficacy for self-regulation in the subcategory of coping with sensory environmental challenges as compared to pre-intervention ($\text{Mdn}=3.63$).

**Social Validity**

All yoga participants and their teachers completed the post-intervention social validity survey. An example of the student survey is listed in Table 20. Teacher questions were identical, although pronouns were changed.
Table 20. Student Social Validity Survey Questions

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My anxious behaviors have decreased since enrollment in the yoga group.</td>
</tr>
<tr>
<td>2</td>
<td>My appropriate classroom behaviors have increased since enrollment in the yoga group.</td>
</tr>
<tr>
<td>3</td>
<td>My participation in the implementation of the yoga was relatively easy (e.g. amount of time/effort, completing forms).</td>
</tr>
<tr>
<td>4</td>
<td>The yoga group was helpful in increasing positive social interaction with others (peers, adults).</td>
</tr>
<tr>
<td>5</td>
<td>Participation in the yoga group was worth the time and effort for me.</td>
</tr>
<tr>
<td>6</td>
<td>I would recommend that other schools implement the yoga group with students like me.</td>
</tr>
<tr>
<td>7</td>
<td>Participating in this yoga program, during school hours, was relatively easy for me and did not interfere with my other school obligations.</td>
</tr>
<tr>
<td>8</td>
<td>Participation in the yoga group was helpful in increasing my ability to use coping skills.</td>
</tr>
<tr>
<td>9</td>
<td>Please list any other thoughts or problems you have about the yoga program.</td>
</tr>
</tbody>
</table>

Student responses are summarized in Table 21. Overall, students reported moderate levels of decreased anxiety (Mdn=4; IQR=3.5-5), moderate levels of increased positive behavior (Mdn=4; IQR=1-4.5), very high ease of participation (Mdn=6; IQR=5-6), high levels of increased interaction (Mdn=5; IQR=2.5-6), very high worth the time and effort (Mdn=6; IQR=5-6), high recommendation for implementation with other students (Mdn=5; IQR=4.5-6), high feasibility (Mdn=5; IQR=3.5-6) and high increases in self-regulation (Mdn=5; IQR=3.5-5.5). These results indicate that overall, students viewed the MIL-A program as feasible, easily integrated into their school schedule,
valuable, and they recommended other students with anxiety participate in similar programs.

Table 21. Summary of Student Social Validity Responses

<table>
<thead>
<tr>
<th>Student</th>
<th>Decreased Anxiety</th>
<th>Increased Positive Behavior</th>
<th>Ease of Participation</th>
<th>Increased Interaction</th>
<th>Worth Time Effort</th>
<th>Implement With Others</th>
<th>Feasible</th>
<th>Increased Emotional Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>5</td>
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<td>2</td>
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<td>5</td>
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<td>3</td>
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<td>5</td>
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<tr>
<td>6</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Six teachers completed post-intervention social validity surveys. The responses are summarized in Table 22. Overall, teachers reported moderate levels of decreased anxiety (Mdn=3; IQR=2-4.25), moderate levels of increased positive behavior (Mdn=3.5; IQR=3-4.5), high ease of participation (Mdn=5; IQR=3-6), moderately increased interaction (Mdn=3.5; IQR=2.75-4.25), high worth the time and effort (Mdn=5; IQR=3-6), high recommendation for implementation with other students (Mdn=5.5;
IQR=4-6), high feasibility (Mdn=5.5; IQR=4-6), and moderate increases in self-regulation (Mdn=4; IQR=3.5-5).

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Decreased Anxiety</th>
<th>Increased Positive Behavior</th>
<th>Ease of Participation</th>
<th>Increased Interaction</th>
<th>Worth Time Effort</th>
<th>Implement With Others</th>
<th>Feasible</th>
<th>Increased Emotional Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher 1</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Teacher 2</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Teacher 4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Teacher 5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Teacher 6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Median</td>
<td>3</td>
<td>3.5</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>5.5</td>
<td>5.5</td>
<td>4</td>
</tr>
</tbody>
</table>

**Qualitative Analyses**

**Participant Perspectives**

All nine students who participated in the yoga program and four of the classroom teachers completed an end interview. As previously stated, discussion questions for these interviews were pre-established and directly focused on how the yoga program affected internalizing/externalizing behavior, self-regulation, adaptive skills, and sensory processing. Questions were created to focus on these domains as they correlate with the outcomes measured in the quantitative data.
The analysis of the interviews demonstrated that identified category codes fit into a framework of themes and subthemes that describe the perceptions of the yoga group and their teachers. The main themes are as follows: (1) General Perceived Benefits, (2) Behavioral Impacts, (3) Strengthening Self-Regulation, and (4) Identifying Program Needs and Limitations.

**General Perceived Benefits**

Students and teachers perceived MIL-A to be a beneficial program, and their positive perception of the program appeared to help sustain their motivation and investment in participation. Most students and teachers expressed a number of reasons they felt yoga was beneficial. The three primary subthemes that emerged from the data and that illustrate the benefits perceived by students and teachers are *Relaxation and Stress Relief*, *Exposure to Yoga*, and *Enjoyment*.

**Table 23. Number of Students and Teachers Identifying General Perceived Benefits**

<table>
<thead>
<tr>
<th></th>
<th>Relax/ Stress Relief</th>
<th>Exposure to Yoga &amp; Enjoyment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td>Number of Respondents</td>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>
Relaxation and Stress Relief

Both teachers and students described increased relaxation and a calm state as benefits of MIL-A. Students frequently expressed benefits related to the program activities and how they felt after completing the yoga session. Several students expressed a sense of relaxation and stress relief. One student stated, “It helped me relax and like get over my stress when I was like mad…it helped calm me down a lot.” While another mentioned how this stress relief transferred into other settings, “I liked the breathing of it, and then sometimes it would relax me. Not just in the program, but sometimes at school during the day.”

Interestingly, in separate interviews teachers echoed student perceptions of relaxation and calm, and also reported to observe these states in the students. One 7th-8th grade teacher commented on yoga participants temperament upon returning to the classroom, “I liked that it made those students that I have go to a quiet room, calm themselves internally, and the best part for us is it’s at the beginning of the day so I felt like it mentally prepared them for their school day and they came in nice and relaxed on the day that they had yoga.” Teachers are often aware of how their students are feeling, and in this particular school setting they felt students were under a lot of academic and social stress. Another teacher took notice of the decreased externalization of this stress following the yoga and stated, “I thought it was good that they could release that tension they are carrying around with them.” Stress relief or relaxation, as a benefit of the yoga
program, was mentioned by 100% of the students and 75% of teachers who were interviewed. See additional exemplars in Table 24.

Table 24. Additional Exemplars of Relaxation and Stress Relief

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Perceived Benefits</td>
<td>Relaxation and Stress Relief</td>
<td>Students: “I liked learning about how to keep our stress away.” Teachers: “The other student loved yoga, saw the benefit, said he was really relaxed when he came out, loved to go there once a week, looked forward to it, so he was way more invested emotionally and mentally to use that or to see it as a benefit.” “I liked seeing the process of kind of having them concentrate, slow down, and relax…some of the processes with the music, the lighting, the movements they were doing is good for them, to see them transition into a slower time, so kind of getting their mind… it seemed to get their minds focused a little bit.”</td>
</tr>
</tbody>
</table>

**Exposure to Yoga and Enjoyment**

None of the students had participated in a formal yoga program prior to the study and few of them had any exposure to it at all. In fact, none of the students had community yoga studios or recreation centers near their homes that offered child or teen yoga classes. Additionally, two of the four teachers commented that their students did not have access to these types of activities in their school or communities. Thus, one of the benefits many students and their teachers saw in MIL-A was the exposure to and enjoyment of yoga.
Thus, they felt that having MIL-A in the school setting facilitated an opportunity for exposure to a new activity.

Teachers were very accepting of the yoga program and felt that it provided their students with new ways to explore and express themselves. One teacher plainly states, “They would never be exposed to yoga on a day-to-day basis in their lives probably. I just think it’s a great program for kids of this age, ‘cause it’s not anything they’d ever think to do for themselves. They don’t even know about it. They’re not exposed.” Another teacher furthers this idea in saying, “I like that it gave the kids an opportunity to express themselves in a way that they wouldn’t normally be able to express themselves during the school day or school year. “

Students shared many thoughts about the program and their perceptions of the activities, especially the physical postures. Among them were statements such as “I liked doing the poses…it was really good. It was really cool” and “I liked it too because...we laughed when people fell over and they couldn’t do it.” In interviews, once postures were mentioned, there was a flurry of responses calling out postures each enjoyed, such as “I liked the tree, I liked downward dog, and I liked the warriors” and “we could stretch and you could pretend to be Superman” and “I’ve been using tree a lot…I like the balance.” For all of the students, this was a novel experience presented in the secure and familiar
school setting. When asked, at the end of the interviews, if they wanted to share anything else about the program, one student quickly replied:

“Just that we love it.”

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Perceived Benefits</td>
<td>Yoga Exposure and Enjoyment</td>
<td>Students:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It was an interesting experience.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teachers:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I think on a more long-term basis, it could be very beneficial for him because he has such a hard time, you know, just keeping his emotions in check. He’s extremely sensitive and… my concept of what yoga is and what possibly was going on in the yoga classes would just be a true benefit.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I’m not sure what the right word is there but I think they’re just curious They would never be exposed to yoga on a day-to-day basis in their lives probably.”</td>
</tr>
</tbody>
</table>

**Behavioral Impacts**

Because the study also examined quantitative data related to behavioral variables, such as adaptive skills, constructs such as behavior, activities of daily living, and social skills, were examined in the end interviews. Based on our analyses, behavioral impacts emerged from the data and were defined as statements made by the students or teachers that endorsed changes in observable behavior within the classroom or home setting. All
four of the teachers observed improved social interaction from pre- to post-intervention. Additionally, five (55%) of the students reported improved social interaction with peers in the school setting.

Overall, the primary behavioral outcomes reported by the students and teachers fell into two subthemes: increased social interaction and increased assertiveness. Assertiveness was defined as actions or observable behaviors that indicated a confident personality or feeling. Students spoke primarily to the idea of increased social interaction with comments such as “How it affected like how I act around people was like, I can make friends faster,” and “Try not being much shyness…it just helps me be myself and how I am.”

Interestingly, teachers felt much stronger than the students about increased social and assertiveness behaviors. While only 55% of students indicated increased social interaction, 100% of the teachers reported to have observed this in their students. Marked changes in social behaviors for one male student were observed by his teacher. She states, “He was very quiet, didn’t really have friends you could say, even just chit-chat conversation in a classroom, just no interaction at all and I see that he is interacting with more of the students now…and they’re more friendly with him and I think it’s because he comes at them with a very relaxed…I think before they could see he was nervous or uptight or just really unsure of himself.”
Another teacher felt that she also observed increased social interaction, this time referring to the program increasing cohesion among peer groups. She reflects, “You know, I did see students that normally at the beginning of the year weren’t talking with each other…it kind of brought students together that I hadn’t seen together before.”

Teachers also expressed that some of their students were taking more initiative and demonstrating increased assertiveness in the classroom. A 6th grade male teacher remarked. “Well, he’ll raise his hand and he’ll come up and actually speak to me and ask me questions and then he wants to participant in the projects now where before he was totally isolated. “It is important to note that one teacher and her student corroborated no behavioral changes, and an additional student stated no behavioral changes.
Table 26. Additional Exemplars of Behavioral Impacts

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral</td>
<td>Increased Social</td>
<td>Students: “How it affected my behavior… I’m not that shy.”</td>
</tr>
<tr>
<td>Impacts</td>
<td>Interaction</td>
<td>Teachers: “Probably the thing I witness more than anything is the social relationships… actually last week I noticed A wanting to go and sit with the group of peers because, you know, he was sitting all by himself… he took it all upon himself to you know, go over and join another group, which at the beginning of the year, I don’t know that he would have done that… been bold enough to, you know, want to… want to be social. You know, I think at the beginning of the year, he would have just been content sitting by himself doing his work. So, you know, I have seen more social interaction on… really on both their parts.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“He’s interacting socially a lot better too. Just in morning time when they’re eating breakfast, he’s chit-chatting and interacting more whereas he used to just stay real quiet at his desk.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“He is interacting more with everyone, including me.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Oh yeah… he’s talking to more people. People are talking to him. You know, people I haven’t really seen him communicating with, he’s communicating with, so now he’s communicating with me, which is good.”</td>
</tr>
<tr>
<td></td>
<td>Increased Assertiveness</td>
<td>“He also volunteers to help me, as you know, collecting things in the room, umm, and he didn’t want that kind of spotlight, almost, he wanted to be just sitting there alone quietly and not interact with anybody, so I’ve seen a difference in that for him.”</td>
</tr>
</tbody>
</table>

**Strengthening Self-Regulation**

MIL-A sessions addressed the physiological and emotional aspects of stress and anxiety. As such, we hypothesized that students participating in MIL-A would experiences changes in psychosocial outcomes. In post-intervention interviews, students
and teachers expressed changes in self-regulation of anger, stress, and anxiety. In this study, self-regulation was conceptualized as a child’s ability to manage or control their emotions, behaviors, and internal monologues. Teachers felt that the yoga program provided students with a resource for coping and students noted several instances where they felt better able to manage their emotions and stressful situations. Seven of the nine students (77%) and three out of four (75%) of the teachers identified strengthened self-regulation.

Teachers noticed changes in the way students would react to stressful situations, such as reading aloud in class, “He got called on to read and he froze… and in the past he would just shake his head at a teacher and just not even try” and she goes on to recount how the child told her that this time “He said he thought about it, raised his hand and got his composure…and did it. So that was a nice story because in the past he would say, “I don’t ever want to read out loud in front of anybody.” So…I feel like he got a hold or a handle on his anxiety and he needed extra time but he eventually overcame his fear with whatever tools he’s got now.” One teacher also noted that her student appeared to be more contemplative and calm in his approach to things. She says, “I think it’s allowing him to think a little bit, to remain a little more calm, and work through their processes.”
Table 27. Additional Exemplars of Managing Emotions and Stressful Situations

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Quotes</th>
</tr>
</thead>
</table>
| General Perceived   | Managing Emotions and Stressful Situations                | Students:
|                     |                                                           | “It relaxed me like when I’d get angry sometimes I’d like start doing the poses, like…kind of like get my mind off things.”                                                                                   |
|                     |                                                           | “When I went home, I had a little bit of a problem sometimes so I just used the breathing and calmed myself down to help it.”                                                                               |
|                     |                                                           | “I do my breathings and then I don’t punch the wall anymore.”                                                                                                                                           |
|                     |                                                           | “I did a tree pose…like that and then I just walked in and I was calm. It kind of helped me learn to control myself like yoga did help me do self-control.”                                                    |
|                     |                                                           | “There was one time where I was mad at somebody in my classroom and I felt like they were all talking about me behind my back and instead of letting it hit me, I let it bounce off me.” |
|                     |                                                           | “Also, yoga taught me about trust…pretty much we were helping out each other a lot. So that’s what I think about trust. You just help each other a lot. Just help them out.”                                     |
|                     |                                                           | “I’m just saying it like helped me clear my mind. It helps me clear my mind of all the people that I want to like hurt and like all the people that I don’t like.”                                          |
|                     |                                                           | “Instead of just like yelling at the people, I just sat there and breathe if I can.”                                                                                                                      |
|                     |                                                           | “It made me feel happier because my dad has cancer…and it’s kind of stressing on me…that my dad has cancer. It helped me feel more helpful in life.”                                                        |
|                     |                                                           | “I actually can concentrate a little bit more, how it helped me at home is I don’t fight with my brother a lot.”                                                                                           |
|                     |                                                           | Teachers:
|                     |                                                           | “Before, sometimes he might make a smart remark or try to act out. Now he’s more just like, turning around and walking back to his seat. So if he’s doing something, I don’t see it, but yeah his responses now to things are much more controlled |
|                     |                                                           | “I think that, umm, it kind of calmed them. It gave them an outlet to release some of that stress.”                                                                                                       |
|                     |                                                           | “I think maybe it helped them…to release stress or show that they’re upset with something that they don’t have to throw a fit or there’s better ways for them to manage their anger or frustration. |

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Identifying Program Needs and Limitations

Students and teachers also discussed program changes that were needed for effective implementation and recommendations for future use of MIL-A. Both students and teachers were asked questions related to dislikes/negatives of the program and additional thoughts on the program. Both felt the program was too short, in frequency and duration. Students made remarks such as “I wanted it…to do it for like the whole school year” and “The only thing I didn’t like about it is just, we didn’t…we didn’t get enough time.”

Teachers felt that many other students in their classes were interested or “curious” about the yoga sessions and that more students would benefit than participated. A teacher describes these thoughts in saying, “I’d like to see that yoga come back here. I have other students I could recommend, for sure, that would be open. They’ve even asked one of my students questions…they’re curious… …in this school, in particular, there’s a lot that goes on at home in a lot of these kids’ lives and I feel like that would be a positive to help them almost cope or forget. Students also endorsed that the program may be well received by other children in the school.

Two teachers also indicated that a potential negative of the program was that students were “pulled out” or “separated” from peers and that there was the potential for
feeling singled out. One student also mentioned that he did not want to miss out on what his classmates were participating in on some of the days (e.g. computer, gym).

Table 28. Additional Exemplars of Program Needs and Limitations

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Quotes</th>
</tr>
</thead>
</table>
| Program Needs and Limitations| Increased Frequency and Duration | Students:  
“I’d want it to be longer.”
“Instead of having it longer session, why don’t we have more session in each week?”
Teachers:  
“I’d like to see that yoga come back here. I have other students I could recommend, for sure, that would be open. They’ve even asked one of my students questions…they’re curious…and he told them what they’re doing and they said, “I need that”… I just feel like it is a good thing for the students to do some yoga to do some relaxation, to do some stretching, to do something different to help themselves with their stress or their worries or whatever is going on in their lives…in this school in particular there’s a lot that goes on at home in a lot of these kids’ lives and I feel like that would be a positive to help them almost cope or forget.”
“I think there’s probably other students that would benefit from this as well…Every time I come in here, kids are like, “I wanna do the yoga”…Why can’t I do yoga?”

Discussion & Convergence

The purposes of this study were to assess the social validity of the Move-Into-Learning for Anxiety (MIL-A) program, examine its effects on anxiety and function, and explore barriers and facilitators of yoga for anxiety reduction within MIL-A. Quantitative methods were used in this study to examine the effects and social validity of the MIL-A program and qualitative methods were used to identify participant perceptions of MIL-A.
Utilization of both methods allowed for a comprehensive analysis of MIL-A program effectiveness, social validity, and implementation.

In answering our first research question, analyses revealed that students demonstrated improvements across all time points, indicating the potential benefit of MIL-A for anxious students. However, only parent-rated anxiety and internalizing symptoms and teacher rated anxiety showed significant effects for time, and there were no statistically significant changes between the MIL-A group and the exercise control group in the original study. These data suggest that MIL-A may be helpful in decreasing anxiety and improving a child’s daily function. However, further investigation was needed to understand if the program truly affected the students and teachers and in what ways it did so.

The social validity survey results indicate that overall, teachers viewed the MIL-A program as highly feasible, easily integrated into the students schedule, and that it did not impede upon their teaching schedule or deter from their teaching duties. Teachers reported moderate impact on student anxiety, emotional-regulation, social interaction skills, and positive behavior. They strongly asserted that they perceived the program as valuable and they highly recommended other students with anxiety participate in similar programs.
The results of the surveys also demonstrated that students felt that MIL-A was moderately helpful in addressing important issues and producing clinically relevant changes in their anxiety and participation. The least significant area of improvement was increased in positive behavior, with answers being attributable to many students feeling that they did not demonstrate significant negative behaviors (e.g. aggression, yelling) prior to intervention. However, students reported that it was very easy to participate in, highly worth their time and effort, and they highly recommend the program for future implementation. They also expressed high increases in interaction and self-regulation as a result of MIL-A.

In answering our second research question, unique insight into the thoughts of the participants was possible through in-depth, qualitative analyses of interviews and social validity surveys. The themes that arose during analysis describe the benefits of MIL-A and support the positive impact it can make in the lives and emotional control of youth experiencing anxiety. There are few stand-alone qualitative studies on yoga with children and adolescents, and a definite need for more. Thorough and purposeful qualitative research may assist in revealing potential underlying processes of change that occur in yoga programs for children (Greenberg & Harris, 2012).

In a previous study involving the third author, the perceptions of children who participated in the original Move-Into-Learning yoga program generated three themes from focus groups: feeling calm and focused, controlling their own behavior, and
supporting a positive self-concept (Case-Smith, Sines, & Klatt, 2010). These results are similar to the current study, which reports feelings of relaxation and stress relief, improved self-regulation, and improved behaviors. Thus, it appears that the Move-Into-Learning program, though adapted in this study, continues to be well received and that it can produce pleasant feelings and experiences and increase ability to cope with stress among children who have psychosocial vulnerabilities. Similarly, interviews from a study of high school students participating in a program called Yoga in the Schools found evidence that yoga could influence health behavior changes in an at-risk population. Specifically, students perceived the yoga practice as having the potential to decrease risk of alcohol and drug use among adolescents. Researchers suggest that the yoga may have helped students to make more positive choices, indicating improved ability to cope and manage different situations (Conboy et al., 2010).

Integration of our quantitative and qualitative data indicates a number of parallels. The strongest connections between the quantitative and qualitative data were evident between BASC-2 reports of improved anxiety, withdrawal, and social stress, as well as improved self-regulation on the Self-Efficacy for Self-Regulation for Children form. First, teachers rated decreased anxiety (p=0.027) on the BASC-2 and students reported decreased state and trait anxiety on the STAIC.

Similarly, post-intervention interviews suggested that students frequently experienced more relaxed emotional states and an overall sense of stress relief. Among
children with anxiety, it is common to have heightened emotional and physiological arousal and to experience less relaxation, particularly in the high demand school environment. Adult studies of yoga effects on sympathetic and parasympathetic activation and cardiovagal function have yielded preliminary evidence that yoga may promote decreased activation of the sympathetic nervous system and actually shift primary activation to the parasympathetic nervous system (Bussing et al., 2012; Innes, Bourguignon, & Taylor, 2005). This supports the concept that the MIL-A may have elicited these types of relaxation responses in the students. Two child studies have examined physiologic variables controlled by the autonomic nervous system, such as rate of respiration, heart rate, and skin resistance, that may be indicators of fear and anxiety (Telles et al., 1997; Telles et al., 1998). Results displayed that, after participation in yoga, children had decreased rates of respiration and more normalized breathing patterns, supporting a possible shift to more parasympathetic nervous system activation.

Connections between decreased withdrawal and social stress on the BASC-2 and interview statements of increased social interaction were also noted when comparing the quantitative and qualitative data. Self-reported social stress decreased in the students, indicating lessened stress and tension in social relationships and also a decrease in feeling excluded from social groups. Additionally, teachers reported less withdrawal among their students on the BASC-2. The withdrawal scale is defined in the BASC-2 as a tendency to avoid social contact. Increases in social initiation and decreases in social isolation were
expressed in end interviews by both teachers and students. Anxious children commonly show aggression towards or withdrawal from peers (Saigh, 1992), both of which appeared true for many of the children in our sample. However, at post-intervention, both self-reports and teacher observation suggested that these types of behaviors were less evident, which may suggest decreased anxiety symptoms. At the very least, the MIL-A provided a safe, nurturing environment for students to socialize and connect with one another.

Additionally, the self and teacher-reported increase in self-regulation was a readily apparent theme in our interview data and it was also reflected on the Self-Efficacy for Self-Regulation for Children form results. While the increases on the self-report form were minimal ($Mdn=3.5$ pre- to $Mdn=3.9$ post-), there were a flood of comments made by students and teachers on increased confidence that they could manage their emotions and stressful situations with more skill. These improvements were evidenced by verbalizations of less escalation to anger, ability to utilize yoga as a coping strategy to control aggressive actions and thoughts, as well as to increase positive self-concept and perspectives.

Lastly, all student-reported outcomes were supported by the social validity survey results. Students felt that the yoga program assisted them in obtaining high levels of increased self-regulation and social interaction, as well as moderate levels of decreased anxiety. Students also expressed that the program was very easy to participate in and
would highly recommend it to others. These results propose that MIL-A has high social validity for students, in that it is easy to participate in, addresses relevant goals, and produces noticeable changes among participants.

Teacher rated social validity only produced moderate increases in social interaction and moderate decreases in anxiety; they also reported moderate increases in self-regulation. Differences in student versus teacher results on the ability of MIL-A to produce clinically relevant changes in the student’s daily life and emotional states may be attributable to the fact that changes in anxiety and emotional-regulation are internal processes and, at times, less observable through external behavioral changes. Most likely, the questions on this survey were too generalized and perhaps did not prompt teachers to consider and aggregate specific observations of social and positive behaviors the way the BASC-2 did. Teachers still gave high ratings for recommending the MIL-A program to other students, indicating they valued the experience of and exposure to yoga.

**Limitations**

End interviews used for the qualitative analysis are considered to be a low level of evidence as they involve individuals verbally reporting perceptions of events that have occurred in the past. Exploring social validity and perspectives with parents would have assisted in providing insight into reasons why the program was not as effective in transferring effects across settings and in daily home life as well as to what families thought of the program and their child’s participation. Additional limitations include a
relatively small sample size and a lack of negative feedback, both of which may cause imbalances in the results.

**Conclusions**

This study provided much needed information on the effects of yoga on children and adolescents. Results were obtained through multiple approaches (standardized assessments, interviews, surveys) and from multiple informants (parent, student, and teacher). Overall, participant perceptions of the MIL-A program are positive and support improved outcomes among anxious children. Teachers and students alike expressed interest in continued or future implementation of the program with the current group as well as with other students. For future implementation participants recommended extended frequency and duration of delivery, as well as increasing enrollment. Further study is needed, both quantitatively and qualitatively to establish statistically significant effectiveness of MIL-A, and to further delve into the physiological and psychological processes that underlie change or lack of change among youth participating in the MIL-A program.

**Conflict of Interest**

The authors declare no conflicts of interest with respect to the authorship and/or publication of this article.
Funding, Protocol, & Registration

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Chapter 5: Implications of Yoga Interventions for Anxiety Reduction in Children and Adolescents
Summary of Findings

This body of work represents the results of three research projects focused on expanding our understanding of the rigor of current yoga research for anxiety reduction in youth and how effective yoga is in producing these effects. Results of the systematic review of yoga interventions for anxiety in youth concluded that yoga is a probably efficacious treatment for anxiety reduction, however, continued research using rigorous study designs and integration of multiple methods is needed to heighten the level of evidence.

Results from our randomized controlled trial of Move-Into-Learning for Anxiety (MIL-A) indicated that yoga has the potential to produce results such as anxiety reduction and improved adaptive skills, however no statistically significant results were observed. The authors attribute this to lack of observed power in the current sample size. Lastly, results of the mixed methods study on effectiveness, social validity, and participant perspectives of MIL-A revealed that students and teachers viewed the program as feasible and valuable. Additionally, students and teachers both expressed positive changes in student behavior, self-regulation, and anxiety following yoga participation.

Limitations

Limitations in the systematic review (Chapter 2) include strict inclusion/exclusion criteria as well as a specific definition of yoga (postures, controlled breathing, and meditation). This may have narrowed the number of included studies. Overall, many
studies included in the systematic review had low methodological rigor and, as such, there was no opportunity to conduct meta-analyses to gain a more definitive summary of the research. The effectiveness study (Chapter 3) had the following limitations: low observed power as a result of small sample size, no statistically significant differences within or between groups, some measures missing responses from teachers and parents. Finally, the study of social validity and participant perspectives (Chapter 4) did not include parent responses, relatively small sample size, and lack of negative feedback. Additionally, verbally reporting perceptions of events that have occurred in the past via end interviews is not considered the strongest level of qualitative evidence. Collecting perspectives and responses in real time is more highly regarded.

**Implications for Practice**

At the present time, yoga interventions for anxiety reduction are feasible, well-received, and may positively impact psychosocial health among children and adolescents. Based on conclusions from this dissertation, school-based applications of yoga for anxiety should carefully consider 1) the extent to which stakeholders value the intervention and how capable they feel in implementing/participating in these interventions, 2) ways to increase collaboration and involvement of all stakeholders (e.g. parents, administration, other teachers), 3) utilizing interventions that are manualized, 4) integrating a measure of intervention fidelity to ensure integrity in intervention application and transferability of outcomes, and 5) frequency/duration of yoga
Interventions are likely most effective when offered at least 2-3 times per week for ≥ six weeks.

**Implications for Research**

Future research should extend the work of this document through replication of MIL-A implementation with a larger sample size. In conjunction, future studies of MIL-A should increase frequency or duration and evaluate the dose/response relationships within the sample. Second, it is imperative that future studies increase parent involvement in outcome measurement, intervention planning, and possibly intervention participation. This will increase the ability to assess the transfer of effects across multiple settings. Lastly, future studies would benefit from inclusion of a physiologic measure such as hearth rate variability or cortisol levels to assist in uncovering physiologic mechanisms that may impact outcomes following yoga.
Appendix A

Full Outline of Move-Into-Learning for Anxiety Program

<table>
<thead>
<tr>
<th>Week</th>
<th>Activity</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>(1) Yoga (2) Breathing</td>
<td>Introduction to yoga breathing and postures</td>
</tr>
<tr>
<td>Week 2</td>
<td>(1) Yoga (2) Roller Coaster Part 1</td>
<td>Stress and Anxiety</td>
</tr>
<tr>
<td>Week 3</td>
<td>(1) Yoga (2) Roller Coaster Part 2</td>
<td>Physiological Arousal &amp; how to regulate</td>
</tr>
<tr>
<td>Week 4</td>
<td>(1) Yoga (2) Core Support System Part 1</td>
<td>External Support System (people, community)</td>
</tr>
<tr>
<td>Week 5</td>
<td>(1) Yoga (2) Core Support System Part 2</td>
<td>Internal Support System (coping skills, personality)</td>
</tr>
<tr>
<td>Week 6</td>
<td>(1) Yoga (2) What are you strong in?</td>
<td>Strengths, Skills</td>
</tr>
<tr>
<td>Week 7</td>
<td>(1) Yoga (2) What are you good at?</td>
<td>Leisure participation &amp; interests</td>
</tr>
<tr>
<td>Week 8</td>
<td>(1) Yoga (2) Healthy Toolbox</td>
<td>Coping Skills, Life Balance, Sleep, &amp; future application</td>
</tr>
</tbody>
</table>

Move-into-learning For Anxiety: Week 1

Opening Discussion

What is Yoga?

- It is a practice that originated in ancient India. The word yoga means “to join” “connection” or “union”. Yoga aims to connect the body, mind, and spirit in order to promote physical, mental, and emotional health.
- Key elements: physical postures, controlled breathing, deep relaxation and meditation. These activities try to get you to control how your body feels, your thoughts, and behaviors.
- Use of yoga in therapy and in schools is generally not spiritual or religious.
- It is used as a method for promoting health and relaxation.
- Yoga designed for youth often incorporates modified versions of:
  - Body postures geared toward strength and flexibility
  - Breathing techniques
  - Mental/emotional awareness
  - Self-regulation skills
Activity

- Write down a personal stressor or something that makes you anxious.
- Set it aside.

Controlled Breathing

- Today we are going to introduce you to some breathing techniques and some of the most common yoga postures.
  - Belly or Diaphragmatic Breathing

Postures

- Table
- Cat
- Cow
- Child’s Pose
- Mountain
- Warrior I
- Warrior II
- Triangle
- Low lunge (knee down)
- Forward Bend
- Wind Freeing (Right, Left, Both)
- Lying Twist

Meditation/Relaxation

- Corpse Pose

Closing Discussion

- Look at your card where you wrote down your stressor.
- Were there any things we learned today that you think could help you with your stress?
Move-into-learning For Anxiety: Week 2

Opening Discussion

- What is stress?
- What is anxiety?
- How are these feelings like being on a roller coaster?
- Mental & Physical Stress (explanation & examples)
  - Often times our mental feelings (anxiety, worry, stress) can result in physical feelings such as:
    - Muscle soreness
    - Fatigue
    - Pain
    - Decreased flexibility
    - Headaches
    - Racing heart
    - Tummy aches

Activity

- Can you think of anymore?
- What are you currently doing to cope or help you manage these feelings?
- Are they effective?
- Today we are going to introduce you to some more breathing techniques and yoga postures focusing on stress reduction and relaxation.

Controlled Breathing

- Seated Breathing
- Belly or Diaphragmatic Breathing
- Mountain pose (w/breath)
- Moon side stretch (w/breath)
- Forward Bend (w/breath)
Postures

- Child’s Pose
- Cat
- Cow
- Bridge
- Legs Straight up
- Wind Freeing
- Lying Twist
- Asana
- Half Frog
- Superman
- Cobra
- Malasana
- Half Moon on Chair
- Squatting Figure 4
- Twisting Side Angle
- Warrior I, II, II
- Tree
- River (reach feet)

Meditation/Relaxation

- Corpse Pose
- Imagine your roller coaster, slow down the cart, straighten out the track, and travel along smoothly, calmly, and slowly. Find a smooth ride.

Closing Discussion

- Were there any things we learned today that you think could help you with your stress, anxieties, or worries? Things that can help you when you have the “roller coaster” of feelings?
Move-into-learning For Anxiety: Week 3

Opening Discussion

- Remember how we talked last week about stress and anxiety?
- Remember how these feelings are like being on a roller coaster?
- Stress and anxiety can cause a lot of physical feelings in the body and can affect our energy levels, making them move slow or fast.

Activity

- Let’s list some physical feelings that are fast/high and some that are slow/low.
- Help students list/guess the following list of energy levels & physical feelings

  - **FAST/HIGH:**
    - Sweat
    - Skin gets hot
    - Jittery
    - Pacing
    - Bouncy
    - Jump
    - Pain
    - Racing heart
    - Hyper
    - Yelling

  - **SLOW/LOW:**
    - Tummy aches
    - Headaches
    - Sleepy
    - Not motivated
    - Sad
    - Stiff/Less Flexible
    - Body Aches
Muscle Soreness

- Do we want to be fast or slow? Neither. We want to be “Just right”!
- How can yoga movements help you feel “just right”?
- Yoga might help speed you up when you are slow/low and slow you down when you are too fast/high.
- Today we are going to introduce you to some more breathing techniques and yoga postures that can:
  - Speed us up/Energize us
  - Slow us down/Relax us

Controlled Breathing

- Seated Breathing
  - Slow us down or speed us up?
- Bumblebee Breath
  - Slow us down or speed us up?
- Laughter breathing
  - Slow us down or speed us up?
- Birthday Candles Breath
  - Speed us up or slow us down?
- Mountain pose (w/breath)
- Moon side stretch (w/breath)
- Forward Bend (w/breath)

Postures

- Child’s Pose
- Cat
- Cow
- Bridge
- Legs Straight up
- Wind Freeing
- Lying Twist
- Speed us up or slow us down?
• Asana
• Half Frog
• Superman
• Cobra
• Malasana
• Half Moon on Chair
• Squatting Figure 4
• Twisting Side Angle
• Warrior I, II, II
• Tree
• River (reach feet)
• Speed us up or slow us down?

**Meditation/Relaxation**

• Corpse Pose
• Imagine your roller coaster has slowed down, stopped and you have gotten off the ride. You are calmly strolling along, feeling not too fast or too slow, but feeling “just right”. Breathe in and out, picturing what “just right” means to you. Maybe you are smiling, maybe your find a patch of grass and warm sun to enjoy, maybe you are with friends talking, maybe you are hugging your favorite person. Enjoy this feeling.
  - Speed us up or slow us down?

**Closing Discussion**

• Were there any things we learned today that you think could help you with your anxiety or stress?
• Things that can help you when you have the “roller coaster” of feelings?
• Remember the signs that your roller coaster needs slowed down or sped up.
Move-into-learning For Anxiety: Week 4

Opening Discussion

- Do you know what support means?
- Do you know what it means when someone supports you?
- Who supports you in your life when you are anxious or feeling bummed?
- What places do you feel safe and supported?

Activity

- What parts of our bodies support us? Help us feel strong?
- Have students list off body areas and how they support us.
  - Core (belly and back)?
  - Legs?
  - Feet?
  - Arms?
- Today we are going to do some breathing activities and yoga postures that can make our bodies feel strong and supported.

Controlled Breathing

- Seated Breathing
- Alternate nostril breathing
  - Start with right hand; use middle finger to cover left nostril & thumb to cover right nostril
  - Cover left nostril with middle finger, breath in with the right. Pause. Cover right with thumb and exhale through the left.
- The Long Exhale
- Mountain pose (w/breath)
- Crescent moon side stretch (w/breath)
- Forward Bend (w/breath)
- Cat/cow in seated (w breath)
- Seated side bend R/L w/ leg extended (w/breath)
Postures

- Child’s Pose
- Seated twist
- Seated forward bend
- Kneeling backbend
- Cobra (back, arms)
- Downward Facing Dog (shoulders, legs, back, core)
- Downward Facing Dog with legs extended
- Plank (core, arms)
- Side Plank (core, arms)
- Lunge (option: arms up & backbend) (legs, arms)
- Warrior I, II, II (legs, arms)
- Side Angle Pose (forearm on knee)
- Boat (core)
- Reverse Plank (arms, core)

Meditation/Relaxation

- Corpse Pose
- Take a moment to appreciate and thank your body for its strength, for its ability to deal with the tough things that life deals us. Thank yourself for how wonderful you are. Imagine all of the people, places, and things that make you feel strong and supported. Be thankful for those things and feel peaceful.

Closing Discussion

- How do you feel?
- Do you feel strong?
Move-into-learning For Anxiety: Week 5

Opening Discussion

- What do you think strength means?
- What are the two different kinds of strength?

Activity

- What makes you feel physically strong?
- What makes you feel mentally strong?
- Share a time that you were going through something tough and you used your strength?
- Today we are going to do some breathing activities and yoga postures that can make our bodies and our minds feel strong.

Controlled Breathing

- Seated Breathing
- Alternate nostril breathing
  - Start with right hand; use middle finger to cover left nostril & thumb to cover right nostril
  - Cover left nostril with middle finger, breath in with the right. Pause. Cover right with thumb and exhale through the left.
- Cat/cow in seated (w/breath)
- Seated side bend R/L w/ leg extended (w/breath)
- Mountain pose (w/breath)
- Crescent moon side stretch (w/breath)
- Forward Bend (w/breath)

Postures

Name body area that supports each pose.

- Child’s Pose
- Seated twist
- Seated forward bend
- Kneeling backbend
- Cobra (back, arms)
- Downward Facing Dog (shoulders, legs, back, core)
- Downward Facing Dog with legs extended
- Plank (core, arms)
- Side Plank (core, arms)
- Lunge (option: arms up & backbend) (legs, arms)
- Warrior I, II, III (legs, arms)
- Side Angle Pose (forearm on knee)
- Boat (core)
- Reverse Plank (arms, core)

**Meditation/Relaxation**

- Corpse Pose
- Take a moment to appreciate and thank your body for its strength, for its ability to deal with the tough things that life deals us. Thank yourself for how wonderful you are. Imagine all of the coping skills you have and personality traits you shine out that make you feel strong and supported. Be thankful for those things and feel peaceful.

**Closing Discussion**

- How do you feel?
- Do you feel strong?

**Move-into-learning For Anxiety: Week 6**

**Opening Discussion**

- What do you think strength means?
- What are the two different kinds of strength?
Activity

- What makes you feel physically strong?
- What makes you feel mentally strong?
- Share a time that you were going through something tough and you used your strength?
- Today we are going to do some breathing activities and yoga postures that can make our bodies and our minds feel strong.

Controlled Breathing

- Seated Breathing

- Mountain pose (w/breath)
- Crescent moon side stretch (w/breath)
- Forward Bend (w/breath)
- Cat/cow in seated (w breath)
- Seated side bend R/L w/ leg extended (w/breath)
Postures

Child’s Pose

- Everyone shares 1 pose that makes them feel strong!

Meditation/Relaxation

- Corpse Pose
  - Take a moment to appreciate and thank your body for its strength, for its ability to deal with the tough things that life deals us. Thank yourself for how wonderful you are. Imagine all of the inner and outer strength you shine out into the world every day. Say to yourself, I am strong, I am strong. I am wonderful.

Closing Discussion

- How do you feel?
- Do you feel strong?
Move-into-learning For Anxiety: Week 7

Opening Discussion & Activity

- What are you good at? Why?
- What do you like about it?
- What are your favorite things to do?
- Why do you think it is important to have things you are interested in and enjoy?
- How do these things help you when you are anxious or stressed?
- Today we are going to do some breathing activities and yoga postures that you feel you have gotten “good at” these last few weeks.
- Then we will explore some new poses to work on!

Controlled Breathing

- Seated Breathing
- Mountain pose (w/breath)
- Crescent moon side stretch (w/breath)
- Forward Bend (w/breath)
- Seated side bend R/L w/ leg extended (w/breath)

Postures

- Hula Hoops (warm-up)
- Leg Pendulums (warm-up)
- Child’s Pose
- Everyone shares 1 pose that they feel good at!

- Let’s try some new, fun poses!
- Cow Face Pose
- Lotus Pose
- Scale Pose
• Pigeon Pose with one hand leg grab
• Fish Pose
• Upward Plank
• Revolved Side Angle Pose
• Revolved Triangle Pose

Meditation/Relaxation

• Reverse Corpse Pose
• Take a moment to appreciate all of the things you are good at, inside and out. Perhaps you are a loyal friend, funny, kind, or athletic. Maybe you are an artist, poet, or patient. Just remember, you are skilled in many things, mentally and physically. Say to yourself, I am wonderful, I am wonderful.

Closing Discussion

• How do you feel?
• Do you feel like you are getting “good at” this?

Move-into-learning For Anxiety: Week 8

Opening Discussion

• What is a healthy toolbox?
• It’s a place that holds items, activities, and ideas of things that make us feel better when we are worried, nervous, stressed out, or when we just need to take a moment to care for ourselves.
• It might have self-care items (i.e. nail polish, brush), comfort items (e.g. stuffed animal, favorite pictures), or even ideas to help you out (e.g. list of coping skills, notebook for journaling).
• Yoga may be something you add to your own healthy toolbox.
Activity

- Pass out Yoga Pretzel cards and have students select which poses they want to add to their toolbox.
- Decorate yoga mats with permanent markers

Controlled Breathing

- Share our favorite types of breathing and participate in them.

Postures

- Perform poses students selected from activity above.

Meditation/Relaxation

- Corpse pose
  - Reflect on our last seven weeks.

Closing Discussion

- How could a healthy toolbox help you when you are stressed or anxious? Could it help you relax? Sleep? In other situations?
Appendix B

Exercise Group Sample Session

Opening Discussion

- How are you feeling today?
- How has your week been?
- Are you looking forward to the weekend?
- Today we are going to do a series of relays at activity stations and throughout the room.

Activity

- Aerobics Video
- Elf Hat Ring Toss
- Jumping Jack Challenge
- Dance Station
- **Follow the Leader Relay**
  - Are you going to lead or follow?
  - This game is for 5 or more players and should be played outside or in an open area.
  - To play, pick one person to be the leader. Everyone else forms two even teams.
  - The leader stands at one end of the playing field and the two teams stand on the other end.
  - When the leader calls out commands, like "hop on one foot," "crab crawl," or "skip," the first players in line must do what the leader says.
  - If the leader says, "freeze," players must stop in their tracks and listen for the next command. As soon as a player returns to the starting line, the next player in line goes.
  - The first team to finish wins.
• **Kickerama**
  o Try this twist on classic kickball: After the pitcher rolls the ball, he yells either "Hop!" "Skip!" or "Jump!" The kicker then has to follow his direction as she makes her way to first base. But before the pitcher can run after the ball, he has to quack like a duck three times.

**Closing Discussion**

- Did you have fun?
- How do you feel?
## Appendix C

### Study Schedule

**October 2014**

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