Reported Benefits of Yoga in Middle Schools: A Review of the Literature

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Abstract

Middle school is a time of adjustments in youth: physical, intellectual, and social changes often result in stress. Middle school students are vulnerable to academic, behavioral, and mental health problems. Yoga is an Indian discipline practiced for health and relaxation. School-based yoga programs are becoming increasingly common given their potential benefits for students. We conducted a literature review of studies of middle school-based yoga programs, focusing on the reported benefits for students. We identified and retrieved 12 studies from electronic databases including Education Resources Information Center, PsycINFO, and Google Scholar that met inclusion criteria: (a) examined the benefits of yoga as the primary intervention conducted in a middle school setting with students ages 10 to 15 years old, (b) was published by June 2022, (c) was reviewed either by a journal editorial board or by a student's dissertation or thesis committee, (d) was available in English, and (e) a full text copy was available. Results of studies were synthesized by clustering findings into common domains. Study results suggested that middle school-based yoga interventions showed mental health, executive functioning, physical, social, and academic benefits for students. Yoga also showed benefits for middle school students who were stressed, anxious, or depressed, and those at risk. We provide considerations for those contemplating the implementation of yoga in middle schools.

Introduction

Middle school is a time of stress and vulnerability for students. Graduating from elementary to middle school comes with the change of having one teacher to six or seven, and the related challenges of transitioning from one authority figure to several (Bernstein, 2002). Students also experience rapid physical, intellectual, and social changes at different rates and different times, while educational contexts and social expectations are expanding (Young et al., 2012). This vulnerable time is associated with a variety of academic, behavioral, and mental health challenges.

During the transition to middle school, many students experience decreased interest and motivation in school along with lower academic achievement (Young et al., 2012). The Middle School Matters Institute (2020) noted that, "The middle grades are the 'make it or break it' years" (p. 1) for some students as they begin to disengage from school, increasing their chances of later school dropout. Coelho and Romao (2016) found decreased self-concept and self-esteem resulting after the transition to middle school. Chung et al. (1998) studied 99 students moving from elementary to middle school and found decreased levels of academic achievement. Other studies have similarly found that the transition to middle grades is associated with negative impacts on student grade point averages (GPA) and other measures of academic achievement (Dotterer, et al., 2009; Gutman et al., 2000).

Middle school is also a time when students struggle with increased levels of behavioral problems. Harrison and colleagues (2012) found the most common adolescent problem behaviors reported by teachers were distractibility, hyperactivity, anxiety, and immature behaviors. Such difficulties are reflected in middle school office discipline referrals, which are most frequently related to disrespect, defiance, and disruption (Kaufman et al., 2010). Middle school students may also begin to refuse to follow

directions or may engage in other non-compliant behaviors (Hecker et al., 2014).

Various mental health difficulties and emotional disorders also begin to emerge during adolescence (McGorry et al., 2011). During the transition to middle school, students often alter their friendship groups and experience decreased general social support (Evans et al., 2018). Merikangas et al. (2010) reported data from the National Comorbidity Survey Replication-Adolescent Supplement indicating that anxiety disorders were the most common (31.9%) during adolescence, followed by behavior disorders (19.1%), mood disorders (14.3%), and substance use disorders (11.4%). The median age of onset for anxiety disorders was 6 years (with symptoms often persisting into middle school years), 11 years for behavior disorders, 13 years for mood disorders, and 15 years for substance use disorders. Such results show the increasing prevalence of distress experienced by many middle school aged adolescents. In fact, an estimated one-fourth of youth between the ages of 8 and 15 years have a mental health disorder: Unfortunately, it is estimated that only about half receive treatment (Merikangas et al., 2009).

Changes and vulnerabilities during the stressful middle school transition require varied school programs and opportunities. Schools are increasingly being asked to provide initiatives targeting students' social-emotional competence, physical health, and mental health (Diamond, 2010; Graham et al., 2011). An intervention that may benefit students is school-based yoga practice. The positive impact of yoga on adolescents has gained interest due to its increasing popularity in the general population and an increasing prevalence of school-based yoga programs (Caldarella & Lulla, 2022; White, 2009).

Yoga

In ancient Indian philosophy, the term yoga has held various meanings. A common meaning includes a mechanism of subduing the mind and senses (Joshi, 1965). Yoga is referenced multiple times in the *Bhagavad Gita* (Mitchell, 2007), one of the most sacred of Hindu scriptures. The *Bhagavad Gita* first refers to yoga as an unbiased balance between two polarized ends of a spectrum. A second definition refers to avoiding fixed mindsets in favor of malleable mindsets to achieve happiness. A third definition is that yoga is the highest state of fulfillment, resilient to despair and bereavement.

According to the *Bhagavad Gita,* yoga was first introduced to the Eastern hemisphere in the 1st millennium B.C. Yoga was brought to the West in the 1950s (Hammond, 2007). Priyadarshan (2018) notes several differences between Eastern and Western orientations to yoga. For example, in the East, yoga is seen as an important part of the culture and as mentioned in the *Bhagavad Gita* has ties to everything from sustenance and nourishment to relationships with others. In the West, yoga is often seen as another form of physical exercise. The East and West also differ in their approaches to meditation and mindfulness. In the East, ample time is naturally embedded into the day to allow for yoga poses and quiet introspection. In the West, yoga is often done at a set-aside time as a part of peoples' busy days. Priyadarshan goes on to note that in the East, people tend to live more simply regarding their home, and apparel, and do more simplistic yoga postures. They may practice yoga alone or with only one other person. The West tends to be more materialistic and focused on appearances while practicing yoga. Yoga in the West is also viewed as more of a social event, with yearnings for challenging postures and more complex forms of practice such as hot yoga. Hookham (2021) also points out differences in the guru-student relationship from East to West. In the East, a guru passes down traditional teachings to their students to obtain spiritual awakening. The guru is seen as a spiritual guide and the student will only achieve spiritual awakening if they open their hearts and minds. In the West, the relationship between student and yoga teacher is more of a typical relationship between two individuals performing a business transaction or two casual friends.

There are different branches and styles of yoga each with distinct traditions and practices (Feuerstein, 2012). Yoga was

originally practiced for relieving suffering (*duhkha*) and gaining liberation (*moksha* or *nirvana*) or enlightenment (*bodhi*). Today in the West, yoga does not align to any belief system or religion, rather it is considered a practice for fostering inner wellbeing (Basavaraddi, 2015). Reasons for practicing yoga often include maintaining fitness, improving health, calming the mind, and living meaningfully (Feuerstein, 2003). Contemporary yoga consists of a combination of physical postures (asanas), breathing techniques (pranayama), and meditation (dyana) (National Center for Complementary and Integrative Health, n.d.).

Yoga in Schools

Research suggests that there has been an increase in yoga practice among school-aged youth. Black et al. (2018) found a significant increase in the use of yoga among children ages 4–17 years in the US, increasing from approximately 3% in 2012 to over 8% in 2017. Khalsa and Butzer (2016) identified eight school-based yoga publications from 2000 to 2009, increasing to 39 from 2010 to 2015. Most of these studies were conducted in elementary schools, followed by high schools, and fewer in middle schools. The authors found wide variability in these studies. For example, between 5 and 100 yoga sessions were held; yoga ranged from 1 to 52 weeks; and the duration of each yoga session ranged from 4 to 180 minutes. Khalsa and Butzer noted that school-based yoga research appeared to be in the early stages as evidenced by various study limitations such as small sample sizes, lack of randomization, limited details about the intervention, and absence of control groups.

Caldarella and Lulla (2022) conducted a review of the reported benefits of high school-based yoga programs and found a similar increase in yoga studies. All 22 studies which met their inclusion criteria were published since 2006, with the majority (60%) published since 2013. Most studies (77%) were conducted in the US with the remainder conducted in India. The most common research designs used were quasi-experimental (n = 54%), experimental (n = 27%), qualitative (n = 14%), and mixed methods (n = 4%). Caldarella and Lulla noted that high school-based yoga programs showed promise in terms of their physical, social, academic, and mental health benefits for students. Yoga also showed benefits for students who were stressed, anxious, or depressed, and those at risk for abusing substances or dropping out of school.

Purpose

There has yet to be a literature review specifically examining the benefits of yoga implementation in middle school settings. Therefore, this review focused on the reported benefits of middle school-based yoga programs for students and considerations for those wishing to implement such programs.

Review Search Strategy

Education Resources Information Center (ERIC), PsycINFO, and Google Scholar databases were used to locate studies. A variety of search terms were used including *adolescence, middle school, yoga, yoga intervention,* and *yoga program*. Quantitative, qualitative, and mixed-methods studies were included based on the following criteria: The study (a) examined the benefits of yoga as the primary intervention conducted in a middle or junior high school setting with students ages 10 to 15 years old; (b) was published by June 2022; (c) was reviewed either by a journal editorial board or by a student's dissertation or thesis committee; (d) was published in English; and (e) a full text copy was available. We also completed an ancestral search of all eligible studies to locate additional sources.

Summary of Eligible Studies

The 12 eligible studies reviewed in this paper, as outlined in Table 1, were published between 2001 and 2021.

Table 1

Summary of Middle School Yoga Studies Reviewed

Study	Design Type	Participants	Yoga Type and Frequency	Student Benefits Reported
Banerjee (2014)	Quasi-experimental	40 students in 7th grade at a public school in Raipur, India (yoga *n* = 20, control *n* = 20). 50% female.	Yoga (surya namaskar, pranayama, bhramari, omkar jap, and yoga nidra) practiced from 6am to 7am; 60-minute sessions daily for 60 days.	Significant increases in memory scores for both males and females in the yoga group. No significant changes in the control group.
Bergen-Cico et al. (2015)	Quasi-experimental	144 students in 6th grade at a middle school in Boston, MA (yoga *n* = 72, control *n* = 72). 50.5% female, predominantly White (57.5 %) and Asian (32.6 %).	Mindfulness Hatha yoga practiced 3 times per week for 4 min at the beginning of English language arts class for approximately 6 months.	Students in the yoga group demonstrated significant increases in both global and long-term self-regulation compared to the control group. Positive feedback from the teacher and most students regarding yoga feasibility and effects.
Bhardwaj & Agrawal (2013)	Experimental	44 participants (yoga *n* = 22, control *n* = 22) from a school in Haridwar, India ages ranged between 10 and 12 years.	Yoga (breathing techniques, postures, and relaxation technique), or 35 minutes daily for six days a week for one month.	The yoga group showed a significant increase in the level of overall, general, and social self-esteem.
Butzer, LoRusso, Shin et al. (2017)	Experimental	211 students in 7th grade at an urban public school in Boston, MA randomly assigned to yoga (*n* = 117) or physical education class (*n* = 94). 63% female, predominately White (54%) and Asian (31%).	Kripalu yoga practiced for 45 minutes, one or two sessions a week, for six months.	Students in control condition significantly more willing to try smoking cigarettes post-intervention than those in yoga condition. Females in yoga condition improved emotional self-control.

Butzer, LoRusso, Windsor et al. (2017)	Qualitative	16 students in 7th grade at a public school in Boston, MA. 50% female, predominantly White (63%), Asian (19%) and Black (12%).	Kripalu Yoga in the School's curriculum practiced 1 to 2 times per week for 35 min integrated into Physical Education curriculum for approximately 6 months.	Students had positive opinions of the effects of yoga on stress, sleep, and relaxation, as well generally positive opinions of yoga helping with self-regulation, social interaction, substance use, and academic performance.
Frank et al. (2017)	Experimental	159 students in 6th and 9th grades at a diverse, high poverty inner city middle school in CA. 53.5% male, predominantly Latino (54.2%), mixed race (21.9%), and African American (16.8%).	Transformative Life Skills (TLS) yoga curriculum taught in home room classes during 30-minute sessions 3-4 times/week for one semester (18 weeks).	Students in the yoga group rated the intervention positively and showed significant reductions in unexcused absences and detentions, as well as significant increases in school engagement and positive stress coping strategies, emotion regulation, and positive thinking.
Hagins et al. (2013)	Experimental	30 students (yoga n = 15, comparison n = 15) in 6th grade at a New York City public middle school. 50% White, 4.17% Black, 8.33% Asian, 16.67% Hispanic, 20.83% other.	A 15-week 50 min yoga program two times/week compared to a 50 min physical education program. Yoga type NA.	No significant differences between groups on physiological responses to behavioral stressor tasks at post-test.
Jain (2019)	Quasi-experimental	80 school students (yoga n = 40, comparison n = 40) of 8-9th grade within the age range of 13 to 15 years in India.	One-hour daily yoga for 6 days a week for one month consisting of Pranayama and Asanas.	Yoga practice was beneficial in improving memory, anxiety, mindfulness, and attention

Kwasky & Serowoky (2018)	Quasi-experimental	15 female at-risk students ages 11–14 in Detroit, Michigan. 50% Hispanic, 43% Caucasian, 7% African American, 7% Arab/Muslim.	An 8-week afterschool yoga program practiced two times/week. Yoga type NA.	Significant increases in students' perceptions of social self-efficacy and physical flexibility, as well as significant decreases in waist circumference.
Manjunath & Telles (2001)	Experimental	20 girls between 10 and 13 years of age, studying at a residential school were randomly assigned to two groups Yoga (n = 10) vs physical training (n = 10) in India.	One hour fifteen minutes per day seven days a week for one month of yoga (Asanas, Pranayama, Kriyas, meditation, Bhajans, and relaxation techniques).	Yoga training improved executive functioning by reducing planning and execution time in simple as well as complex tasks and facilitated reaching a target with a smaller number of moves in a complex task.
McMahon et al. (2021)	Quasi-experimental	119 students, ages 11–14 from after-school programs for middle school students in North Carolina (yoga *n* = 52, control *n* = 66) 42.5% African American, 24.2% Latinx, 15% White, 10% Asian, 5.8% Multi-Racial.	6-weeks, with two 40 min classes per week of Kundalini yoga.	Students in the yoga program reported significant decreases in emotion dysregulation across the program. Students in the yoga program also reported significant decreases in anger, depression, and fatigue over one yoga session. Students in the comparison condition only reported decreases in fatigue over one session of the alternative activity.
Rangan et al. (2008)	Quasi-experimental	49 boys in India with ages ranging from 11 to 13 years who were part of a yoga curriculum were compared to 49 other boys who were not in yoga (98 students total).	3 hours daily for one year using the Gurukula education system with yogasanas, ablutions, puja, yogic games, and pranayama.	Planning and executive abilities were better using the Tower of London test at the start and the end of an academic year with the yoga group than the non-yoga group.

Two (17%) of the studies were published from 2001 and 2011 and 10 (83%) were published between 2012 and 2021. Seven of the studies (58%) were conducted in various parts of the US, while five (42%) were conducted in India. A total of 83% of the studies were conducted in regular schools, while 17% were conducted in alternative schools. The most common research designs used were quasi-experimental (n = 6), followed by experimental (n = 5), and qualitative (n = 1). The average study sample size was 77 (range = 15 to 159). A variety of yoga practices were implemented including pranayama (breath regulation), asanas (body postures), omkar jap and nidras (meditations), bhajans (songs), and yogic games. Some studies used specific types of yoga including Kripalu, Mindfulness Hatha Yoga, Kundalini, and Transformative Life Skills (TLS). Yoga classes lasted an average of 58 min (range = 4 to 180 min) and were held an average of 3 times per week (range = 2 – 6) over an average of 15 weeks (range = 4 - 48).

Implementation Considerations

As the literature demonstrates, yoga appears to provide various benefits for middle-school students. It also appears acceptable and feasible to implement yoga practice for at-risk adolescents in middle school settings (Frank et al., 2017; Hagins et al., 2013; Kwasky & Serowoky, 2018; McMahon et al., 2021). A great deal can be learned from reviewing how middle schools have implemented yoga programs in previous studies. This section explores considerations for implementing yoga in middle schools.

Table 2

Considerations for Implementing Yoga in Middle School

Implementation considerations	
Time of day	When will yoga lessons be conducted: Before, during, or after school?
Student gender	Will students be comfortable with combined or separate gender yoga groups?
Yoga instructors	Will the school hire outside yoga instructors, or will staff members teach yoga? What are the minimum qualifications required to teach yoga?
At-risk students	Will students with particular risk factors affect how yoga is implemented?
Location	Where will the yoga lessons be conducted? Will the setting need to be adapted to provide privacy and minimal distractions and noise?
Other factors	How will yoga be incorporated into the school schedule, classes, and activities? Be prepared to respond to possible pushback from school faculty and staff.

Time of Day

The studies reviewed were categorized in terms of the time during the school day when yoga was implemented. Yoga was most frequently implemented while school was in session (45%); this was done in English, Homeroom, and Physical Education classes, or interspersed throughout the school day (Bergen-Cico et al., 2015; Butzer, LoRusso,

Windsor et al., 2017; Frank et al., 2017; Hagins et al., 2013; Rangan et al., 2008). Two studies implemented yoga after school (Kwasky & Serowoky, 2018; McMahon et al., 2021). One study (Jain, 2019) implemented yoga at a school camp. Banerjee (2014) was the sole study which implemented a yoga intervention before school started. The remaining two studies did not specify the time of day that yoga was implemented (Bhardwaj & Agrawal, 2013; Manjunath & Telles, 2001).

Student Gender

The middle school studies we reviewed differed in terms of how students of different genders were involved. Most studies (64%) combined genders for their yoga classes (Banerjee, 2014; Bergen-Cico et al., 2015; Bhardwaj & Agrawal, 2013; Butzer, LoRusso, Windsor et al., 2017; Frank et al., 2017; Hagins et al., 2013; Jain, 2019). However, two studies targeted only female students (Kwasky & Serowoky, 2018; Manjunath & Telles, 2001) and Rangan et al. (2008) solely targeted male students. McMahon et al. (2021) implemented yoga interventions separately to groups of male and female students.

Yoga Instructors

A total of 45% of the reviewed studies mentioned using trained instructors to teach yoga (Bhardwaj & Agrawal, 2013; Bergen-Cico et al., 2015; Frank et al., 2017; Hagins et al., 2013; McMahon et al., 2021). In terms of previous experience teaching yoga, only two studies provided that information. Frank et al. mentioned that their yoga instructors had a few years of acquired experience in the school setting and at least two years teaching elsewhere. Hagins et al. stated their yoga teachers had three and five years of yoga teaching experience, respectively. The remaining three studies did not disclose yoga teacher experience outside of their completed yoga training (Bhardwaj & Agrawal; Bergen-Cico et al.; McMahon et al.). In terms of gender of trained yoga teachers, only two studies reported this. Bergen-Cico et al. noted that their one yoga teacher was female. Of the five trained yoga teachers in McMahon et al., 80% were female.

At-Risk Students

As stressors vary from school to school in terms of socioeconomic status, neighborhood risks, and adverse childhood experiences, this impacted how yoga was implemented. A total of 36% of the reviewed studies targeted *at-risk* students. The term at-risk in our review refers to studies of students from low-socioeconomic neighborhoods, in urban areas, from minoritized backgrounds, with histories of academic and behavioral challenges, and/or adverse childhood experiences. Low socioeconomic status refers to a regions' median income being below the poverty level, often with high unemployment, low parental education, high welfare eligibility, and high rates of single parent families (Reardon, 2016).

When implementing a yoga program for adolescent girls in a latch key afterschool program, Kwasky and Serowoky (2018) made sure their students' physical needs were met by loaning out workout leggings and yoga mats and offering a meal after class. When implementing yoga in an inner-city high poverty middle school, Frank et al. (2017) focused lessons on teaching students to understand the stress response, physical and emotional awareness, self-regulation, and creating healthy relationships to reduce stress and promote social-emotional health and physical wellness. When working with at-risk middle school students with histories of academic and behavioral challenges, McMahon et al. (2011) focused on trauma informed yoga practices and teaching ways to cope with academic, emotional, and behavioral problems. One lesson contained positive self-talk mantras and discussion of the concept of *right action*: channeling energy that is usually used for yearning, jealousy, aggression, or physically attacking others into self-regulation, candor, compassion, and altruism. This instruction was designed to encourage students to engage in behaviors informed by their long-term goals instead of their short-term emotional reactions.

Location

Another consideration for implementing yoga in middle schools is the location of the practice. Yoga lessons must be conducted in an open, clean, and safe space (Bhardwaj & Agrawal, 2013). Difficulties with the yoga setting, such as distractions, noise, or lack of hygiene in the environment, may pose barriers for students and reduce buy-in.

Other Factors

Other logistical factors must be addressed by schools before implementing a yoga program, as noted by Caldarella and Lulla (2022). These factors include whether yoga is offered for school credit or as a club; whether it is conducted by trained school staff or external yoga instructors; and whether yoga is offered to all students or is focused on those that are at risk. Will yoga be taught for extra credit, used as an opening class exercise, offered as an alternative class, be a replacement for homeroom, be part of after school programs, or dispersed throughout the day? Practicing yoga as part of, or instead of, a general physical education class may also be considered (Butzer, LoRusso, Windsor et al., 2017). In addition, being prepared to respond to possible pushback from school faculty and staff regarding the implementation of yoga in middle schools, given the demands to teach required academic content and the challenges associated with implementing extracurricular programs.

Reported Benefits of Yoga in Middle Schools

Although yoga is not yet considered an evidence-based intervention in middle schools, it shows reported benefits in several areas, as described below. The literature suggests that middle school-based yoga programs can help students in the areas of mental health, executive functioning, physical health, social interactions, and academics (see Table 1). The literature reports favorable outcomes for general middle school populations as well as for youth at risk due to poverty (Frank et al., 2017) and histories of adverse childhood events in resource poor environments (Kwasky & Serowoky, 2018).

The sections below address the reported benefits of yoga in detail. Specifics related to youth who have been identified as at-risk are also detailed in these sections.

Mental Health Benefits

The most common reported benefits of yoga in middle school were improvements in students' mental health, namely emotional regulation, self-esteem, mood, anxiety, and depression. In fact, yoga has been referred to as "a mental and emotional tool" for students (Conboy et al., 2013, p. 174). Research suggests that yoga can have a positive impact on adolescents' capacities for emotional regulation. Specifically, middle school students practicing yoga have been found to improve in their ability to self-regulate anxiety, depression, and anger (Bergen-Cico et al., 2015; Butzer, LoRusso, Windsor et al., 2017; Frank et al., 2017; McMahon et al., 2021).

A randomized controlled trial by Frank et al. (2017) divided 159 at-risk Californian urban middle school students into either an 18-week yoga social emotional learning curriculum (30 minutes in their homeroom class three to four days per week), or to a homeroom control group. Students were considered at-risk based on low SES, below average GPA, and/or living in a single parent home or with other relatives. Students in the yoga homeroom class learned yoga positions, breathing strategies, and meditation. The students were administered the Positive and Negative Affect for Children (Laurent et al., 1999) and the Response to Stress Questionnaire (Connor-Smith et al., 2000). Results demonstrated that students in the yoga class showed more progress in positive thinking, emotional regulation, and cognitive restructuring than the control group.

In another study, Butzer, LoRusso, Shin et al. (2017) conducted an experimental study where 211 seventh grade students were randomly assigned to yoga or a physical education class. The yoga group practiced Kripalu yoga for 45 minutes, one or two sessions a week, for six months. Students were administered multiple questionnaires pre, during, post, and follow up. The

questionnaires included items from the Kendall-Wilcox Self-Control Schedule (Kendall & Williams, 1982), the Anger Control Subscale of the Children's Anger management Scale (Zeman et al., 2002), the Children's Sadness Management scale (Zeman et al.), and the Substance Use Willingness Scale from the Youth Risk Behavior Survey (Center for Disease Control, 2014). Long-term follow-up revealed a pattern of delayed effects in which females in the yoga condition, and males in the physical education group, demonstrated improvements in emotional regulation. Students in the yoga condition were also significantly less willing to try smoking cigarettes post-intervention than participants in the control condition.

Yoga has also been reported to help middle school students increase self-esteem. Bhardwaj and Agrawal (2013) separated 44 Indian middle school students into two groups: a treatment group and a control group. The treatment group received 35 minutes of yoga instruction six days a week. All students were administered the Indian adaptation of Battle's Self-Esteem inventory for Children (1988), a forced-choice *(yes/no)* questionnaire, pre and post-test. Results indicated that students in the yoga group significantly increased their self-esteem while students in the control group remained the same or decreased.

Yoga has been reported to be effective in boosting mood and reducing anxiety among middle school students. Middle school students have reported that when yoga stretches and breathing techniques are done consistently it allows them to improve their ability to relax and remain calm during stressful situations, such as during a triggered panic attack, or when they are feeling overwhelmed (Butzer, LoRusso, Windsor et al., 2017). Similarly, in a quasi-experimental study, Jain (2019) found that seated mindfulness, breathing, loosening exercises, asana, and relaxation techniques reduced anxiety and increased mindfulness among 40 students in eighth and ninth grades compared with a similar control group.

Yoga also appears to have a positive impact on depressive symptoms and anger. Following both a single session and six weeks of 40-minute sessions twice a week of an after-school Kundalini yoga intervention, McMahon et al. (2021) found that 52 at-risk middle school students with academic and behavioral challenges reported significantly fewer depressive and anger symptoms on the Depression Anxiety Distress Scale-21 (Lovibond & Lovibond 1995) and the Profile of Mood States-Adolescents (POMS-A: Terry et al., 1999) than an alternative activity comparison group.

Butzer, LoRusso, Windsor et al. (2017) conducted a qualitative study of 16 students who participated in a 35-minute Kripalu yoga intervention twice a week for six months. Yoga classes consisted of centering and breathing exercises, warm-ups, yoga poses, student-led poses and discussions, and relaxation exercises. Results indicated students generally perceived yoga to be beneficial for relaxing and dealing with stress.

Executive Function Benefits

Yoga has been reported to positively impact middle school students' executive function, which is defined as mental mechanisms used to direct behavior to reach a specified goal (Banich, 2009). Executive function involves mental processes that enable an individual to plan, focus attention, remember instructions, and manage multiple tasks (Fischer, 2010). Jain (2019) examined 40 middle school students in a one-month yoga participation condition versus a control group. Before and after the study, students were administered the Digit Letter Substitution Test (DLST: Natu & Agarwal, 1995) to assess attention and the Wechsler Memory Scale, fourth edition's (WMS-IV; Wechsler, 2009) digit forward and backward to assess memory. In the DLST, digit forward, and WMS-IV backward subtests, students in the yoga condition showed significantly greater improvements in attention and memory than did the control group.

Banerjee (2014) conducted a quasi-experimental study over a two-month period where 40 middle school students were equally divided between a control group and a 60-minute morning yoga intervention group. The researchers examined differences in memory between control and experimental yoga groups as a whole and control and experimental groups by gender alone using the Post-Graduate Institute (PGI; Pershad & Wig, 1977) memory scale. At post-test, students in the yoga intervention scored significantly higher on the PGI than students in the control group. In addition, female students enrolled in the yoga intervention received higher memory scores than female controls. Male students enrolled in the yoga intervention also received higher memory scores than male controls.

A randomized experimental study by Manjunath and Telles (2001) separated 20 middle school students into a month-long seven day per week, 75-minute yoga intervention or a generic physical training intervention lacking instructions to relax. Pre- and post-interventions, all students were asked to attempt three different exercises, involving arranging colorful beads in a specific pattern to three vertical rods, part of a standardized measure of planning ability (The Tower of London test; Shallice, 1982). Each exercise was more difficult than the last with an exact number of moves to be made – two, four, and five moves. Planning and execution time were measured in seconds as well as the amount of moves each student made during each task. Results indicated that students in the yoga condition had 53.9% lower planning time with two and 59.4% lower planning time with four move exercises, 63.7% lower execution time for four and 60.3% lower execution time for five move patterns, and 20.9% lower individual number of moves in four move exercises than the physical training group. These results suggested that the yoga intervention helped improve the students' processing speed and decision-making efficiency.

Rangan et al. (2008) conducted a quasi-experimental study where 49 residential middle school students at two different schools were matched one-to-one in terms of age and socioeconomic status. For one year, half of the students participated in yoga exercises interspersed throughout the school day and the other half did not. The students' planning, execution, and number of moves were compared to their counterparts on The Tower of London test (Shallice, 1982). Results indicated that students enrolled in the yoga curriculum performed significantly better than the control group in planning, accuracy, speed, and meticulous task execution.

Physical Benefits

Research on yoga in middle school has also found physical benefits such as improved fitness and weight loss. Kwasky and Serowoky (2018) recruited 15 at-risk female middle school students to be part of a quasi-experimental after school yoga study twice a week for eight weeks. Students were considered at risk due to living in urban environments with high levels of violence and trauma. Waist circumference was measured in inches and reaching flexibility was measured with the Accuflex Sit and Reach Test (Wells & Dillon, 1952) at baseline, during, and after the yoga intervention. Results indicated a lower waist circumference, indicating weight loss, and increased flexibility, indicating improved fitness, following exposure to yoga.

Yoga has also been reported as benefitting middle students' sleep and fatigue. Using interviews, Butzer, LoRusso, Windsor et al. (2017) found that most students post-yoga intervention reported that they spent less time falling asleep, were able to achieve deeper sleep, achieved less interrupted sleep, and improved their sleep satisfaction compared to before the yoga intervention. Middle school students also reported significantly less fatigue on the POMS-A immediately after attending a single yoga session compared with before the session (McMahon et al. (2021).

Social Benefits

Research reports that yoga can also have social benefits for middle school students. Yoga lessons consist of didactic and experiential content. During interviews with

Butzer, LoRusso, Windsor et al. (2017), students participating in yoga noted their satisfaction of working and being part of a small group and having an equal opportunity and open space for sharing insights with one another. Middle school students in Kwasky and Serowoky's (2018) study practiced yoga at school twice weekly for eight weeks. Self-efficacy was measured using the standardized Self-Efficacy Questionnaire for Children (Muris, 2001). Results indicated that participants showed significantly increased social self-efficacy at posttest and at one month follow-up. It should be noted that some middle school students have expressed discomfort in attempting yoga positions in a large group setting, next to unfamiliar members of the opposite sex, and/or those with more experience and skills (Butzer, LoRusso, Windsor et al.).

Academic Benefits

Yoga has been reported to positively impact middle school students' academic performance. During interviews, Butzer, LoRusso, Windsor et al. (2017) found that most students reported success in ridding themselves of anxiety by using yoga breathing exercises before school assignments, tests, and oral presentations, which resulted in better academic performance. In the Frank et al. (2017) randomized controlled trial, researchers examined student academic and behavioral records and administered the School Engagement Scale (Cernkovich & Giordano, 1992). These researchers found that at-risk students who participated in yoga decreased their unexcused absences, detentions, suspensions, and increased school engagement, such as belonging and working hard in school. Math and English grades for these at-risk students also increased following the yoga intervention. Others have reported that, as yoga can help improve students' focus, memory, self-esteem, and anxiety/stress in school, their academic performance often improves as well (Caldarella & Lulla, 2022; Wei, 2016).

Limitations

This study included a review of the literature examining the benefits of yoga in middle schools; however, there were some limitations. There was one small experimental study (Hagins et al., 2013) which found that a 15-week yoga program did not provide significant differences in stress reactivity compared to a physical education class in sixth grade students. The reasons for these results were hypothesized to be due to the yoga intervention failing to focus on stress management but may also have been due to the small sample size (15 in each experimental group).

Another limitation was that we did not conduct a meta-analytic review due to the variety of research methods (i.e., quasi-experimental, experimental, qualitative) used in the literature. However, a set of inclusion criteria were used to evaluate each study to ensure minimal selection bias. Other limitations were that there are not yet many middle school yoga studies, and there was a large variability in the type and quality of studies, with some not reporting the specific type of yoga implemented.

We agree with McMahon et al. (2021) that further research needs to be conducted due to the frequent lack of randomization at the student level. We further agree that the literature could benefit from a longitudinal study on the physical, mental health, and academic effects of yoga in middle school, examining socioeconomic status as an influential factor with larger sample sizes (Bhardwaj & Agrawal, 2013; Kwasky & Serowoky, 2018; McMahon et al., 2021). The literature also included little information on the fidelity of yoga implementation in middle school, like results found in high school studies (Caldarella & Lulla, 2022).

Conclusion

The results of this first literature review specifically focused on middle school settings suggest that yoga appears to provide a variety of mental health, executive functioning, physical, social, and academic benefits for students. The studies reviewed also suggested that yoga can benefit adolescents who are stressed, anxious, depressed, or those who are at risk. However, these results represented just 12 studies published across

the US and India using a variety of research designs and yoga types. Research on middle school-based yoga programs is still in its early stages. Given the encouraging results in past studies, we encourage further implementation and evaluation of middle school yoga programs using rigorous research designs.

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