
RESEARCH TO PRACTICE

Yoga as an Intervention for Children With Attention Problems

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Abstract. A multiple baseline design across three grade level groups with a comparison group was employed to investigate the effectiveness of yoga for improving time on task with 10 elementary school children who evidenced attention problems. A yoga videotape, published by GaiaM, was used that required the children to follow an adult instructor and three children who engaged in deep breathing, physical postures, and relaxation exercises for 30 minutes, twice a week, for a period of 3 weeks. Time on task was defined as the percentage of intervals observed that the students were orientating toward the teacher or task, and performing the requested classroom assignments. The results indicated effect sizes that ranged from 1.5 to 2.7 as a function of the intervention. Effect sizes at follow-up decreased, but ranged from .77 to 1.95. Peer comparison data indicated that classmates' time on task remained essentially unchanged throughout the three phases of the study.

Developing effective interventions for children with attention difficulties has been an important area of psychological research, as it is a prevalent problem in schools today (DuPaul & Stoner, 1994). Problems of inattention occur in varying degrees, with the most severe form often resulting in a diagnosis of Attention Deficit Hyperactivity Disorder-Inattentive Type (ADHD). The National Association of School Psycholo-

gists (2003) recognizes that inattentive behaviors exist along a continuum from mild to severe and advocates for school psychologists to address a broad range of attention problems, not solely those students diagnosed with ADHD.

Students with attention problems often fail to finish assignments, are easily distracted, have difficulty listening to directions, concentrating, and organizing their work, and most

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often require supervision to accomplish tasks (Dawson, 1995). Not surprisingly, some researchers have found that as many as 80% of children with attention problems also display academic performance problems (Cantwell & Baker, 1991). Typically, school-based problems such as academic underachievement are often related to poor study and organizational skills as well as impulsivity, inattention, and hyperactivity in the classroom (Faraone et al., 1993). Further, children with attention problems often demonstrate poor social skills such as aggression and failure to adhere to rules that often result in impaired peer relationships (Ernhardt & Hinshaw, 1994). In an innovative study, Mannuzza, Klein, Abikoff, and Moulton (2004) compared 207 Caucasian boys with ADHD with matched controls and noted that the diagnosis of ADHD was a precursor to development of oppositional defiant disorder, conduct disorder, and adult antisocial personality disorder.

There are several interventions identified in the literature for addressing the difficulties of children with attention problems. They include behavior modification and cognitive behavioral treatments (Abramowitz & O'Leary, 1991), and medication for those children with an ADHD diagnosis. Behavioral interventions, such as token reinforcement programs, contingency contracting, and response cost, are commonly used with these children and have been found to be effective in improving classroom behavior (Barkley, 1990). Children with attention problems often respond well to these interventions because they provide frequent, immediate feedback and incorporate secondary, potent reinforcers. Similarly, cognitive behavioral interventions have been shown to be effective, but also are relatively time-consuming and require considerable resources for proper implementation (Abramowitz & O'Leary).

Treatment with stimulant medication is another common intervention for children with severe attention problems (Pelham, 1993). Stimulants have been found to have a positive effect on classroom behavior, social interactions, and academic performance (DuPaul, Stoner, Tilly, & Putnam, 1991). However,

stimulant medications have negative side-effects for certain children, such as insomnia, appetite loss (HaileMariam, Bradley-Johnson, & Johnson, 2002), obsessive-compulsive symptoms (Borcherding, Keysor, Rapoport, Elia, & Amass, 1990), and growth suppression (Zeiner, 1995). Because of this, parents often search for alternative treatment options.

Yoga is one such alternative that shows promise as an intervention for a variety of social, emotional, behavioral, and academic difficulties (Nardo & Reynolds, 2002). Although previous experimental research on yoga's effectiveness specifically for attention problems is somewhat limited, a few studies have been conducted. One of the early studies that employed yoga as a treatment for ADHD and oppositional behaviors was successful in reducing inattention and impulsive and oppositional behavior (Redfering & Bowman, 1981). A yoga program that incorporated meditation decreased children's hyperactivity, inattention, and anxiety, and improved their peer relationships and sleep patterns (Harrison, Manocha, & Rubia, 2004). Similarly, Jensen and Kenny (2004) reported that boys with ADHD decreased their hyperactivity, impulsivity, and inattention after completing a yoga program.

Yoga incorporates physical postures, breath control, mental concentration, and deep relaxation to positively affect mental states (Zipkin, 1985). It produces similar effects as relaxation in that it tends to result in feelings of calmness. Yoga also tends to promote self-control, attention and concentration, self-efficacy, body awareness, and stress reduction (Nardo & Reynolds, 2002).

The coordination of body movements and stretching in combination with deep breathing improves the body's overall circulation. This results in a release of tension as well as increasing levels of blood and oxygen throughout the entire body that in turn affect the central and autonomic nervous systems (Brosnan, 1982; Lalvani, 1999).

The autonomic nervous system, which primarily regulates involuntary activity such as heartbeat and respiration, consists of the sympathetic and parasympathetic systems (Seamon & Kenrick, 1994). Although these

systems generally control the same muscles and glands, they work in opposition to each other (Carlson, 1998). The sympathetic system utilizes stored energy and prepares the body for "fight or flight" by increasing heart rate and blood sugar level (Carlson; Seamon & Kenrick). In contrast, the parasympathetic division conserves energy and is active in relaxed situations. Activities of this division include a decrease in heart rate and activation of the digestive system (Carlson). In essence, the process of yoga deactivates the sympathetic division and stimulates the parasympathetic system resulting in a sense of calm, emotional balance, tranquility, and increased concentration (Brosnan, 1982).

Although there is a dearth of current systematic studies in this area, some research studies have examined the effectiveness of yoga on various aspects of students' functioning. Yoga has been shown to improve children's concentration, as measured by scores on coding (Hopkins & Hopkins, 1979) and static motor performance tasks (Telles, Hanumanthaiah, Nagarathna, & Nagendra, 1993). Additionally, the practice of yoga has been shown to reduce middle school children's state anxiety, heart rate, headaches, and general tension and stress symptoms (Kalayil, 1988). Slovacek, Tucker, and Pantoja (2003) examined the relationship of yoga instruction in an inner-city K-8 school to several significant outcome variables. Although one cannot attribute yoga as the causal factor in this study due to the lack of a control group, students' participation levels in yoga were all positively related to academic performance, positive student attitudes about themselves, student physical fitness levels, and student behavior. Moreover, the therapeutic potential of yoga has been suggested for children with psychomotor deficits (Hopkins & Hopkins, 1976) that are often also exhibited by children with attention deficits. A particularly attractive aspect of yoga when implemented with children is their reported feelings of well-being and enhanced body awareness (Hopkins & Hopkins, 1979). It would seem sensible that children's heightened body awareness, calmness, reduced

tension, and improved concentration (Brosnan, 1982), especially for attention problems, would be conducive to learning (Hopkins & Hopkins, 1979). However, the effect of yoga on direct measures of children's attention in the classroom has not been studied. Therefore, the purpose of this study was to examine the effectiveness of yoga on improving attention in primary-grade children.

Methods

Participants and Setting

Ten elementary school students with attention problems (aged 6-10) across three grade levels (Grades 1, 2, and 3) volunteered to participate in the present investigation. Specifically, they were recruited by the school psychologist who made initial contact with the parents and secured permission. The school psychologist recruited students whose teachers had sought school psychology consultation services due to the students' attention problems.

The participants were not diagnosed with ADHD, which is in accord with the National Association of School Psychologists' (2003) position that school psychologists need to address a broad range of attention problems, not exclusively those students diagnosed with ADHD. Criteria for participation in the investigation included documented attention problems in the classroom as evidenced by less than 80% time-on-task, which has been cited as evidence of attention problems (Rhode, Jenson, & Reavis, 1993), during two structured observations conducted by the school psychologist, written parent permission, and verbal student assent.

To calculate their percentage of time on task, the students were observed in their classrooms during their morning class work using a structured Behavioral Observation Form (BOF; Rhode et al., 1993). Time on task was defined as the percentage of intervals observed where the students had eye contact with the teacher or assigned task, and performed the requested classroom assignments. The BOF employed 10-minute observations using momentary time sampling with 10-second intervals. At least one of the two screening observations per student was completed with an

additional observer (the school psychology intern), and adequate interobserver agreement was established (above 80%).

The students were from a suburban middle and upper middle class town in the northeastern United States. Of the 10 participants, 3 were male and 7 were female; 1 was Hispanic and 9 were Caucasian; 2 were mainstreamed special education students (1 learning disability and 1 speech/language impairment) and 8 were regular education students. The control students were a composite of the same gender children in each participant's classroom, with similar demographic characteristics to the participants according to the school's overall population.

Design

A multiple baseline design across three grade levels with a follow-up phase that included 10 children and composite controls was employed. The students were grouped for the intervention by grade level, as the experimenter previously found children to be most engaged in yoga exercises when they were done in a small group as opposed to individually. Consequently, the grade levels were treated as the unit of analysis. Grade 1 included 3 students (Students 8, 9, and 10), Grade 2 included 3 students (Students 5, 6, and 7), and Grade 3 included 4 students (Students 1, 2, 3, and 4). The phases included baseline, intervention, and follow-up. Prior to beginning the baseline phase, the school psychologist scheduled with the classroom teachers the time of the school day that the yoga exercises would be taking place for each grade level. Because the observations during the intervention phase would be taking place immediately following the yoga exercises, the observations during the baseline, as well as follow-up, phases were completed at the same time of day to be consistent across phases. The exact time of day of the intervention varied by grade level groups according to the most accommodating time for the classroom teachers, although all grade levels participated at some point during the morning. During the observations, the children were engaged in either whole group lessons or indi-

vidual seatwork in their classrooms, most often in language arts.

Dependent Variable

Time on task was defined as the percentage of intervals observed where the students had eye contact with the teacher or assigned task, and performed the requested classroom assignments. The students were observed in their classrooms by the school psychologist and/or intern using the structured BOF as completed during the initial screening for inclusion in the study (Rhode et al., 1993) to calculate their percentage of time on task. The BOF employed 10-minute observations using momentary time sampling with 10-second intervals. The student's behavior was observed and recorded at the end of the 10-second interval. The participants were observed approximately two times per week across all phases of the study (baseline lasted approximately 3, 5, and 7 weeks for Grades 3, 2, and 1, respectively; the intervention phase took place for 3 weeks for all grades; follow-up data were collected for approximately 3 weeks for all grades). At the same time that each participant was observed, the same gender children in the classroom were observed to serve as comparison peers (the observer chose a different comparison child during each 10-second interval to form a composite). The school psychologist and intern were both trained in observational procedures as part of their graduate programs in school psychology.

Interobserver Agreement

Twenty percent of observations across the three phases of the study were coded by both the experimenter and another observer to establish the degree of interobserver agreement. Percentage of agreement was calculated to be 91 (number of intervals with the same rating divided by total number of intervals multiplied by 100). Although the school psychologist supervised the yoga exercises and observed the students in the classroom, it was not believed that the children evidenced reactivity to her presence in that she often spent time in the classroom. Additionally, the investigator and additional

observer adhered strictly to the operationally defined criteria for time on task to obtain valid observational data, given the fact that they were not blind to the hypothesis of the study or the treatment phase of the participants.

Treatment Integrity

To ensure that the intervention was consistently and accurately employed across students, all components of the intervention were compared to a checklist protocol. They were checked off only if completed as intended. The protocol included the following: (a) all participants in the grade level group were present in the school psychologist's office; (b) all participants were dressed appropriately for the yoga exercises (i.e., comfortable clothes, shoes off); and (c) researcher played yoga videotape and participants followed along with deep breathing, physical postures, and relaxation exercises.

Social Validity

All students completed a social validity questionnaire, based on Bray and Kehle's (1996) index, upon completion of the follow-up phase. The three-item scale assessed how much the students liked engaging in the yoga fitness exercises, the frequency and duration of the yoga, and the overall effect of the treatment on their ability to focus in the classroom. The ratings ranged from 1 = "I Disliked It Very Much" to 5 = "I Liked It Very Much." Depending on the age of the students, the questions were read to them.

Treatment

The "Yoga Fitness for Kids" (Gaiam, 2003; <http://www.gaiam.com/retail/product.asp?product%5Fid=91%2D0192+MSTR>) commercial videotape from Living Arts was the treatment variable. Two versions of this videotape were used. The first grade children were shown the version designed for ages 3–6 with an adult instructor. The second and third grade children were shown the version designed for ages 7–12 with the same instructor. No other materials were required. The videotapes required the children to follow the videotape that depicted this adult instructor and

three children engaged in deep breathing, physical postures, and relaxation exercises. This was done for 30 minutes, twice a week, for a period of 3 weeks. The students followed along with the videotape in the school psychologist's office grouped by grade level. The school psychologist supervised the children during the treatment. No behavioral interventions were necessary, as the children complied with the directions and remained engaged with the exercises.

The videotapes depicted movement between various physical postures performed in an age-appropriate game-like manner. At the outset of the exercises the children were instructed to engage in simple warm-up exercises (i.e., jumping up and down like a "shooting rocket"). The video instructor described the postures using animals or objects in nature. There were various poses including the frog, downward dog, and bridge. For example, the frog pose, from the age 3 to 6 videotape, required the children to squat down and make "ribbet" noises. The instructor frequently reminded the children to take slow deep breaths while engaging in the postures. Finally, the videotape concluded with guided imagery where the children laid on their backs on the floor envisioning peaceful images such as being a seed that sprouted into a beautiful flower.

Results

Structured Behavioral Observation Procedure

Historically, visual inspection has been the most commonly used method to determine single-case intervention effects (Busk & Marascuilo, 1988); however, it has also been shown to be unreliable at times due to individual differences and bias among evaluators (Wampold & Furlong, 1981). Thus, the additional calculation of effect sizes for each grade level group was achieved by using Busk and Serlin's (1992) *Approach One: No Assumptions* method. These effect sizes were used as an indicator of the practical magnitude and importance of the yoga treatment. The effect sizes reported in the study were interpreted in concert with Cohen's (1992) guidelines. That

Table 1
Participants' and Composite Peers' Average Effect Sizes as a Function of
Grade Level and Phase of Study

| Grade & Condition | Average Baseline | Average Intervention | Average Follow-up | Standard Deviation Baseline | Effect Size Intervention | Effect Size Follow-up |
|-------------------|------------------|----------------------|-------------------|-----------------------------|--------------------------|-----------------------|
| 3 Treatment | 68.92 | 84.58 | 80.77 | 6.15 | 2.55 | 1.95 |
| 3 Comparison | 87.88 | 87.21 | 87.65 | 4.64 | -.14 | -.05 |
| 2 Treatment | 60.94 | 81.31 | 72.75 | 7.48 | 2.72 | 1.58 |
| 2 Comparison | 82.81 | 80.97 | 82.17 | 4.29 | -.43 | -0.15 |
| 1 Treatment | 65.48 | 85.28 | 75.56 | 13.07 | 1.51 | .77 |
| 1 Comparison | 83.97 | 84.89 | 84.11 | 10.82 | .09 | .01 |

is, a small effect should be .20 or greater, a moderate effect .50 or greater, and a large effect .80 or greater.

The effect size for the average of each grade level group was derived by calculating the difference between the mean of the baseline and the mean of the intervention phases divided by the standard deviation of the baseline phase. Additionally, for the follow-up data, the effect size was derived by calculating the difference between the mean of the baseline and the mean of the follow-up phases divided by the standard deviation of the baseline phase. The group data collected across baseline, intervention, and follow-up phases are depicted in Table 1 and Figure 1.

Effect sizes for the average for each grade level group ranged from 1.51 to 2.72 indicating a large effect. Effect sizes at follow-up decreased, but remained moderate to large ranging from .77 to 1.95 for grade level groups. Figure 1 depicts relatively stable levels of on-task behavior at baseline for Grades 3 and 2, with more variability in Grade 1 initially. One session of yoga practice was required before producing an effect on student behavior during the treatment phase across grade level groups. On-task levels decreased slightly at follow-up but generally remained higher than baseline levels. The observation that the data

did not return to baseline levels after the withdrawal of the treatment would indicate that a "behavior trap" occurred (Hartmann & Atkinson, 1973). Therefore, it was assumed that the behavior was maintained by environmental contingencies. Further, peer comparison data indicated that classmates' time on task remained essentially unchanged during the three phases of the study (Table 1). Following intervention, on-task levels for the yoga participants were commensurate with those of comparison peers. However, the slightly positive baseline trends, together with the existence of a substantial number of overlapping data points (see Figure 1) suggest caution in the interpretation of the findings.

Treatment Integrity

At the end of each treatment session the data collector completed the Treatment Integrity Checklist. It was determined that all elements of the intervention were implemented with 100% accuracy.

Social Validity

The average of Grades 1 and 2 were both 5.0 suggesting they "liked it a lot." However, the average of Grade 3 was 3.5. This 3.5 ranking was an anomaly in that one child in Grade 3 responded with a 1 meaning "disliked it very

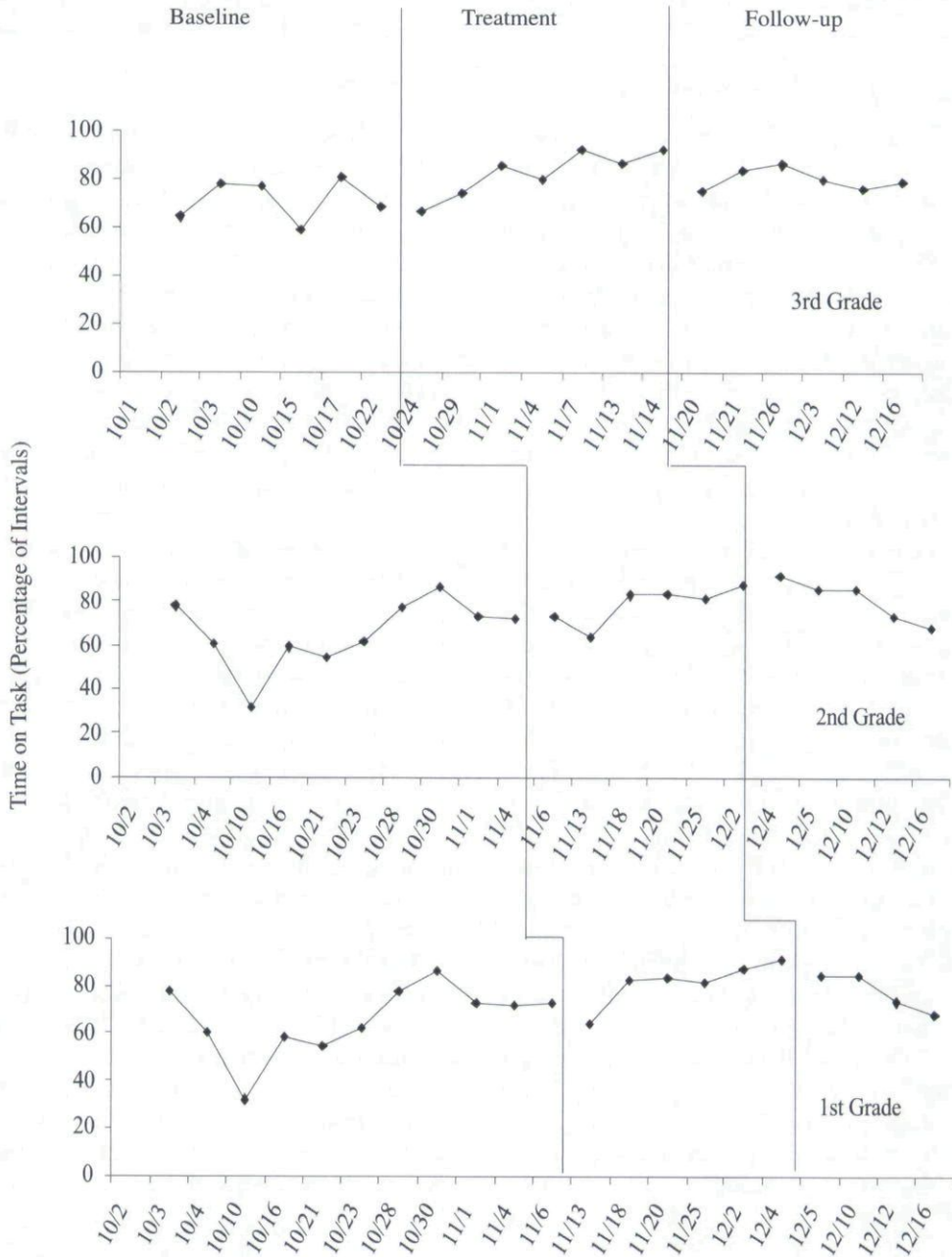


Figure 1. Average percentage of time on task across grade levels.

much" to Item 2, which asked her to rate the following statement: *Doing the yoga twice a week for three weeks*. The experimenter asked the participant about her response and she indicated that she wanted to do yoga much more than just twice a week.

Discussion

As stated earlier, the use of yoga to address attention problems in children not formally classified as students with attention deficit hyperactivity disorder is in concert with NASP's position. Assuming that the results of this study are replicated, yoga may become a promising alternative or complement to behavioral and medical interventions that are commonly used for children with attention problems. Of particular significance was that the practice of yoga facilitated by employing the videotapes was not only easily implemented, but was also enjoyed by the children. This intervention has the potential to be implemented not only in small groups in the school psychologist's office but also with an entire classroom. For example, the class could engage in brief yoga exercises to help them focus prior to taking a test or to settle into work after recess.

Although there is a dearth of recent research in this area, the findings of this study are in concert with other studies that have shown the benefits of yoga for children. These include the improvement of children's concentration, as measured by scores on coding (Hopkins & Hopkins, 1979) and static motor performance tasks (Telles et al., 1993); the reduction of children's state anxiety, heart rate, headaches, and general tension and stress symptoms (Kalayil, 1988); and the correlation with academic performance, positive student attitudes about themselves, physical fitness levels, and behavior (Slovacek et al., 2003).

Future research should include replication with different ages, and with different degrees of severity of inattention. Also, future studies should examine the effects of yoga on other indices of social competence such as promoting children's social skills, stress management, and general well-being. In addition, studies should incorporate outcome measures re-

lated to classroom performance and academic achievement, as well as social validity from the perspective of the classroom teacher. Finally, studies with a longer term follow-up would provide more data regarding the sustainability of the effects of the intervention.

Limitations

Although the observations were conducted at the same time of day across phases, the students were occasionally engaged in different activities related to their normal classroom routine (e.g., whole group activities vs. independent seatwork). The type of activity may have had an effect on the variability of the data. Additionally, the investigator served dual roles as both implementer of the intervention and observer of the participants, which introduces a potential bias that impacts the internal validity of the findings. To reduce the potential bias, the investigator strictly adhered to the operationally defined criteria for time on task. However, a future study could employ an observer who is blind to the purpose of the study and the phase of the participants. Further, comparison students did not present a control for attention problems, rather only a comparison for demographics. Future research could identify a control group of students with similarly poor rates of attention to task.

These results make a contribution to the literature on improving children's attention within educational settings. However, the magnitude of these effects were calculated using Busk and Serlin's (1992) *Approach One: No Assumptions Model*. Although effect sizes provide a valuable supplement to visual analysis, the different techniques used to calculate effect sizes in single case research can yield quite different results (Parker et al., 2005). Consequently, interpretation of the results of this study should be made with caution.

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