
Efficacy of the Get Ready to Learn Yoga Program Among Children With Autism Spectrum Disorders: A Pretest–Posttest Control Group Design

Kristie Patten Koenig, Anne Buckley-Reen, Satvika Garg

KEY WORDS

- autistic disorder
- child behavior
- education, special
- program evaluation
- yoga

Occupational therapists use school-based yoga programs, but these interventions typically lack manualization and evidence from well-designed studies. Using an experimental pretest–posttest control group design, we examined the effectiveness of the Get Ready to Learn (GRTL) classroom yoga program among children with autism spectrum disorders (ASD). The intervention group received the manualized yoga program daily for 16 wk, and the control group engaged in their standard morning routine. We assessed challenging behaviors with standardized measures and behavior coding before and after intervention. We completed a between-groups analysis of variance to assess differences in gain scores on the dependent variables. Students in the GRTL program showed significant decreases ($p < .05$) in teacher ratings of maladaptive behavior, as measured with the Aberrant Behavior Checklist, compared with the control participants. This study demonstrates that use of daily classroomwide yoga interventions has a significant impact on key classroom behaviors among children with ASD.

Koenig, K. P., Buckley-Reen, A., & Garg, S. (2012). Efficacy of the Get Ready to Learn yoga program among children with autism spectrum disorders: A pretest–posttest control group design. *American Journal of Occupational Therapy*, 66, 538–546. <http://dx.doi.org/10.5014/ajot.2012.004390>

Kristie Patten Koenig, PhD, OTR/L, FAOTA, is Assistant Professor, Department of Occupational Therapy, New York University, 35 West 4th Street, New York, NY 10012; kpk3@nyu.edu

Anne Buckley-Reen, OTR/L, RYT, is President, For Kids OT, PC, Fort Tilden, NY.

Satvika Garg, MS, OTR/L, is Research Assistant, Department of Occupational Therapy, New York University, New York.

The number of people diagnosed with autism spectrum disorders (ASD) has increased dramatically. Using data from a population-based multisite surveillance network, the Centers for Disease Control and Prevention (CDC) revised the ASD prevalence estimates from 1 in 150 children to 1 in 110 children (CDC, 2009). These data indicate a 600% increase over the past 2 decades and a 57% increase over the past 4 years of data collected by the CDC (Dawson, 2010). The most recent figure released by the CDC is that 1 in 88 children are now diagnosed with ASD (CDC, 2012), a prevalence that has implications for occupational therapy practitioners in all practice settings.

The need for scientifically based educational interventions, whenever practical, is outlined in the Individuals With Disabilities Education Improvement Act of 2004, the reauthorization of the Individuals With Disabilities Education Act of 1997. Myriad interventions, many unproven, are used with children with disabilities, including children with ASD. Often, multiple interventions are used, making it exceedingly difficult to assess the efficacy of a new intervention used in a classroom.

Children with ASD present unique challenges to the classroom teacher. The child's inability to regulate his or her own behavior is often most problematic. At very high or low levels of stress or emotional arousal, complex cognitive processes are compromised. Interventions that address this arousal system may then affect functional behavior and educational achievement. Appropriate classroom behaviors include the ability to attend to task; transition from one activity to another; maintain a calm, organized state as demands change; and independently engage in schoolwork. Maintaining a calm, alert state is conducive to

optimal learning in the classroom. Few opportunities exist in most educational curricula to train students in the skills required for maintenance of a calm but alert state (Goldberg, 2004).

Our aim in this research was to examine the effectiveness of a manualized occupational therapy intervention, Get Ready to Learn (GRTL), which uses yoga postures and breathing and relaxation exercises with elementary school students with ASD and challenging and maladaptive behavior. The GRTL program is a daily classroom-based preparatory yoga curriculum developed by Anne Buckley-Reen that uses specific developmentally targeted breathing exercises, yoga postures, chanting, and relaxation techniques to enhance the functional and academic performance of students with a variety of disabilities (Buckley-Reen, 2009).

Yoga and Occupational Therapy

Yoga is classified as a mind–body intervention by the National Center for Complementary and Alternative Medicine (2011) and is often used as a complementary approach in occupational therapy to enhance engagement in occupation (American Occupational Therapy Association, 2005). Deep breathing, meditation, massage, and yoga have been identified as the four complementary and alternative medicine therapies whose use by adults in the United States significantly increased from 2002 to 2007, with deep breathing and yoga identified as the third and fourth most commonly used interventions with children during the same time period (Barnes, Bloom, & Nahin, 2008). Occupational therapy practice has mirrored this trend, with therapists integrating yoga and movement programs into their clinic and school-based practice. The efficacy of these programs, which are being used with increasing frequency, needs to be studied.

Yoga's Efficacy as a School-Based Intervention

Yoga has been shown to have beneficial effects on mood, anxiety, stress, psychological and physical health–related quality of life, and pain in adult patient populations including people with cancer, chronic pain, schizophrenia, obsessive–compulsive disorder, and anxiety disorders (Field, 2011; Krisanaprakornkit, Krisanaprakornkit, Piyavhatkul, & Laopaiboon, 2006; Lin, Hu, Chang, Lin, & Tsauo, 2011; Sarris, Camfield, & Berk, 2011; Vancampfort et al., 2011). Among healthy adults, yoga's benefits in stress reduction have been shown in randomized controlled trials, but these studies had methodological flaws with short periods of intervention and limited follow-up data (Chong, Tsunaka, Tsang, Chan, & Cheung, 2011). Yoga's benefits

have been shown in pediatric populations as well, although the small number of studies and methodological flaws make it difficult to draw definitive conclusions about the efficacy of yoga interventions with children (Krisanaprakornkit, Ngamjarus, Witoonchart, & Piyavhatkul, 2010).

Yoga is increasingly being used in classrooms across the United States as a way to have an impact on and enhance students' behavioral and academic functioning, such as their attention, concentration or focusing ability, impulse control, strength, motor coordination, and social skills (Ehleringer, 2010; Galantino, Galbavy, & Quinn, 2008; Harrison, Manocha, & Rubia, 2004; Kenny, 2002; Klatt, 2009; Peck, Kehle, Bray, & Theodore, 2005; Uma, Nagendra, Nagarathna, Vaidehi, & Seethalakshmi, 1989). In a controlled experimental study carried out by Chan, Cheung, and Sze (2008), low-achieving children with behavioral problems who participated in a yoga intervention showed significant reductions in behavioral problems, including withdrawn behaviors and attention problems. Khalsa, Hickey-Schultz, Cohen, Steiner, and Cope (2011) found that yoga may exhibit a protective or preventive role among adolescents with mental health variables. Students who participated in a yoga program demonstrated significant improvements in anger control with less fatigue and slight or minimal improvements in anxiety, mood, perceived stress, and resilience. By contrast, the control group, who participated in regular physical education classes, showed a worsening on all mental health outcome measures.

Although most of the available research studies have been able to illustrate the positive effects of yoga as a promising education-based intervention (Harrison et al., 2004; Jensen & Kenny, 2004; Powell, Gilchrist, & Stapley, 2008), inherent weaknesses in study design, including small sample size, lack of a comparison group, and lack of a manualized intervention, have made it difficult to draw definitive conclusions. Many of the studies addressed multiple practice patterns, making it difficult to distinguish the sole effects of yoga on a specific impairment (Galantino et al., 2008). The intervention period is often limited to 1 or 2 times per week, which may not be enough intensity to produce significant changes (Harrison et al., 2004; Peck et al., 2005).

By examining the effects of the GRTL program among a larger sample of children with a specific disability and using a control group, a manualized program, and psychometrically valid outcome measures, this research contributes to evidence on the benefits of a yoga-based program in improving educational outcomes. The purpose of this research was to examine the effect of the GRTL program among children with ASD on decreasing maladaptive behaviors that may interfere with classroom

performance and increasing adaptive classroom behaviors. Specifically, we hypothesized that (1) children who participate in the GRTL program would show a decrease in interfering behaviors, as measured by the Aberrant Behavior Checklist, compared with the control group and (2) children who participated in the GRTL program would show increased adaptive classroom behaviors, such as time on task, and a decreased need for teacher direction, as measured by video observation, compared with the control group.

Method

Research Design

We used a pretest–posttest control group design to explore the effects of the GRTL program on challenging behaviors among children with ASD. We used a convenience sample drawn from a large urban public school. Institutional review board approval was obtained from New York University and the New York City Department of Education, and parent and teacher consent was obtained before the study commenced. Participating students were informed verbally and with visual cues about the program, but we were unable to obtain written assent because of the participants' functional level. Classes were chosen by school administrators so that the intervention and control group classes were comparable on the basis of similar levels of adaptive functioning. Adaptive functioning was confirmed using the Vineland Adaptive Behavior Scales–II (VABS–II; Sparrow, Cicchetti, & Balla, 2005), which was completed for all participants before intervention.

Participants

Eight classrooms were recruited from a large urban school that serves more than 700 students with autism. It has a diverse minority student population, and 64% of the students are classified as economically disadvantaged. Classes have a 6:1:1 student:teacher:classroom assistant ratio. We initially recruited four classes per condition for a total of 48 participants. Inclusion criteria for the students included (1) diagnosis of an ASD, (2) elementary school age (5–12), and (3) no known medical conditions that would prevent participation in the GRTL program.

Instrumentation

We used the Aberrant Behavior Checklist (ABC)–Community to assess challenging behavior (Aman & Singh, 1994). The ABC–Community is an outcome measure commonly used in intervention trials for children with

ASD (McCracken et al., 2002; Pandina, Bossie, Youssef, Zhu, & Dunbar, 2007) and retained its original factor structure when used specifically with a sample of children with ASD (Brinkley et al., 2007). The ABC–Community is a 58-item checklist that yields five subscales: Irritability/Agitation/Crying, Lethargy/Social Withdrawal, Stereotypic Behavior, Hyperactivity/Noncompliance, and Inappropriate Speech. Individual items are rated on a scale ranging from 0 (*not a problem*) to 3 (*a severe problem*) and totaled; higher scores on individual subscales indicate more pathology. In this study, we also totaled the subscale scores to indicate overall level of behavior problems. The ABC–Community's internal consistency is high (subscale range = .86–.95), its interrater reliability is acceptable (.63), and it has high test–retest reliability (.96–.99). The ABC–Community was completed by the parent and teacher pre- and postintervention to assess behavior in multiple contexts.

The VABS–II is a parent-based interview designed to assess independence and proficiency across several domains, including social, daily living, communication, and motor, and yields an adaptive behavior score. Internal consistency for the VABS–II composite is .94. Test–retest reliability has been reported as .88, and interrater reliability is acceptable at .74 (Sparrow et al., 2005). We chose a parent (rather than teacher) report measure for adaptive behavior to capture behavior in contexts other than school and to reduce respondent burden for teachers.

Coding of Behavior

A video observation was made for the first structured activity that occurred after the GRTL program in the intervention condition and after the standard morning activities in the control condition. This activity was typically group instruction. A team of research assistants recorded the frequency of off-task behaviors and frequency of teacher input to redirect for each participating student. Observations were recorded in 4-min time frames on a coding sheet developed for this study. Video observations were not made in the two inclusion classrooms because of the presence of a large cohort of students who were not a part of the study and whose permission and consent were not given.

Procedures

Participating classroom teachers assigned to the intervention condition (1) received a 2.5-hr inservice training by Anne Buckley-Reen, who developed the program; (2) received the GRTL program DVD, instructional materials, and yoga mats necessary to begin the program; (3) were asked to complete the ABC–Community on their students; and (4) were supplied with video cameras and asked to tape their first structured group activity of the day for 2–3

days. The control condition teachers were contacted and asked to fill out the ABC–Community on their students and videotape their first structured activity of the day for 2–3 days in the pretest phase. Research assistants contacted parents in both groups and completed the VABS–II and the ABC–Community before the start of intervention. All sessions were implemented daily by the classroom teacher; Buckley-Reen provided weekly monitoring and consultation.

Intervention

The GRTL program was implemented every school day for a period of 16 wk. Before the daily commencement of the GRTL program, students assisted in getting the room ready, including moving desks, putting yoga mats on the floor, and placing a large stop sign on the classroom door so other staff did not interrupt the session. All teachers, assistants, and paraprofessionals participated either on a yoga mat or seated in a chair. The DVD was placed in a player and projected onto a screen or television monitor in view of all students. The occupational therapist modeled the program on the DVD, providing visual and verbal cues. The same DVD was used daily.

The GRTL program started with an initial period of establishing a quiet state, including all classroom staff, who were asked to be silent throughout the program, thus reducing extraneous distractions and contributing to the state of calm in the classroom. The program itself began with breathing exercises (pranayamas), physical postures and exercises (asanas), deep relaxation (yoga nidra), and chanting (kirtan). Postures were in a developmental sequence, and each pose was repeated twice. Repetition of each pose supported participation among students who might be slow to initiate or have difficulty with ideation by providing added time and modeling. The chanting was done in a call-and-response format requiring back-and-forth communication. This routine was done every morning for approximately 15–20 min. The control group participated in the standard morning activity, which consisted of getting the materials and room ready and having a morning meeting–type group activity, which may or may not have included physical exercise.

Fidelity of Implementation

We assessed fidelity of implementation using a checklist that included a 16-point scale in five categories: (1) classroom environment, (2) classroom organization and setup, (3) program implementation by the teacher, (4) DVD routine and student support, and (5) GRTL program conclusion. A score of 12–16 points indicates good program implementation. The first and third authors (Koenig and Garg) assessed fidelity of implementation using the

checklist and videotaped sessions to reach 80% agreement on the GRTL categories. Raters achieved 100% agreement on two independent samples. Direct classroom observation in all four intervention classrooms was then rated for fidelity, and all classes scored within the good implementation range.

Data Collection

Because of the nature of intervention, teachers were not blinded to condition when they completed pretest and posttest ratings on the ABC–Community. Baseline data were collected for the video observations before intervention, and data were then collected for the postintervention period. Video raters achieved 85% agreement on all frequency counts. Video raters were not blinded to condition but were not involved in any aspects of intervention implementation.

Data Analysis

We analyzed all data with SPSS Version 18 (SPSS, Inc., Chicago). Demographic information was collected, and descriptive statistics, including a mean difference score (d score = posttest score – pretest score), were calculated for each outcome variable. We conducted an analysis of variance to compare and determine the differences between groups on the ABC–Community and video observations with effect sizes reported. Significance level was set at .05.

Results

We recruited eight classes with 6 children per class for a potential initial pool of 48 children. One class in the intervention condition had a roster of 7 children, for a total pool of 25 children in the intervention group and 24 children in the control group. One student in the intervention group transferred to another school shortly after the GRTL program began, and the parents of 2 students in the control condition refused to give consent, yielding 24 participants in the intervention group and 22 participants in the control group. In both the intervention and the control conditions, three classes were classified as self-contained autistic support classrooms, and one class in each condition was a partial inclusion or integrated class whose students spent time in regular education classrooms.

Table 1 shows the descriptive statistics and group differences (yoga intervention group vs. control group) in age, sex, baseline scores on the ABC–Community, and adaptive behavior scores as measured by the VABS–II. When comparing the two groups, we found no significant differences in age, sex, ethnicity, and VABS–II scores. Groups were also comparable on pretest measures of the

Table 1. Demographic and Baseline Data for Intervention and Control Groups

Characteristic	Intervention (<i>n</i> = 24)	Control (<i>n</i> = 22)	<i>p</i>
Gender			
Male	19	18	
Female	5	4	
Mean age	9 yr, 7 mo	8 yr, 7 mo	
Ethnicity, %			
African American	50	41	
Hispanic	37.5	32	
White	12.5	9	
Asian	0	18	
VABS–II, <i>M</i> (<i>SD</i>)			
Communication	64.95 (14.50)	66.53 (15.16)	.748
ADLs	69.65 (15.89)	72.88 (17.99)	.565
Socialization	62.05 (16.41)	66.88 (14.24)	.350
Adaptive Behavior	64.90 (14.90)	66.88 (13.36)	.675
Teacher ABC–Community, <i>M</i> (<i>SD</i>)			
I	10.36 (9.92)	10.91 (9.85)	.732
II	15.72 (12.10)	10.48 (8.44)	.091
III	5.96 (6.18)	3.70 (3.17)	.126
IV	15.28 (10.49)	13.96 (7.95)	.659
V	2.92 (3.68)	1.87 (2.89)	.250
Total	50.24 (34.98)	40.91 (25.36)	.251
Parent ABC–Community, <i>M</i> (<i>SD</i>)			
I	9.67 (10.58)	7.79 (9.36)	.618
II	8.87 (9.36)	6.36 (7.64)	.438
III	2.60 (3.58)	3.21 (4.80)	.699
IV	14.00 (14.21)	10.21 (12.05)	.454
V	3.27 (3.71)	1.79 (3.06)	.254
Total ^a	49.00 (27.81)	29.80 (32.99)	.415

Note. Nonparametric tests and analysis of variance testing showed that the intervention and control groups were not significantly different on gender, age, and functional skill level as measured by the VABS–II. We found no significant differences on pretest measures, including teacher and parent ratings on the ABC–Community. ABC–Community = Aberrant Behavior Checklist–Community; ADLs = activities of daily living; I = Irritability, Agitation, Crying; II = Lethargy, Social Withdrawal; III = Stereotypic Behavior; IV = Hyperactivity, Noncompliance; V = Inappropriate Speech; *M* = mean; *SD* = standard deviation; VABS–II = Vineland Adaptive Behavior Scales–II. ^aABC subscales were totaled to yield a total score indicative of overall behavioral issues.

ABC–Community as completed by the teachers and parents, with no significant differences in ratings.

Table 2 shows the group differences in maladaptive behavior as measured by an analysis of variance in the pretest–posttest change scores on the ABC–Community. Students who participated in the GRTL program showed significant differences ($F[1, 44] = 5.079, p = .029$) in total ABC–Community score compared with students in the control condition. Ferguson (2009) outlined a recommended minimum effect for practically significant effects for social science data with a Cohen's *d* value of 0.41, with 1.15 considered a moderate effect. We found

a moderate effect ($F[1,44] = 5.079, p = .029$, Cohen's $d = 1.19$) for the total behavior scores on the teacher ratings of the ABC–Community and a small effect for the Irritability/Agitation/Crying subscale ($F[1, 44] = 3.89, p = .05$, Cohen's $d = 0.59$). The Lethargy/Social Withdrawal ($F[1, 44] = 3.064, p = .087$, Cohen's $d = 0.53$) and Hyperactivity/Noncompliance ($F[1, 44] = 3.34, p = .074$, Cohen's $d = 0.55$) subscales approached significance and did reach the criteria for a practically significant effect size. The Stereotypic Behavior and Inappropriate Speech subscales did not demonstrate significant changes in the intervention group. The students in the control group did not display any significant reductions in maladaptive behavior as measured by the ABC–Community and actually had scores that tended to either stay the same or increase, which is indicative of more negative behavior, with the exception of the Lethargy/Social Withdrawal subscale.

On the ABC–Community, 18 of 24 parents or guardians (75%) in the intervention group returned the ABC–Community checklist and 17 of 22 parents or guardians (77%) in the control group returned the checklist. Table 3 presents the results from this smaller subset of parents. We found no significant differences in parent ratings of behavior on the ABC–Community, and behavior tended to slightly increase on most of subscales; however, the intervention group had a lower mean change (mean = 1.65, standard deviation = 2.01) in maladaptive behavior (indicating less severe behaviors) than the control group (mean = 4.67, standard deviation = 5.01), indicating that the students in the control group were rated as more challenging by their parents after the 16-wk intervention period. We should also note that parents' ratings of students' behavior had a tendency to be lower, and more positive, than teachers' ratings of problematic behavior.

Video observations were coded, and frequency counts of off-task behavior and teacher redirection during 4-min segments were recorded for students in the self-contained classrooms only ($n = 6$). Individual student observations were summed for a frequency score for the total class. An analysis of variance did not yield significant group differences, but the number of off-task behaviors dropped during the first structured activity for both the intervention group (pretest = 13, posttest = 6) and the control group (pretest = 14, posttest = 4), as did the need for teacher redirection in the intervention group (pretest = 5 posttest = 3) and control group (pretest = 10, posttest = 5). All classrooms showed improvement in classroom management over 16 wk as measured by off-task behaviors and teacher redirection.

Table 2. Comparison of the Difference in Challenging Behaviors Between the Intervention and Control Groups, as Rated by Classroom Teachers

Teacher ABC–Community	Intervention Group (<i>n</i> = 24)			Control Group (<i>n</i> = 22)			<i>p</i>	Cohen's <i>d</i>
	Pretest	Posttest	<i>d</i> ^a	Pretest	Posttest	<i>d</i> ^a		
I	9.88	7.88	−2.00	11.41	14.05	2.57	0.050	0.59
II	15.83	10.88	−4.44	10.68	9.55	−0.93	.087	0.53
III	6.08	4.33	−1.75	3.77	4.55	0.88	0.128	0.47
IV	15.17	12.17	−3.00	13.86	15.36	1.50	0.074	0.55
V	3.00	1.96	−1.04	1.95	2.00	0.05	0.254	0.35
Total	49.96	37.21	−12.75	41.68	45.50	3.82	0.029	1.19

Note. ABC–Community = Aberrant Behavior Checklist–Community; I = Irritability, Agitation, Crying; II = Lethargy, Social Withdrawal; III = Stereotypic Behavior; IV = Hyperactivity, Noncompliance; V = Inappropriate Speech.

^a*d* is the calculated mean difference score: $d = (\text{posttest score} - \text{pretest score})$. Higher numbers on the ABC–Community are indicative of more behavioral problems, so a reduction in score yielding a negative *d* mean difference score indicates a reduction in behavioral issues as rated by the ABC–Community.

Discussion

Yoga provides multimodal learning for students with disabilities. It is ideal for visual learners, especially for students with ASD, because teachers position themselves at the students' eye level, using their body as a visual tool (Goldberg, 2004). The GRTL program also uses visual modeling in the form of the instructional materials projected for the students to watch during the program. The program was developed by an occupational therapist and, with training and monitoring, can be used by classroom personnel as part of their daily routine or preparatory curriculum to get their students "ready to learn."

The children in the study had an average score of 62–72 on all the VABS–II subscales, which would put them in a lower range of functioning, yet they were able to participate and learn all aspects of the yoga program and were either independent in the program or required minimal verbal or physical prompts by the end of 16 wk. We found that teachers' ratings of students who participated in the yoga intervention showed improved behavior compared with teachers' ratings of students who engaged in their daily morning routines. These findings are in line with those of previous studies that showed the impact of

yoga on behavior (Galantino et al., 2008; Harrison et al., 2004; Jensen & Kenny, 2004), but they have been extended for comparison with a control group and use of a manualized intervention. The intervention had a moderate effect (Cohen's $d = 1.19$) on total behavior scores on the ABC–Community on the basis of teacher ratings.

Although teachers were not blind to the intervention, and therefore results may be subject to bias, this study does demonstrate that a psychometrically valid instrument used with the population with ASD can detect changes in the intervention group that are relevant to functional performance in the classroom. The children in the intervention group displayed significantly less irritable behavior and changes in lethargy and social withdrawal and hyperactivity and noncompliance that approached significance.

Peck et al. (2005) identified one issue with research on yoga-based programs that is often overlooked: the lack of intensity and duration of the intervention. Many studies have examined programs that offer yoga 1 or 2 times per week for a short duration. The GRTL program is offered daily and becomes a part of the classroom routine; moreover, it appears to be easy for teachers to implement, as noted by the high fidelity of implementation. The initial teacher training, monitoring, and support and manualized

Table 3. Comparison of the Difference Between the Intervention and Control Groups on Parent Ratings of Challenging Behaviors

Parent ABC–Community	Intervention Group (<i>n</i> = 18)			Control Group (<i>n</i> = 17)			<i>p</i>	Cohen's <i>d</i>
	Pretest	Posttest	<i>d</i> ^a	Pretest	Posttest	<i>d</i> ^a		
I	7.30	9.70	2.40	9.00	13.75	4.75	.528	.025
II	8.70	8.80	0.10	9.88	9.63	−0.25	.941	0.000
III	1.80	3.40	1.60	5.13	6.88	1.75	.940	0.000
IV	11.78	12.78	1.00	13.13	18.50	5.37	.380	0.052
V	3.50	3.10	−0.40	2.75	5.13	2.38	.085	0.175
Total	35.22	40.44	5.22	39.87	53.87	14.00	.564	0.023

Note. ABC–Community = Aberrant Behavior Checklist–Community; I = Irritability, Agitation, Crying; II = Lethargy, Social Withdrawal; III = Stereotypic Behavior; IV = Hyperactivity, Noncompliance; V = Inappropriate Speech.

^a*d* is the calculated mean difference score: $d = (\text{posttest score} - \text{pretest score})$. Higher numbers on the ABC–Community are indicative of more behavioral problems, so a reduction in score yielding a negative *d* mean difference score indicates a reduction in behavioral issues as rated by the ABC–Community.

materials supported the ease with which teachers can implement the program with their students. The GRTL program appears to have social validity as well, because teacher feedback forms indicated high satisfaction with use of the program and indicated that the daily routine improved classroom functioning.

We found no significant changes in parent ratings of behaviors on the ABC–Community. Similar to Khalsa et al.’s (2011) findings, the GRTL program appears to have had a preventive effect in that the posttest scores for the intervention group stayed the same or had minimal changes (mean = 1.65) compared with parent ratings of the control group, which showed mean changes that were indicative of an increase in maladaptive behaviors (mean = 4.67). Interesting to note is that although they were not statistically significant, parents’ ratings on all subscales at pretest were higher for the intervention group than for the control group (indicating more maladaptive behavior), but they were lower at posttest than those of the control group (indicating less maladaptive behavior). Parent ratings of children’s behavior were, on average, better than teacher ratings on the ABC–Community, which may be related to the lack of significant findings of overall change.

Limitations

We used a convenience sample of an intact group (classrooms) from a large urban school and did not use random sampling or sample size estimation. Classrooms that were selected by school administrators to participate in the study may have had inherent selection bias that may have affected the results. Raters were not blinded to condition, which may have contributed to bias in the study. Because only 77% of the parents in the intervention and control conditions completed the posttest ABC–Community, a response bias may have altered the results.

Implications for Occupational Therapy Practice

The results of this study have the following implications for occupational therapy practice:

- Occupational therapists can use yoga-based programs with a variety of school-based populations.
- Our study demonstrated that a manualized yoga program can have an impact on maladaptive behaviors rated by teachers as interfering with learning and classroom functioning.
- Occupational therapists can take the lead in bringing evidence-based yoga interventions into public school classrooms.
- These interventions are in line with Response-to-Intervention universal classroom programs and prepara-

tory activities that can be integrated into the school day.

Future Research

Future research should examine the effectiveness of the GRTL program in relation to academic outcomes and performance-based executive function tasks that assess attention and focus among students with ASD to see whether their improved classroom behavior affects educational performance. Direct observation of behaviors of children who attend inclusive classrooms after the GRTL program is recommended to assess the impact of the intervention in the regular education classroom.

Conclusion

In comparing students who received a daily 16-wk manualized yoga intervention with students who engaged in their standard morning routine, we found that the intervention group showed a reduction in behaviors that were identified as maladaptive by teachers, including irritability, lethargy, social withdrawal, hyperactivity, and noncompliance. Occupational therapists can bring evidence-based yoga programs to public school classrooms as a viable option for improving behavior. ▲

Acknowledgments

We acknowledge a New York University Steinhardt Goddard Fellowship Award for funding this project; Gary Hecht, Superintendent, and Barbara Joseph, Deputy Superintendent, District 75, New York City Department of Education, for their support and efforts on behalf of the Get Ready to Learn program; Rima Ritholtz, Principal; Elena Talamo, Assistant Principal; teachers, assistant teachers, and students in all participating classes at Public School 176X; and Sonia Sumar, mentor to Anne Buckley-Reen, and graduate students in the Department of Occupational Therapy, New York University, including Dinamarie Raimondi, Ilana Rothbein, Bruria Sharbat, Lorraine Venice C. Ocampo Tan, Radhika Chintakrindi, and Lydia Alexander.

References

- Aman, M. G., & Singh, N. N. (1994). *Aberrant Behavior Checklist–Community supplementary manual*. East Aurora, NY: Slosson Educational.
- American Occupational Therapy Association. (2005). Complementary and alternative medicine (CAM) position paper. *American Journal of Occupational Therapy, 59*, 653–655. <http://dx.doi.org/10.5014/ajot.59.6.653>
- Barnes, P. M., Bloom, B., & Nahin, R. (2008, December). *Complementary and alternative medicine use among adults*

- and children: United States, 2007 (CDC National Health Statistics Report No. 12). Hyattsville, MD: National Center for Health Statistics.
- Brinkley, J., Nations, L., Abramson, R. K., Hall, A., Wright, H. H., Gabriels, R., et al. (2007). Factor analysis of the Aberrant Behavior Checklist in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *37*, 1949–1959. <http://dx.doi.org/10.1007/s10803-006-0327-3>
- Buckley-Reen, A. (2009). *Get ready to learn*. New York: New York City Department of Education.
- Centers for Disease Control and Prevention. (2009). Prevalence of autism spectrum disorders—Autism and Developmental Disabilities Monitoring Network, United States, 2006. *MMWR*, *58*(SS10), 1–20.
- Centers for Disease Control and Prevention. (2012). Prevalence of autism spectrum disorders—Autism and Developmental Disabilities Monitoring Network, United States, 2008. *MMWR*, *61*(SS3), 1–19.
- Chan, A. S., Cheung, M., & Sze, S. L. (2008). Effect of mind/body training on children with behavioral and learning problems: A randomized controlled study. In B. N. DeLuca (Ed.), *Mind-body and relaxation research focus* (pp. 165–193). Hauppauge, NY: Nova Science. Retrieved from www.cuhkinrc.com/attachments/File/Ch_8-Chan-PC.pdf
- Chong, C. S. M., Tsunaka, M., Tsang, H. W. H., Chan, E. P., & Cheung, W. M. (2011). Effect of yoga on stress management in healthy adults: A systematic review. *Journal of Alternative Therapies*, *17*, 32–38. <http://dx.doi.org/10.1089/act.2011.17108>
- Dawson, G. (2010). Commentary: The changing face of autism requires rethinking policy needs. *Social Policy Report*, *24*, 22–23.
- Ehleringer, J. (2010). Yoga for children on the autism spectrum. *International Journal of Yoga Therapy*, *20*, 131–139.
- Ferguson, C. J. (2009). An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice*, *40*, 532–538. <http://dx.doi.org/10.1037/a0015808>
- Field, T. (2011). Yoga clinical research review. *Complementary Therapies in Clinical Practice*, *17*, 1–8. <http://dx.doi.org/10.1016/j.ctcp.2010.09.007>
- Galantino, M. L., Galbavy, R., & Quinn, L. (2008). Therapeutic effects of yoga for children: A systematic review of the literature. *Pediatric Physical Therapy*, *20*, 66–80. <http://dx.doi.org/10.1097/PEP.0b013e31815f1208>
- Goldberg, L. (2004). Creative relaxation: A yoga-based program for regular and exceptional student education. *International Journal of Yoga Therapy*, *14*, 68–78. Retrieved from www.relaxationnow.net/articles/exceptionaled.html
- Harrison, L. J., Manocha, R., & Rubia, K. (2004). Sahaja yoga meditation as a family treatment programme for children with attention deficit–hyperactivity disorder. *Clinical Child Psychology and Psychiatry*, *9*, 479–497. <http://dx.doi.org/10.1177/135910450404046155>
- Individuals With Disabilities Education Act of 1997, Pub. L. 105–117.
- Individuals With Disabilities Education Improvement Act of 2004, Pub. L. 108–446, 20 U.S.C. § 1400 *et seq.*
- Jensen, P. S., & Kenny, D. T. (2004). The effects of yoga on the attention and behavior of boys with attention-deficit/hyperactivity disorder (ADHD). *Journal of Attention Disorders*, *7*, 205–216. <http://dx.doi.org/10.1177/108705470400700403>
- Kenny, M. (2002). Integrated movement therapy: Yoga-based therapy as a viable and effective intervention for autism spectrum and related disorders. *International Journal of Yoga Therapy*, *12*, 71–79.
- Khalsa, S. B. S., Hickey-Schultz, L., Cohen, D., Steiner, N., & Cope, S. (2011). Evaluation of the mental health benefits of yoga in a secondary school: A preliminary randomized controlled trial. *Journal of Behavioral Health Services Research*, <http://dx.doi.org/10.1007/s11414-011-9249-8>
- Klatt, M. (2009). Integrating yoga, meditation, and occupational therapy for inner-city children. *Explore: The Journal of Science and Healing*, *5*, 152–153. <http://dx.doi.org/10.1016/j.explore.2009.03.026>
- Krisanaprakornkit, T., Krisanaprakornkit, W., Piyavhatkul, N., & Laopaiboon, M. (2006). Meditation therapy for anxiety disorders. *Cochrane Database of Systematic Reviews*, 2006, CD004998. <http://dx.doi.org/10.1002/14651858.CD004998.pub.2>
- Krisanaprakornkit, T., Ngamjarus, C., Witoonchart, C., & Piyavhatkul, N. (2010). Meditation therapies for attention-deficit/hyperactivity disorder (ADHD). *Cochrane Database of Systematic Reviews*, 2010, CD006507. <http://dx.doi.org/10.1002/14651858.CD006507.pub.2>
- Lin, K., Hu, Y., Chang, K., Lin, H., & Tsauo, J. (2011). Effects of yoga on psychological health, quality of life, and physical health of patients with cancer: A meta-analysis. *Evidence-Based Complementary and Alternative Medicine*. Vol. 2011, Article ID 659876. <http://dx.doi.org/10.1155/2011/659876>
- McCracken, J., McGough, J., Shah, B., Cronin, P., Hong, D., Aman, M. G., et al. Research Units on Pediatric Psychopharmacology Autism Network. (2002). Risperidone in children with autism and serious behavior problems. *New England Journal of Medicine*, *347*, 314–321. <http://dx.doi.org/10.1056/NEJMoa013171>
- National Center for Complementary and Alternative Medicine. (2011). *Yoga for health: An introduction*. Retrieved July 25, 2011, from <http://nccam.nih.gov/health/yoga/introduction.htm>
- Pandina, G. J., Bossie, C. A., Youssef, E., Zhu, Y., & Dunbar, F. (2007). Risperidone improves behavioral symptoms in children with autism in a randomized, double-blind, placebo-controlled trial. *Journal of Autism and Developmental Disorders*, *37*, 367–373. <http://dx.doi.org/10.1007/s10803-006-0234-7>
- Peck, H. L., Kehle, T. J., Bray, M. A., & Theodore, L. A. (2005). Yoga as an intervention for children with attention problems. *School Psychology Review*, *34*, 415–424.
- Powell, L., Gilchrist, M., & Stapley, J. (2008). A journey of self-discovery: An intervention involving massage, yoga and relaxation for children with emotional and behavioral difficulties attending primary schools. *European Journal of Special Needs Education*, *23*, 403–412. <http://dx.doi.org/10.1080/08856250802387398>

- Sarris, J., Camfield, D., & Berk, M. (2011). Complementary medicine, self-help, and lifestyle interventions for obsessive compulsive disorder (OCD) and the OCD spectrum: A systematic review. *Journal of Affective Disorders*. Advance online publication. <http://dx.doi.org/10.1016/j.jad.2011.04.051>
- Sparrow, S. S., Cicchetti, D. V., & Balla, D. A. (2005). *Vineland Adaptive Behavior Scales* (2nd ed.). Circle Pines, MN: AGS.
- Uma, K., Nagendra, H. R., Nagarathna, R., Vaidehi, S., & Seethalakshmi, R. (1989). The integrated approach of yoga: A therapeutic tool for mentally retarded children: A one-year controlled study. *Journal of Mental Deficiency Research*, 33, 415–421. Retrieved from www.healthandyoga.com/html/research_papers/iaoy/om.asp
- Vancampfort, D., De Hert, M., Knapen, J., Wampers, M., Demunter, H., Deckx, S., et al. (2011). State anxiety, psychological stress and positive well-being responses to yoga and aerobic exercise in people with schizophrenia: A pilot study. *Disability and Rehabilitation*, 33, 684–689. <http://dx.doi.org/10.3109/09638288.2010.509458>