



Published in final edited form as:

Focus Altern Complement Ther. 2014 September 1; 19(3): 148–155. doi:10.1111/ftc.12130.

A Randomised Controlled Trial Comparing the Impact of Yoga and Physical Education on the Emotional and Behavioural Functioning of Middle School Children

Sara C. Haden¹, Leslie Daly², and Marshall Hagins³

¹Department of Psychology, Long Island University

²Department of Psychology, Long Island University

³Department of Physical Therapy, Long Island University

Abstract

Background—Yoga programs geared for school children have become more widespread, but research regarding its impact on children is lacking. Several studies have reported positive outcomes, though there is a need for more randomised controlled trials.

Objectives—To determine the effects of yoga on children’s emotional and behavioural functioning when compared with physical education (PE) classes.

Methods—Thirty middle school children were randomised to participate in either a school-based Ashtanga-informed yoga or PE class three times a week for 12 weeks. Emotional (i.e. affect, self-perceptions) and behavioural (i.e. internalising and externalising problems, aggression) functioning were measured pre and post-intervention.

Results—There were no significant changes between groups in self-reported positive affect, global self-worth, aggression indices or parent reports of their children’s externalising and internalising problems. However, negative affect increased for those children participating in yoga when compared to the PE program.

Conclusions—In general, findings suggest that yoga and PE classes do not differentially impact on middle school children’s emotional and behavioural functioning. However, children reported experiencing increased negative emotions after receiving yoga while children in the PE group reported a decrease in these feelings. Implications of these results and potential directions for future research on children’s yoga are discussed.

Keywords

Yoga; Children; Emotions; Psychology; RCT

Disclosures

No competing financial interests exist.

Introduction

Today's youth experience a variety of stressors from family interpersonal problems, peer relationship troubles and academic concerns. Research tends to focus on extraordinary stressors experienced by children; however, even less severe forms of stress are likely to have negative impacts on healthy emotional, behavioural and academic functioning. In fact, youth who experience conflicts with friends and family are more likely to report sadness, act out, feel less socially competent, and have poorer academic functioning than those who deny interpersonal stressors.¹ It has also been shown that early adolescents who self-regulate have a more positive development and are less likely to engage in problem behaviours than youth who have difficulties regulating their experiences.^{3,4}

Programs that provide exercise, relaxation and stress management skills have been shown to lead to improved self-regulation in children.⁵ While exercise alone has proven to be effective in improving wellbeing, studies examining the practice of yoga with school children have also demonstrated beneficial results relative to stress management.^{6,7}

Yoga geared specifically toward children in schools has become more common, with multiple programs training teachers in the United States.⁹ Possible reasons for this increase in yoga practice among children may be that it combines physical activity, breathing exercises, meditation and relaxation, has limited space and equipment requirements, is focused on individual progression rather than competition, and is explicitly aimed at the control of mental processes related to perception and the control of stress.

Yoga has been suggested to improve physical ability, reduce stress, strengthen cognitive abilities, as well as decrease aggression, negativity, fear and feelings of helplessness.¹⁵ Some studies have shown that yoga can improve motor performance such as steadiness of execution of a physical task¹⁰, and improve objective measures of the autonomic nervous system known to be associated with the management of fear and anxiety.¹¹ Yoga practice (or practices that include a component of yoga) has helped children remain calm and focused,¹² reduced absenteeism from the classroom,¹³ and even increased performance on the planning of cognitive tasks.¹⁴ Although these studies all suggest positive outcomes from youth participation in yoga, the number of studies is low and the methodology weak, and consequently, the findings can be considered preliminary. In particular, there is a need for randomised controlled studies to examine the effects of yoga on children's emotional and behavioural functioning relative to stress.

The goal of this project was to use a randomised controlled trial design to determine the effects of yoga on children's emotional and behavioural functioning using a comparison group consisting of physical education (PE) classes. It was hypothesised that youth in the yoga group would demonstrate greater positive affectivity and fewer emotional and behavioural functioning problems compared to youth in the PE group.

Participants and Methods

Institutional review board approval was granted from both the New York City Department of Education (DOE) and the Long Island University prior to the recruitment of participants.

Enrolment was conducted by the primary investigators and graduate research assistant. Parents of all sixth grade students were informed of the study via flyers, emails and a presentation by the investigators at a student orientation ($N = 66$). The final sample consisted of 30 students enrolled in the sixth grade at a New York City Public School who provided assent to participate and whose parents consented to their participation. Of the 30 students enrolled, half of the participants ($n = 15$) were randomly assigned to the yoga program, and the other half randomly assigned to the general PE course¹. None of the participants withdrew after the intervention. Allocation to intervention groups was randomly generated by having a research assistant who was not involved in the evaluations pull names out of a hat. No random numbers were generated; rather, each subsequent name was assigned to a different intervention. Group assignment was then conveyed to the DOE teacher by the research assistant. Those administering the outcomes measures were blinded to group assignment; however, blinding success was not formally evaluated. Data were collected during the spring of 2013.

Outcome measures

Demographic Information—Parents were asked to complete a demographic information sheet created by the researchers to obtain information about the child and the child’s family. Table 1 provides a summary of the demographic information by group. Most participants were 11 years old, white, and reported having a biological mother and father as the primary parental figures. For the majority of participants, both parental figures worked, with the estimated family income falling into either the \$10,000 to \$75,000 range or the over \$125,000 range.

Participants were also screened for any medical conditions, including heart problems, low/high blood pressure, fainting spells, asthma, diabetes, neurological disorders, hearing loss/damage, and mental retardation. Asthma was the only medical condition reported.

Positive and Negative Affect—In order to measure the child’s degree of positive and negative affect, the Positive and Negative Affect Scales [PANAS]¹⁶ were completed at both time 1 (pre-intervention) and time 2 (post-intervention). Participants were asked to rate 30 words (15 positive and 15 negative affect words) based on how much they felt each emotion over the past two weeks, ranging from “very slightly/not at all” (1) to “extremely” (5). Mean values were computed for each scale. The PANAS demonstrates strong psychometric properties including convergent and divergent validity with child depression and anxiety measures.^{16,17}

Parent-Reported Child Problems—Participants’ parents were asked to complete the Child Behaviour Check List [CBCL],¹⁸ which assesses emotional and behavioural problems in children. It has strong psychometric properties and, among broadband child behaviour rating scales, is considered the gold standard.¹⁹ The measure consists of 120 items regarding the child’s functioning now or over the past six months that are answered on a three-point scale (0 = not at all true, 1 = somewhat true or sometimes true, and 2 = very true or often

¹Originally 31 students enrolled. One subject dropped out after the pre-intervention measures were completed but prior to the intervention and was therefore not included in any of the analyses.

true). The measure is consistent with child disorder symptoms reflected in the Diagnostic and Statistical Manual of Mental Disorders [DSM-IV].²⁰ The present study focused on internalising (e.g. Anxious/Depressed, Attention Problems, Somatic Complaints) and externalising Problems (e.g. Aggressive Behaviour, Delinquent Rule-Breaking Behaviour, Social Problems). The Internalising Problems Scale is computed by collapsing t-scores for boys and girls on symptoms of anxiety, depression, withdrawal and somatic symptoms. The Externalising Problems Scale is computed by collapsing t-scores for boys and girls on symptoms of rule-breaking and aggressive behaviour.

Self-Reported Aggressive Behaviour—Participants also completed a self-reported measure about their aggressive behaviours using the Revised Parent Rating Scale for Reactive and Proactive Aggression [R-PRA].²¹ The R-PRA taps both reactive (RA; e.g. Gets mad when he or she does not get their own way) and proactive aggressive functions (PA; e.g. Changes the rules of the game to help him or her win). The child indicates how often he/she engages in each behaviour from never (1), sometimes (2), to very often (3). Past research has documented strong internal reliability and validity in child samples as well as cross-informant agreement between parents and children.²²

Child Self-Worth—The Self Perception Profile for Children [SPPC]²³ is a 36-item measure completed by the child. It consists of six sub-scales tapping five domains: Scholastic Competence, Social Acceptance, Athletic Competence, Physical Appearance, Behavioural Conduct, and a Global Self-Worth Scale. The questions have a “structured alternative format”, which presents the child with two descriptions and asks the child to first choose which one is most like him or her, and then asks whether the statement is “sort of true for me” or “really true for me”. The Global Self-Worth Scale (GSWS) was computed for the present study. The SPPC is the most widely used measure assessing youth self-esteem and has demonstrated strong internal consistency and test-retest reliability in child samples,²⁴ as well as discriminant validity with psychopathology.²⁵

Student Engagement—A brief measure was created by the researchers to assess the students’ level of engagement in either the PE or yoga program in an effort to tap active engagement with the intervention. The measure included descriptions of a minimally, moderately and maximally engaged student. The instructor was asked to observe and assign which description best matched each student at two times points during the intervention.

Interventions

Participants were randomly assigned to a 12-week yoga or PE program. Classes met for one and a half hours, three times a week. Two teachers who had completed a 200-hour certification program and had used the following curriculum for at least 3 years conducted the yoga classes.

The yoga intervention is considered an Ashtanga-informed yoga practice, consisting of physical postures, breathing practices and relaxation techniques in addition to short meditation practices and class rules that reflected the moral and ethical components of yoga. Specifically, each of the classes consisted of: 1) an opening ritual (centering, conscious

breathing) for 3–7 minutes; 2) 30-minute asana practice (standing for 15 minutes, seated for 5 minutes, backbends/inversions for 5–10 minutes) with each pose held for a count of five, or occasionally taught as a “vinyasa flow” linking all the poses together for one breath; 3) brief seated meditation for 2 to 5 minutes; and 4) closing ritual of guided relaxation in Savasana (body scan) for 4 minutes. Homework on a specific aspect of the practice was encouraged each week. All classes integrated the 8 limbs of yoga but in an indirect and varied manner (no required memorisation of Sanskrit terms). See Hagins, Haden and Daly (2013)²⁶ for a thorough description of the yoga intervention. Home practice was not prescribed but was encouraged and included the following options: 1) choose one pose to practice, 2) practice Sury Namaskar A every morning, 3) develop a sequence of 5 poses in a vinyasa style, 4) practice a pose the participant disliked the most, 5) invent a new yoga pose, and 6) try to teach someone at home what you learned in class. The yoga curriculum was created in accordance with the New York State and National Physical Education Standards.

The PE curriculum included regular physical education classes offered by the school. The PE class used common games such as soccer and volleyball, as well as an indoor walking program to encourage moderate levels of physical activity and to provide an opportunity for social interaction among students. Approximately 75% of the total time was spent actively participating in games or walking, while approximately 25% was spent being physically inactive during attendance and instruction on rules of the various games or related instruction.

Participants were first contacted by the research team at their school and parents were provided with information about the study and a consent form. Pre-testing occurred one week prior to group assignment, while post-testing occurred approximately one week after the end of the intervention programs.

In the testing session, trained research assistants met individually with children to complete all of the measures in one session lasting approximately 45 minutes. The children also completed a stressor task and physiological measurements were recorded.²⁶ The focus of the present study is on the questionnaire data. See Hagins, Haden and Daly (2013)²⁶ for a more thorough description of the study procedures.

Data Analysis Plan—Preliminary analyses computed the reliability of the scales at both time 1 and time 2. Student engagement and attendance were also analysed by group and time. Primary analyses tested the main hypothesis that children who participated in the yoga program would be better able to regulate stress, as demonstrated by reports of greater positive affect, less negativity, reduced aggression and fewer internalising and externalising problems than youth in the PE group at time 2 (post-intervention). All statistical analyses were conducted using IBM SPSS (v22.0).

Results

Preliminary Analyses

All outcome measures demonstrated adequate internal consistency at times 1 and 2, with Cronbach alpha values ranging from .68 to .95 across all measures. Prior to testing the main

hypotheses, differences between groups in attendance and demographic variables were analysed using ANOVA and chi-square as appropriate. There were no statistically significant differences between groups related to demographic variables (see Table 1). However, there was a statistically significant difference in attendance rates, such that there was greater attendance in the yoga classes compared to the PE classes.

Participants were also screened for any medical conditions, including heart problems, low/high blood pressure, fainting spells, asthma, diabetes, neurological disorders, hearing loss/damage and mental retardation. Parents did not report any of these conditions except for asthma ($n = 3, 17\%$). One participant was prescribed medication for their asthma.

Primary Analyses

A series of repeated measures analysis of variance (RM-ANOVA) tests were performed to test for within-subject by group interaction effects for positive and negative affect, global self-worth, self-reported aggression, and internalising and externalising problems. The between-subject variable was group assignment (PE or yoga group). The alpha level was set at .025 for all models. RM-ANOVA allowed assessment of changes in the variables from pre- to post-intervention, as well as by group assignment, and by time and group assignment.

There was no significant interaction effect between time and condition for positive affect ($F(1,28) = .04, p = .84, \eta^2 = .00$), global self-worth, ($F(1,25) = .82, p = .37, \eta^2 = .02$), self-reported reactive aggression ($F(1,28) = .92, p = .35, \eta^2 = .04$), proactive aggression ($F(1,28) = .85, p = .36, \eta^2 = .05$), or externalising ($F(1,17) = .20, p = .66, \eta^2 = .02$) and internalising problems ($F(1,15) = .41, p = .53, \eta^2 = .10$) (Table 2).

A significant interaction between time and group on negative affect emerged ($F(1,28) = 7.59, p < .01, \eta^2 = .21$). Simple effects tests for negative affect for time 1 and 2 were conducted but there was no main effect for group on negative affect at time 1 ($F(1,29) = 1.84, p = .19, \eta^2 = .06$) or time 2 ($F(1,24) = 1.20, p = .28, \eta^2 = .04$). However, inspection of the means revealed a crossover-effect, such that negative affect increased for the yoga condition and decreased for the PE condition. Specifically, negative affect at time 2 was greater for the yoga condition ($M = 24.27, SD = 1.94$) than the PE condition ($M = 21.27, SD = 1.94$), while at time 1 it was greater for the PE condition ($M = 24.20, SD = 1.91$) than the yoga condition ($M = 20.53, SD = 1.91$).

Discussion

Failure to find differences in middle school children's emotional and behavioural functioning was not expected. The findings suggest that yoga and PE do not differentially impact middle school children's functioning as measured by these domains. Several explanations are offered for this finding. First, exposure to a new discipline such as yoga may be challenging for children at this age, and therefore, may increase measures of stress in the short-term. In fact, several of the outcome measures showed a non-significant increase at time 2 for children in the yoga condition. Benavides and Caballerro (2009)²⁷ have shown that participants in yoga show increased self-worth but that this is dependent on one's confidence. Perhaps children did not feel confident participating in the yoga program and

this negatively impacted on their emotional and behavioural functioning, albeit non-significantly.

Second, the “dose” of yoga may not have been satisfactory. Streeter and colleagues (2010)²⁸ have suggested that the benefits of yoga are most evident when individuals are able to perform it daily. Students were only able to participate in yoga two or three times a week. Moreover, performing only two measurements at time 1 and 2 may not have been optimal. Perhaps the effects of yoga are time-limited when performed only a few times a week for 12 weeks, and changes in affect and self-perception may have only been evident immediately after the intervention.

Third, one of the outcomes of yoga practice may be greater self-awareness and mindfulness. These variables were not assessed in the current study. It might be argued that increased self-awareness may lead to increased reports of stress. For example, findings showed that children in the yoga classes reported increased negative feelings such as sadness and shame. While yoga has been associated with a decrease in negative affect in a previous study,²⁹ this was with an older sample and only after a single 90-minute session of Hatha yoga. In another study, Noggle and colleagues³⁰ reported a significant decrease in negative affect among a predominantly Caucasian sample of high school students (mean age 17 years) who participated in a PE class compared with students who completed a Kripalu-based yoga program two to three times a week for ten weeks. However, both of these studies assessed older samples and the yoga instruction was different. It could be argued that hypothesising that the “direction” would be more positive may not be the prediction to test. Increases in awareness included both awareness of negative and positive affect. Perhaps for this specific age group, children’s increased mindfulness due to the yoga intervention may have led to increased perceptions of negative emotions. White³¹ theorises, based on her findings with fourth and fifth grade girls who completed a mindfulness-based stress reduction program for one hour a week over the course of eight weeks, increasing awareness of stressors via a yoga-type practice can increase stress possibly as part of the developmental processes of younger children. Kokinakis³² reported similar results among ninth grade girls who participated in at least 13 classes of either PE or Kripalu Yoga curriculum. She found that negative affect only decreased for boys who completed the yoga program compared with those enrolled in the PE course. In light of these contradictory findings, future research would benefit from measuring intervening variables – mindfulness and body awareness – and examine how they, in turn, impact on emotional and behavioural functioning.

Lastly, several methodological shortcomings are worth mentioning. The small sample of children limits the generalisability of the findings. Moreover, the involvement of school personnel in the yoga class might have impacted the child’s performance. Overall, the sample of children were considered high functioning and did not endorse negative self-perceptions or behavioural problems at time 1. Perhaps significant changes would be more evident in a sample of children who report more difficulties at baseline – thereby increasing the possibility that a yoga program could lead to measurable positive changes. In addition, perhaps the yoga protocol was not balanced enough or did not incorporate other techniques that impact children’s psychosocial functioning more directly.

Conclusions

The current study employed a relatively rigorous study design to examine changes in behavioural and emotional functioning in middle school kids randomly assigned to either a PE or yoga program over 12 weeks. While the present findings did not support any significant effects of yoga, several limitations of the current study may have contributed to these findings: 1) inadequate sample size; 2) inadequate dose of the intervention; 3) failure to measure intervening variables such as mindfulness and body awareness that may partially explain changes in primary variables such as negative and positive affect; 4) inappropriate sample that may have potential floor and/or ceiling effects for the primary variables; and 5) failure to gain equivalent enthusiasm from school personnel for both arms of the study such that participants have equivalent expectations of benefit. Future studies will benefit from consideration of these limitations within the planning and implementation stages.

Acknowledgments

We would like to thank Rachel Goldstein, Cara Spitalewitz, David Mazer, Janae Johnson and Lainie Posecion for their assistance with data collection, and students from the Institute of Collaborative Education for their participation in this study.

Funding

This work was funded by the National Institute of General Medical Sciences [1SC3GM088049-01A1].

References

1. Clarke A. Coping with interpersonal stress and psychosocial health among children and adolescents: A meta-analysis. *J Youth Adolesc.* 2006; 35:11–24.
2. Dodge, K. The Development and Treatment of Childhood Aggression. Pepler, D.; Rubin, KH., editors. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1991. p. 201–218.
3. Gestdottir S, Lerner RM. Intentional self-regulation and positive youth development in early adolescence: Findings from the 4-H study of positive youth development. *Dev Psychol.* 2007; 43:508–521. [PubMed: 17352556]
4. Zimmerman SM, Phelps E, Lerner RM. Intentional self-regulation in early adolescence: Assessing the structure of selection, optimization, and compensation processes. *Eur J Dev Sci.* 2007; 1:271–298.
5. Hampel P, Meier M, Kummel U. School-based stress management training for adolescents: Longitudinal results from an experimental study. *J Youth Adolescence.* 2008; 37:1009–1024.
6. Ross A, Thomas S. The Health Benefits of Yoga and Exercise: A Review of Comparison Studies. *J Altern Complement Med.* 2010; 16:3–12. [PubMed: 20105062]
7. Streeter CC, et al. Effects of Yoga Versus Walking on Mood, Anxiety and Brain GABA levels: a randomized controlled MRS study. *J Altern Complement Med.* 2010; 16:1145–1152. [PubMed: 20722471]
8. Salmon P, Lush E, Jablonski M, et al. Yoga and Mindfulness: Clinical Aspects of an Ancient Mind/Body Practice. *Cogn Behav Pract.* 2009; 16:59–72.
9. Wenig, M.; Andrews, S. *YogaKids: Education the whole child through yoga.* New York, New York: Stewart, Tabori & Chang; 2003.
10. Telles S, Hanumanthaiah B, Nagarathna R, et al. Improvement in static motor performance following yogic training of school children. *Percept Mot Skills.* 1993; 76:1264–1266. [PubMed: 8337075]

11. Udupa K, Madanmohan, Bhavanani AB, Vijayalakshmi P, Krishnamurthy N. Effect of pranayam training on cardiac function in normal young volunteers. *Indian J Physiol Pharmacol.* 2003; 47:27–33. [PubMed: 12708121]
12. Telles S, Narendran S, Raghuraj P, et al. Comparison of changes in autonomic and respiratory parameters of girls after yoga and games at a community home. *Percept Mot Skills.* 1997; 84:251–257. [PubMed: 9132715]
13. Barnes VA, Bauza LB, Treiber FA. Impact of stress reduction on negative school behavior in adolescents. *Health and Quality of Life Outcomes.* 2003 Apr.1:10. [serial online]. <http://www.hqlo.com/content/1/1/10>. [PubMed: 12740037]
14. Manjunath NK, Telles S. Improved performance in the Tower of London test following yoga. *Indian J Physiol Pharmacol.* 2001; 45:351–354. [PubMed: 11881575]
15. Stueck M, Gloeckner N. Yoga for children in the mirror of the science: Working spectrum and practice fields of the Training of Relaxation with Elements of Yoga for Children. *Early Child Dev Care.* 2005; 175:371–377.
16. Laurent J, Catanzaro S, Joiner T, et al. A measure of positive and negative affect for children: Scale development and preliminary validation. *Psychol Assess.* 1999; 11:326–338.
17. Hughes AA, Kendall PC. Psychometric Properties of the Positive and Negative Affect Scale for Children (PANAS-C) in Children with Anxiety Disorders. *Child Psychiatry Hum Dev.* 2009; 40:343–352. [PubMed: 19142724]
18. Achenbach, TM.; Edelblock, C. *Manual for the Child Behavior Checklist and Revised Child Behavior Profile.* Queen City, Vermont: Queen City Publishers; 1983.
19. Leary, A.; Collett, BR.; Myers, KM. Rating Scales. In: Dulcan, M., editor. *Textbook of Child and Adolescent Psychiatry.* 4th edition. Washington, District of Columbia: American Psychiatric Publishing; 2010. p. 89-110.
20. American Psychiatric Association [APA]. *Diagnostic and statistical manual of mental health disorders.* 4th edition. Washington, District of Columbia: APA; 2000.
21. Brown K, Atkins MS, Osborne ML, et al. A revised teacher rating scale for reactive and proactive aggression. *J Abnorm Child Psychol.* 1996; 24:473–480. [PubMed: 8886943]
22. Ollendick TH, Jarrett MA, Wolff J, et al. Reactive and proactive aggression: Cross-informant agreement and the clinical utility of different informants. *J Psychopathol Behav Assess.* 2009; 31:51–59.
23. Harter, S. *Manual for the self-perception profile for children.* Denver, CO: University of Denver; 1985.
24. Granleese J, Joseph S. Further psychometric validation of the Self-Perception Profile for Children. *Pers Individ Dif.* 1994; 16:649–651.
25. Cole DA, Martin JM, Peeke LA, et al. Children's over- and underestimation of academic competence: A longitudinal study of gender differences, depression, and anxiety. *Child Dev.* 1999; 70:459–473. [PubMed: 10218266]
26. Hagins M, Haden SC, Daly L. A randomized controlled trial on the effects of yoga on stress reactivity in 6th grade students. *Evid Based Complement Altern Med.* 2013 Jan. [serial online]. <http://dx.doi.org/10.1155/2013/607134>.
27. Benavides S, Caballero J. Ashtanga yoga for children and adolescents for weight management and psychological well being: An uncontrolled open label pilot study. *Complement Ther Clin Pract.* 2009; 15:110–114. [PubMed: 19341991]
28. Streeter CC, Whitfield TH, Owen L, et al. Effects of yoga versus walking on mood, anxiety, and brain GABA levels: a randomized controlled MRS study. *J Altern Complement Med.* 2010; 16:1145–1152. [PubMed: 20722471]
29. West J, Otte C, Geher K, Johnson J, Mohr D. Effects of Hatha yoga and African dance on perceived stress, affect, and salivary cortisol. *Ann Behav Med.* 2004; 28:114–118. [PubMed: 15454358]
30. Noggle JJ, Steiner NJ, Minami T, Khalsa SB. Benefits of yoga for psychosocial well-being in a US high school curriculum: a preliminary randomized controlled trial. *J Dev Behav Pediatr.* 2012; 33:193–201. [PubMed: 22343481]

31. White LS. Reducing stress in school-age girls through mindful yoga. *J Pediatr Health Care*. 2012; 26:45–56. [PubMed: 22153143]
32. Kokinakis, LH. Yoga and adolescents: What do we know? The effect of yoga on adolescents' cognition and social-emotional development [dissertation]. Ann Arbor, Michigan: University of Michigan; 2011.

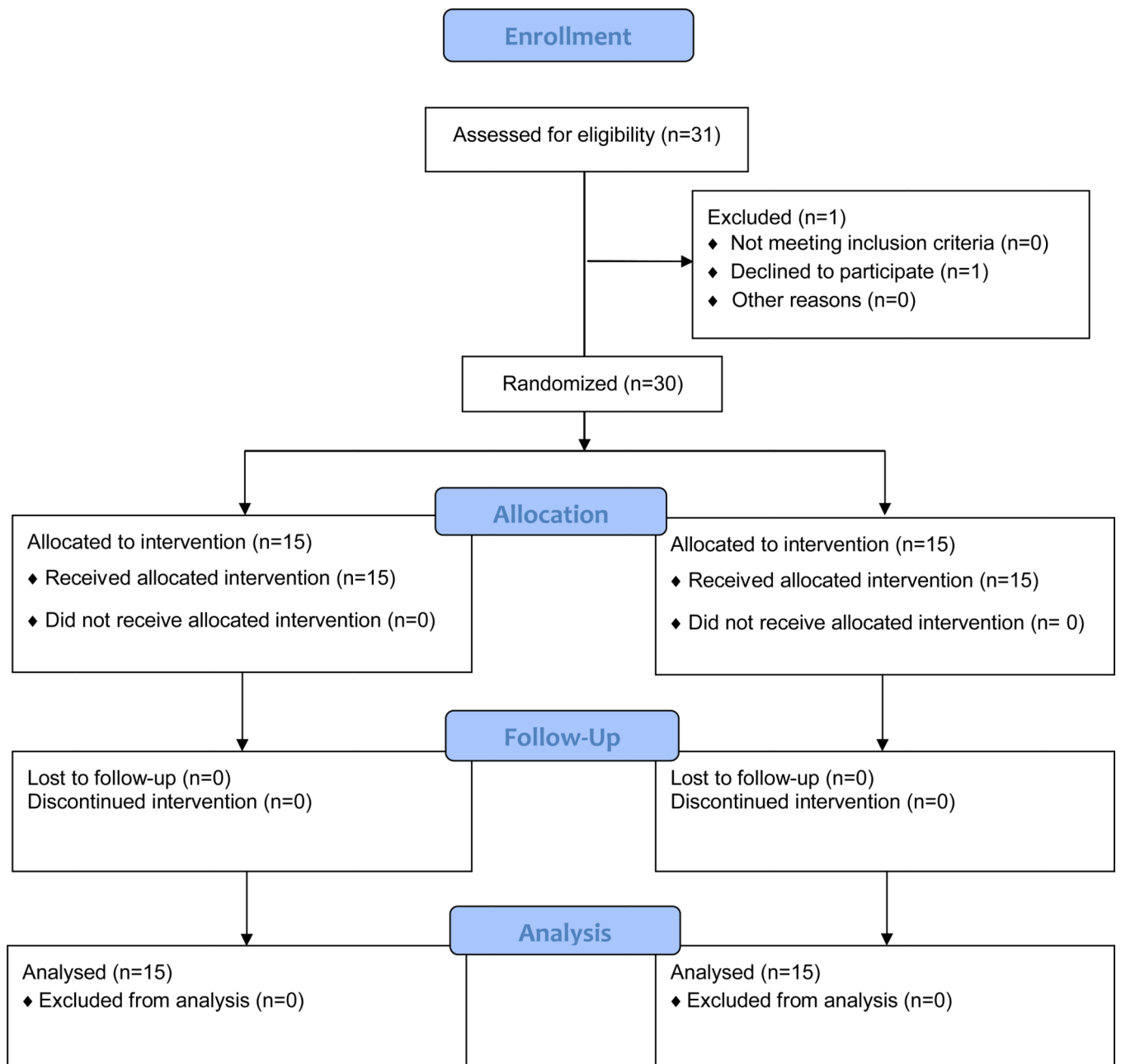


Figure 1.
CONSORT 2010 Flow Diagram

Table 1

Baseline characteristics of participants (N=30)

| | Yoga (n = 15) | PE (n = 15) | Test statistic |
|-----------------------|------------------|----------------|--|
| Gender | | | |
| Boys | 10 | 7 | $X^2 (1, N = 30) = 1.22, p = .46, \phi = .20$ |
| Girls | 5 | 8 | |
| Age | | | |
| 10 years | 3 | 9 | $X^2 (1, N = 24) = .25, p = .62, \phi = -.10$ |
| 11 years | 2 | 10 | |
| Race/Ethnicity | | | |
| White | 7 | 5 | $X^2 (4, N = 24) = 1.53, p = .82, \phi = .25$ |
| Black | 0 | 1 | |
| Asian | 1 | 1 | |
| Hispanic | 2 | 2 | |
| Other | 2 | 3 | |
| | | | |
| Primary Figure | | | |
| Mother | 2 | 10 | $X^2 (1, N = 24) = .00, p = .100, \phi = .00$ |
| Mother and Father | 2 | 10 | |
| Family Income | | | |
| \$10K–\$25K | 3 | 0 | $X^2 (8, N = 22) = 11.87, p = .16, \phi = .73$ |
| \$25K–\$50K | 1 | 0 | |
| \$50K–\$75K | 0 | 4 | |
| \$75K–\$100K | 2 | 1 | |
| \$100K–\$125K | 0 | 1 | |
| \$125K–\$150K | 0 | 1 | |
| \$150K–\$175K | 2 | 1 | |
| \$175K–\$200K | 0 | 1 | |
| \$200K+ | 3 | 2 | |

| | Yoga (n = 15) | PE (n = 15) | Test statistic |
|-------------------------------------|------------------|----------------|---|
| Class Attendance^a | 28.38 (.77) | 24.17 (6.58) | $F(1,29) = 5.29, p = .03, \eta^2 = .19$ |
| Engagement (T1)^b | 2.69 (.48) | 2.42 (.51) | $F(1,29) = 1.92, p = .18, \eta^2 = .08$ |
| Engagement (T2)^b | 2.62 (.51) | 2.67 (.49) | $F(1,29) = .07, p = .80, \eta^2 = .00$ |

T1 = Time 1; T2 = Time 2; PE = Physical education

^a Student engagement rated on a 3-point scale

^b Class attendance = number of classes attended.

Table 2

Means for study variables by treatment group (PE and Yoga) at Time 1 (Pre-Intervention) and Time 2 (Post-Intervention) (N=25)

| Variables | Yoga (n = 14) | | PE (n = 12) | |
|--------------------------|---------------|--------------|--------------|--------------|
| | Mean (SD) | | Mean (SD) | |
| | Time 1 | Time 2 | Time 1 | Time 2 |
| Positive Affect | 50.00(4.26) | 51.57 (3.46) | 47.33 (4.60) | 48.67 (3.74) |
| Negative Affect | 20.79 (1.86) | 24.93 (1.96) | 24.08 (2.01) | 21.58 (2.12) |
| Global Self-Worth | 20.39 (1.31) | 18.62 (1.39) | 19.50 (1.50) | 19.70 (1.58) |
| Reactive Agg. | 8.00 (.36) | 8.86 (.71) | 7.75 (.38) | 8.17 (.76) |
| Proactive Agg. | 12.29 (.43) | 13.71 (1.15) | 10.17 (.47) | 10.83 (1.24) |
| Externalizing | 45.00 (2.90) | 46.64 (2.72) | 45.67 (3.92) | 47.67 (3.68) |
| Internalizing | 48.00 (2.89) | 48.00 (3.13) | 44.75 (4.79) | 41.75 (5.19) |

Agg. = Aggression; PE = Physical education