



# Reducing Stress in School-age Girls Through Mindful Yoga

Laura Santangelo White, PhD, RN, CPNP

## ABSTRACT

**Introduction:** School-age children report much stress in their daily lives, which may lead to psychological and physical problems. Mindfulness-based Stress Reduction is a program of awareness-based practices effective with adults. The purpose of this study was to investigate the efficacy of mindfulness training through yoga with school-age girls to reduce perceived stress, enhance coping abilities, self-esteem, and self-regulation, and explore the relationship between the dose of the intervention and outcomes.

**Method:** Fourth- and fifth-grade girls were recruited from two public schools and randomly assigned to intervention and wait-list control groups. The intervention group met 1 hour a week for 8 weeks and completed 10 minutes of daily homework.

**Results:** Self-esteem and self-regulation increased in both groups. The intervention group was more likely to report greater appraisal of stress ( $p < .01$ ) and greater frequency of coping ( $p < .05$ ). Homework accounted for 7% of the variance in reported stress.

**Discussion:** Consistent with reports of mindfulness training, greater awareness of the feelings associated with stress may enhance coping abilities. However, it is possible that the in-

creasing awareness of stressors in itself increased stress, possibly as part of the process of developing mindfulness or related to cognitive, emotional, or social development. Mindfulness in children may differ from mindfulness in adults and warrants further investigation. *J Pediatr Health Care.* (2012) 26, 45-56.

## KEY WORDS

Stress, school-age, yoga, mindfulness, meditation

School-age children report having many stressors in their daily lives, including homework, peer pressure, being teased, receiving poor grades (Ryan-Wenger, Sharrer, & Campbell, 2005; Sharrer & Ryan-Wenger, 2002), fear of the effects of war (Ryan-Wenger, 2002), bullying (Horowitz et al., 2004), standardized testing (Skybo & Buck, 2007), and perceived parental pressure and isolation (Luthar, 2003).

The cumulative daily events experienced by children have a deleterious effect on future health (Carter, Garger, Ciesla, & Cole, 2006; Compas, Malcarne, & Fondacaro, 1988), and mediate the impact of acute events on psychological health (Wagner, Compas, & Howell, 1988). Recurrent or prolonged stress may lead to problems such as headaches (Strine, Okor, McGuire, & Balluz, 2006; White & Farrell, 2005), abdominal pain (Thomsen, 2002, White & Farrell, 2005), school absenteeism (Strine et al., 2006), overeating (Jenkins, Rew, & Sternglanz, 2005), and tobacco use (Orlando, Ellickson, & Rand, 2001). Children need a repertoire of coping strategies to effectively manage stressful encounters (Grant et al., 2006) and develop resilience (Rutter, 2006).

Mindfulness-based Stress Reduction (MBSR), including meditation and yoga, is associated with stress reduction in adults (Chiesa & Serretti, 2009; Greeson, 2009; Grossman, Niemann, Schmidt, & Walach, 2004; Ospina, 2008). Although children are able to meditate (Black, Milam, & Sussman, 2009) and practice yoga (Birdee et al., 2009; Galantino, Galbavy, & Quinn, 2008), the

---

Laura Santangelo White, Boston College William F. Connell School of Nursing. The data in this study is based on a doctoral dissertation.

Supported by a grant from the Alpha Chi chapter of Sigma Theta Tau.

Conflicts of interest: none to report.

Correspondence: Laura Santangelo White, PhD, RN, CPNP, Boston College William F. Connell School of Nursing, 140 Commonwealth Ave., Chestnut Hill, MA 02467; e-mail: JLCLA@comcast.net.

0891-5245/\$36.00

Copyright © 2012 by the National Association of Pediatric Nurse Practitioners. Published by Elsevier Inc. All rights reserved.

doi:10.1016/j.pedhc.2011.01.002

efficacy of mindfulness-based practices with children has had little empiric exploration. Yet learning stress reduction techniques, such as mindfulness meditation and yoga, is particularly important during childhood, when life-long habits are being formed.

## STRESS AND COPING

The stress response involves the interaction between an automatic physiological reaction and a conscious volitional coping response. The brain and body are connected through the autonomic nervous system, endocrine, and immune systems, which work together to facilitate adaptation to stress (McEwen, 2005). New or uncertain experiences influence pituitary and adrenal activity (LeMoal, 2007). The physiological reaction to stress, muted during childhood, increases during adolescence (Gunnar, Wewerka, Frenn, Long, & Griggs, 2009; Stroud et al., 2009).

The conceptualization of stress for this study was based on later work by Lazarus (2006), which views cognitive appraisal and coping in relation to emotions. A stressor is the event that generates the stress response through a cognitive evaluation of whether the situation poses a risk to the individual's well-being. The cognitive appraisals are interpreted by the nervous system, which determines the physiological and behavioral stress response. While the automatic reaction is initially adaptive (allostasis), prolonged exposure to the physiological mediators may lead to a prometabolic state (allostatic load) and deleterious health effects (McEwen, 2005).

Coping is part of self-regulation during perceived stress (Compas, 2001; Skinner & Zimmer-Gembeck, 2007). Regulation affects the automatic emotional reaction to stress by increasing available information and flexibility to enhance adaptation (Skinner & Zimmer-Gembeck, 2007). School-age children are capable of regulating physiological, behavioral, and emotional arousal (Simonds, Kieras, Rueda, & Rothbart, 2007). Individual differences such as cognitive ability, self-esteem, gender, perceived control, or material resources may affect the appraisal of stressors and the available coping options.

Evidence supports the ability of school-age children to cognitively appraise stressors, generate and evaluate coping strategies (Huang & Menke, 2001; Ryan-Wenger et al., 2005; Sharrer & Ryan-Wenger, 1994, 2002; Skybo, 2005; Taxis, Rew, Jackson, & Kouzekanani, 2004; Walker, Smith, Garber, & Claar, 2006), and recognize feelings and thoughts associated with stress (Sharrer & Ryan-Wenger, 2002). Cognitively, school-age children are capable of setting goals, planning and modifying actions, and coordinating and evaluating progress, self-reflection, and self-awareness (Eccles, 1999). During this period, children are building competence through developing culturally important skills (Erikson, 1963). Perceived competence in developmental domains affects how children feel about themselves (Harter, 1982).

Self-esteem may influence the stress appraisal and coping process. Children with higher self-esteem may use more effective ways to manage perceived threats (Harter, 1986), while children with low self-esteem may overestimate the negative impact of a stressor (Kliewer & Sandler, 1992). Self-esteem during the school-age period is less stable than during adolescence and therefore possibly amenable to intervention (Robins & Trzesniewski, 2005).

Girls are at a greater risk than boys of lower self-esteem during adolescence (Robins & Trzesniewski, 2005), report more stressful experiences (Griffith, Dubow, & Ippolito, 2000), and are more concerned with social relationships, norms, and expectations (Hampel & Peterman, 2006; Washburn-Ormachea, Hillman, & Sawilowsky, 2004). Compared with boys, girls are more likely to internalize their feelings and report depression and use more social supports and emotion-focused strategies (Griffith et al., 2000; Hampel & Peterman, 2006; Washburn-Ormachea et al., 2004), such as rumination, resignation, and passive avoidance (Hampel & Peterman, 2006).

The physiologic stress reaction may be modified by recognizing the associated feelings at the onset of the stress reaction and consciously responding with coping strategies.

## MINDFULNESS-BASED STRESS REDUCTION

MBSR is a training program of awareness-based practices, including mindfulness meditation and mindful Hatha yoga, created by Jon Kabat-Zinn to relieve suffering in adults (Kabat-Zinn, 1990/2005). Mindfulness is an awareness of the present moment that is cultivated by paying attention on purpose to the things that usually are not noticed (Kabat-Zinn, 1990/2005). Mindfulness enhances awareness of feelings and thoughts as they are experienced.

The MBSR program trains persons to recognize when the automatic stress reaction is beginning and to consciously respond to avoid a detrimental state of hyperarousal (Kabat-Zinn, 1990/2005). Reviews of MBSR with adults report stress reduction (Chiesa & Serretti, 2009; Grossman et al., 2004; Ospina, 2008), decreased rumination and trait anxiety, and increased empathy and compassion (Greeson, 2009).

## MINDFULNESS AND CHILDREN

Children are able to recognize feelings associated with stress (Brobeck, Marlund, Haraldsson, & Berntsson, 2007; Sharrer & Ryan-Wenger, 2002), focus attention for varying periods (Benson et al., 2000; Ott, 2002; Rosaen & Benn, 2006), and practice sitting meditation (Black et al., 2009) and yoga (Galantino et al., 2008). The prerequisite for mindfulness training is the willingness to explore a novel experience and the ability to follow directions (Ott, 2002). Children and adolescents are able to participate in mindfulness training

(Barnes, Pendergrast, Harshfield, & Treiber, 2008; Beauchemin, Hutchins, & Patterson, 2008; Biegel, Brown, & Shapiro, 2009; Bögels, Hoogstad, van Dun, de Schutter, & Restifo, 2008; Bootzin & Stevens, 2005; Britton et al., 2010; Lee, Semple, Rosa, & Miller, 2008; Napoli, Krech, & Holley, 2005; Semple, Lee, Rosa, & Miller, 2009; Semple, Reid, & Miller, 2005; Sibinga et al., 2008; Singh et al., 2007; Zylowska et al., 2008).

The multiple methodologies and quality of reported data hinders meta-analysis or the calculation of effect sizes for mindfulness studies with children and adolescents (Burke, 2010). Mindfulness studies with children and adolescents have included participants with clinical issues such as aggression, learning disabilities, reading problems, drug use and sleep problems, hypertension risk, human immunodeficiency virus, and heterogeneous psychiatric problems. Participant ages ranged from 9 to 21 years, and interventions varied in format and duration. In some studies, mindfulness techniques were adapted from adult MBSR or Mindfulness-based Cognitive Therapy (MBCT) protocols, and other studies used specific mindfulness practices such as breathing, focusing on the soles of the feet, short daily teacher-led meditations, or techniques as part of a multicomponent treatment. Adaptations from adult protocols included: (a) reduced teacher/learner ratio, (b) reduced length of homework, (c) shorter sessions, (d) repetitive practices, and (e) shorter meditation periods. The duration of the programs ranged from 5 weeks of daily short meditations before school-day classes to 90-minute weekly sessions for 12 weeks.

Findings included reduction of anxiety and changes in behavior, attention, self-control, and self-esteem. Anxiety was reduced in most studies. However, Semple et al. (2009) noted that anxiety was reduced only in 9- to 13-year-old children with reading problems who reported greater anxiety levels at baseline. Attention changes included decreased attention problems in children with reading problems (Semple et al., 2009) and increased attentional conflict monitoring and set shifting with adolescents with attention problems (Zylowska et al., 2008). Improved behavior and self-control also was noted (Beauchemin et al., 2008; Bögels et al., 2008; Lee et al., 2008). Improved self-esteem, global assessment of function, and decreased anxiety was reported by a sample of adolescents with various outpatient psychiatric diagnoses (Biegel et al., 2009). A multidimensional intervention using mindful meditation improved sleep quality for adolescents with a history of drug abuse (Bootzin & Stevens, 2005; Britton et al., 2010).

To investigate the benefit of MBSR for urban, African American adolescents infected with human immunodeficiency virus, five adolescents between 13 and 21 years of age were interviewed after completing at least five sessions of MBSR training that was closely modeled on the Kabat-Zinn (1990/2005) program. The participants

reported (a) improved attitudes, (b) decreased reactivity, (c) improved behavior by thinking before acting, (d) improved self-care, and (e) recognition of the importance of the group (Sibinga et al., 2008).

The attainment of mindfulness was only measured in one study with the adult-validated self-report Mindful Attention and Awareness Scale (Brown and Ryan, 2003). Mindful awareness was reported by adolescents with externalizing disorders after an 8-week modified MBCT program (Bögels et al., 2008).

## MINDFUL MOVEMENT

Mindful movement through yoga is one of the formal mindfulness practices in the MBSR program and was the home practice most greatly correlated with positive psychological outcomes in adults (Carmody & Baer, 2007). Yoga, as a distinct practice with adults, may decrease anxiety (Smith, Hancock, Blake-Mortimer, & Eckert, 2007; Waelde, Thompson, & Gallagher-Thompson, 2004; Woolery, Meyers, Sternlieb, & Zeltzer, 2004), stress (Brown & Gerbarg, 2005; Granath, Ingvarsson, von Thiele, & Lundberg, 2006; Michalsen et al., 2005), depression (Butler et al., 2008; Michalsen et al., 2005), and pain (daSilva, Lornzi-Filho, & Lage, 2007). Yoga, as a component of MBSR, enhances awareness and attention to body movements and breath.

Adolescents report the willingness to use yoga as a therapy for pain when asked about complementary and alternative therapies (Tsao, Meldrum, Kim, Jacob, & Zeltzer, 2007). Evidence suggests that yoga with children may play a role in physical and psychological health (Birdee et al., 2009) and is associated with improved cardiovascular status, physical functioning, and behavior (Galantino et al., 2008). Outcomes studied with children and adolescents included decreased feelings of helplessness (Stueck & Gloeckner, 2005), improved pulmonary function (Jain et al., 1991; Mandanmohan, Udupa, & Bhavanani, 2003), decreased disease symptoms (Jain et al., 1991; Kuttner et al., 2006; Mandanmohan et al., 2003), and improved cognitive function (Manjunath & Telles, 2001, 2004).

Despite encouraging support for mindfulness practices and yoga, the efficacy of mindfulness-based training through yoga has not been explored. Yet behavioral interventions learned prior to the turbulence

...behavioral interventions learned prior to the turbulence of adolescence are important assets to build resilience and protect children from the deleterious effects of stress.

of adolescence are important assets to build resilience and protect children from the deleterious effects of stress.

The purpose of this study was to test the efficacy of an 8-week stress reduction program using mindful movement as a strategy to decrease levels of perceived stress, facilitate coping, and enhance self-esteem and self-regulation in school-age girls. The following two hypotheses were tested:

1. School-age girls who participate in mindful movement stress reduction will report significantly less perceived stress, significantly greater coping, and significantly greater self-esteem and self-regulation than do school-age girls who participate in a wait-list control group.
2. The dose of mindful movement is inversely correlated with perceived stress and positively correlated with coping, self-esteem, and self-regulation.

## METHODS

### Sample

The sample for this study included fourth- and fifth-grade girls attending demographically comparable public schools who were (a) willing to participate in a weekly class for the length of the intervention; (b) willing to complete daily homework 6 days each week; (c) were able to speak, read, and write the English language; (d) were able to pay attention for 1 hour; and (e) were able to participate in physical poses. Students with a history of formal mindfulness or yoga training or a developmental disorder as determined by the need for special education one-to-one assistance were excluded from the study. All respondents met the inclusion criteria. A total sample size of 128 participants was determined by an a priori power analysis, given two time points, with a power of 0.80, an  $\alpha$  level of 0.05, and an effect size of  $f = 0.25$  (Faul, 1992/2008). A 10% attrition rate was assumed. Therefore the proposed total sample size for this study was 140 participants. Because of overwhelming interest, the sample size at baseline was  $N = 190$ . After accounting for missing data, the analyzed sample included 155 participants.

Recruitment letters, consents, assents, and demographic forms were mailed home to parents of all fourth- and fifth-grade girls in the intervention school and put in student backpacks in the control school because of principal preference the second week of the school year (September 2009).

The demographic description of the sample is described in Table 1. Most families reported no recent family stress (85.1%) and no current participant health problem (85.1%). The reported stressors included (a) grandparent illness, (b) family death, (c) recent move, (d) unemployed parent, or (e) resolving domestic abuse. The health problems reported included (a) asthma, (b) allergies, (c) headaches, (d) back pain,

and (e) history of broken bones. The majority of participants were in the fifth grade ( $n = 91$ , 58.7%), with a mean age in years of 9.9 ( $SD \pm 0.720$ , range 8-11 years).

### Measures

The Feel Bad Scale (Lewis, Seigel, & Lewis, 1984) is a validated measure of perceived stress with school-age children consisting of three columns. The first column lists 20 stressors. The second column measures how badly the child would feel if the stressor occurred, or how badly he or she felt when the stressor did occur (appraisal of stress). The third column measures how frequently the stressor actually occurred (frequency). Both columns are scored on a 5-point Likert scale ranging from 1 (not bad) to 5 (terrible) for appraisal of stress ("badness") and 1 (never) to 5 (all the time) for the frequency column. The appraisal value in column one and the frequency value in column two are multiplied for an item value. The total score is calculated by adding the item values. The possible range of scores is 20 to 500. The higher the score, the higher the perceived stress reported. The Cronbach's  $\alpha$  values at time one for the intervention group and control group were 0.86 and 0.84, respectively, and at time two they were 0.85 and 0.89.

The Schoolagers' Coping Strategies Inventory (Ryan-Wenger, 1990) is a frequently used and validated measure of coping. It consists of two 26-item subscales: coping frequency and coping effectiveness. The frequency subscale is scored on a 3-point Likert scale that ranges from 0 (never) to 3 (most of the time) added together for a possible score from 0 to 72. The Cronbach's  $\alpha$  values at time one for the intervention group and control group were 0.83 and 0.79, respectively, and at time two they were 0.85 and 0.80.

The Global Self-Worth subscale of the Self-Perception Profile for Children (Harter, 1985) is a frequently used and validated measure of self-esteem consisting of six items that presents two types of child. The participants choose which type of child is most like herself. It is measured on a 4-point Likert scale from 1 (really true for me) about a negative statement to 4 (really true for me) regarding a positive statement. The item values are added and the mean is calculated for a possible score of 1 to 4. A higher score indicates greater reported perceived self-esteem. The Cronbach's  $\alpha$  values at time one for the intervention group and control group were 0.76 and at time two they were 0.78 and 0.82, respectively.

The Healthy Self Regulation subscale of the Mindful Thinking and Action Scale for Adolescents (West, 2008) is a newly developed scale tested with adolescents to measure mindfulness. Current studies are testing validity with school-age children. The subscale measures healthy self-regulation. It consists of 12 items scored on a 6-point Likert scale from 1 (almost never) to 6 (almost always). The scale is computed by

**TABLE 1. Baseline family demographic characteristics**

| Characteristic       | Total group (N = 155) (%) | Intervention (n = 70) (%) | Control (n = 85) (%) |
|----------------------|---------------------------|---------------------------|----------------------|
| Marital status*      |                           |                           |                      |
| Married              | 131 (85.1)                | 59 (84.3)                 | 72 (85.7)            |
| Not married          | 23 (14.9)                 | 11 (15.7)                 | 12 (14.3)            |
| Race/ethnicity*      |                           |                           |                      |
| White                | 138 (88.3)                | 59 (84.3)                 | 77 (91.7)            |
| African American†    | 2 (1.3)                   | 2 (2.9)                   |                      |
| Asian†               | 6 (3.9)                   | 3 (4.3)                   | 3 (3.6)              |
| Latina†              | 4 (2.6)                   | 3 (4.3)                   | 1 (1.2)              |
| Multiple†            | 2 (1.3)                   | 1 (1.4)                   | 1 (1.2)              |
| Native American†     | 2 (1.3)                   | 1 (1.4)                   | 1 (1.2)              |
| Religion‡            |                           |                           |                      |
| Catholic             | 81 (52.9)                 | 36 (51.4)                 | 45 (54.2)            |
| Jewish               | 22 (14.4)                 | 8 (11.4)                  | 14 (16.9)            |
| Protestant           | 22 (14.4)                 | 11 (15.7)                 | 11 (13.3)            |
| Other                | 28 (18.3)                 | 15 (21.4)                 | 13 (15.7)            |
| Education            |                           |                           |                      |
| Mother*              |                           |                           |                      |
| High school or less  | 26 (16.9)                 | 15 (21.4)                 | 11 (13.1)            |
| College              | 81 (52.6)                 | 34 (48.6)                 | 47 (56)              |
| Post-college         | 47 (30.5)                 | 21 (30)                   | 26 (31)              |
| Father§              |                           |                           |                      |
| High school or less  | 35 (22.9)                 | 18 (26.1)                 | 17 (20.2)            |
| College              | 72 (47.1)                 | 34 (49.3)                 | 38 (45.2)            |
| Post-college         | 46 (30.1)                 | 17 (24.6)                 | 29 (34.5)            |
| Employment           |                           |                           |                      |
| Mother               |                           |                           |                      |
| Unemployed/part-time | 88 (64.2)                 | 41 (65.1)                 | 47 (63.5)            |
| Full-time            | 49 (35.8)                 | 22 (34.9)                 | 27 (36.5)            |
| Father¶              |                           |                           |                      |
| Unemployed/part-time | 17 (12.4)                 | 5 (8.1)                   | 12 (16)              |
| Full-time            | 120 (87.6)                | 57 (91.9)                 | 63 (84)              |

\*Total group, N = 154; intervention group, n = 70; control group, n = 84.  
†Groups combined to ensure adequate cases per cell for Pearson  $\chi^2$  analysis.  
‡Total group, N = 153; intervention group, n = 70; control group, n = 83.  
§Total group, N = 153; intervention group, n = 69; control group, n = 84.  
||Total group, N = 137; intervention group, n = 63; control group, n = 74.  
¶Total group, N = 137; intervention group, n = 62; control group, n = 75.

adding the individual item values for a possible score of 12 to 72. A higher score represents greater self-regulation. The Cronbach's  $\alpha$  values at time one for the intervention group and control group were 0.85 and 0.76, respectively, and at time two they were 0.88 and 0.86.

### Design and Procedures

A randomized, cluster, repeated measures research design randomly assigned two public schools to either the intervention or wait-list control group. Permission was obtained from the school principals and the Boston College Institutional Review Board. A focus group with seven 10-year-old girls was conducted to evaluate the feasibility of the proposed intervention and instruments.

The demographic form was sent home with the recruitment packet, which included a letter of introduction, consent, and assent. The instruments were administered by a paper and pencil questionnaire

while the items were read aloud by the interventionist. The measures were administered at the first week and at the completion of the 8-week intervention. Completing the instruments took approximately 45 minutes. Each class was attended by research assistants to assist any girl who needed help or needed to leave the room.

The experimental group met approximately 60 minutes immediately after school 1 day per week and completed 10 minutes of yoga homework 6 days a week. The control group met at baseline and after the intervention. The control group participants were offered yoga classes after the completion of the experimental group.

### Fidelity

Study fidelity was maintained through the use of (a) an intervention manual, (b) a journal kept by the interventionist, (c) an intervention checklist monitored by research assistants, (d) written instructions, (e) homework with

## BOX 1. Weekly outline of intervention

- Collect homework
- Ring tingsha bells
- Breathing/sitting meditation
- Discussion of homework experience
- Introduction of new topic with activity
- Yoga warm-up
- Yoga asanas
- Questions/comments
- Homework assignment
- Ring tingsha bells

pictures and audio instructions, and (f) feedback during the sessions.

### Treatment adaptation

The MBSR program developed by Kabat-Zinn (1990/2005) is an 8-week intervention including (a) 2.5-hour weekly classes, (b) sitting meditation, (c) body scanning (that is, awareness of different parts of the body), (d) yoga, (e) mindful eating and walking, (f) approximately 45 minutes of daily homework guided by a compact disk and a workbook and (g) one full-day retreat.

The Mindful Awareness for Girls through Yoga program was adapted from the principles of MBSR and focused on the yoga portion. Developmental considerations included: (a) shorter sessions, (b) more repetition, (c) concrete experiences, (d) greater movement, (e) emphasis on safety, and (f) a balance between new experiences with repetition (Thompson & Gauntlett-Gilbert, 2008). The group sessions were based on direct, concrete experience with greater explanations of techniques and translation to daily life. The classes met immediately after school in the same room at the same time and were led by the same interventionist and research assistants. Sessions were 1 hour per week for 8 weeks. Two boxes were set up, and the participants placed their homework sheets in one box and took a small gift from the other box. The format of the class was consistent each week (Box 1), with 10 minutes of guided daily homework (Box 2) monitored by a self-reported check mark. At the end of the 8-week program, the girls kept their yoga mats.

## BOX 2. Homework (10 minutes)

- Choice of stretching poses
- Sitting breathing meditation
- Mountain pose and raise arms (tadasana)
- Side bend (left and right)
- Cat/cow (bidaldasana)
- Mouse (garbhasana)
- Puppy stretch (uttana shishosana)
- Rag doll (paschimottanasana)
- Corpse (savasana)

## RESULTS

In the intervention school, 200 recruitment letters were sent and 77 responses were received (a 38.5% response rate). In the control school, 225 letters were sent and 118 responses were received (a 52% response rate). The sample at baseline included 190 girls. The flow of participants is described in Figure 1. One participant did not start the intervention because of other commitments. The analyzed sample included 70 participants in the intervention group and 85 in the control group ( $n = 155$ ).

The collected data were prepared for analysis by inspection, description of the sample, and psychometric testing of the instruments. Data collection forms were labeled with the participant code, and forms were kept in a locked file cabinet. Data were entered into the statistical program SPSS 16. Frequencies were performed on all study variables, and random missing data were substituted with the mean of the reported values. Participants missing more than 40% of at least one scale were excluded from analysis.

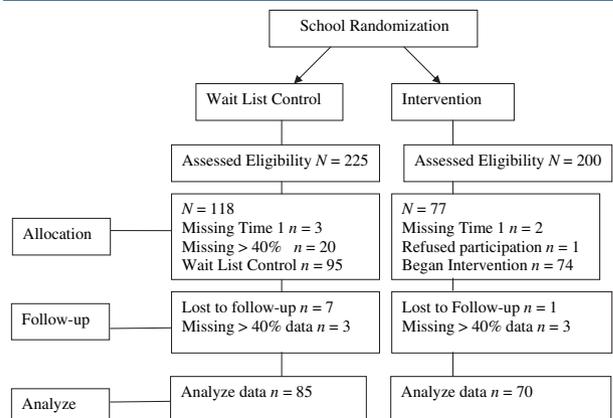
Descriptive statistics were evaluated and group differences were compared by Pearson  $\chi^2$  analysis on categorical variables and  $t$  test on continuous variables. Categorical variables needed to be recoded to ensure adequate cell counts. No significant differences between groups were found. Cronbach's coefficient  $\alpha$  was used to measure internal consistency reliability of measures.

The data were analyzed by an intention-to-treat analysis to include all participants randomly assigned to their respective groups regardless of the treatment received. The intervention group data were further analyzed by the dose of the intervention (number of sessions attended and home yoga practice).

### Hypothesis 1

Repeated measures analysis of variance with Bonferroni correction with a statistical significance of  $p = .01$  tested between-subject and within-subject differences

**FIGURE 1. Flow of participants through the study.**



**TABLE 2. Repeated measures analysis of variance for frequency of coping (N = 155)**

| Source           | df  | MS      | F      | $\eta$ | p    |
|------------------|-----|---------|--------|--------|------|
| Between subjects |     |         |        |        |      |
| Group            | 1   | 36.745  | 0.217  | 0.001  | .642 |
| Error            | 153 | 169.041 |        |        |      |
| Within subjects  |     |         |        |        |      |
| Time             | 1   | 16.893  | 0.641  | 0.004  | .425 |
| Time x group     | 1   | 112.868 | 4.281* | .027   | .040 |
| Error            | 153 | 26.366  |        |        |      |

\* $p < .05$ .

between the intervention and control groups. The group of fourth- and fifth-grade girls with two levels (intervention and wait-list control) was entered as the between-subjects factor. Time, with two levels (pre-test and post-test), was entered as the within-subjects factor.

No significant difference in perceived stress was found between the intervention and control groups:  $F(1) = 0.06, p = .806$ . However, the interaction between time and group approached a  $p = .05$  level of significance:  $F(1) = 3.59, p = .060$ , with a small effect size ( $\eta = 0.02$ ). Compared with the control group, the intervention group was more likely to increase their stress scores at time 2.

The frequency subscale of the Schoolagers' Coping Strategies Inventory was used to measure the frequency of coping. No significant between-group difference was found:  $F(1) = 0.217, p = .64$ . However, an interaction between group and time was found (Table 2). Compared with the control group, the intervention group was more likely to increase their frequency of coping score:  $F(1) = 4.28, p = .04$  (Figure 2).

No significant differences between groups were found in self-esteem:  $F(1) = 0.32, p = .573$ , or self-regulation:  $F(1) = 0.111, p = .739$ . Over time both

groups reported a significant increase in self-esteem:  $F(1) = 14.1, p = .000$ , and self-regulation:  $F(1) = 12.51, p = .001$ .

### Hypothesis 2

The dose of mindful movement was measured by the number of sessions attended and the amount of self-reported home practice of yoga. The number of sessions attended ranged between three and eight, with most participants completing eight sessions ( $N = 43, 61.4\%$ ). The amount of home yoga practice ranged from 0 to 42 times, with a mean reported frequency of  $10.8 (\pm 9.6)$  times.

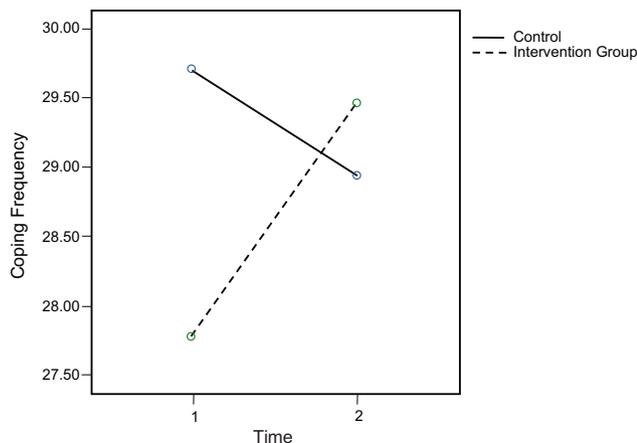
The dose was examined as two independent variables. The only significant correlation between the predictor variables (attendance and home yoga practice) and criterion variables (stress, coping, self-esteem, and self-regulation) was between home yoga practice and perceived stress ( $r = 0.29, p = .05$ ). The final model of regression included home yoga practice as the only independent variable, accounting for 7% (adjusted  $R$  square = 0.07) of the variance in perceived stress.

### Further Analysis

To further explore the increasing stress scores and the increasing coping frequency, the two subscales of the Feel Bad Scale (appraisal and frequency of stressors) were evaluated separately. No significant difference was found in the frequency of occurrence of stressors at both time points in either group. The appraisal subscale measures stress appraisal by asking how badly one feels about a specific stressor.

No between-group differences were found in the appraisal scores:  $F(1) = 1.15, p = .283$ . However, a significant interaction was found between group and time:  $F(1) = 8.15, p = .005$ , with a medium effect size ( $\eta = 0.05$ ) (Table 3). Compared with the control group, the intervention group was significantly more likely to increase their appraisal of stress scores after the intervention (Figure 3). The relationship between the appraisal scores and coping was explored. In the control group,

**FIGURE 2. Coping frequency scores.**

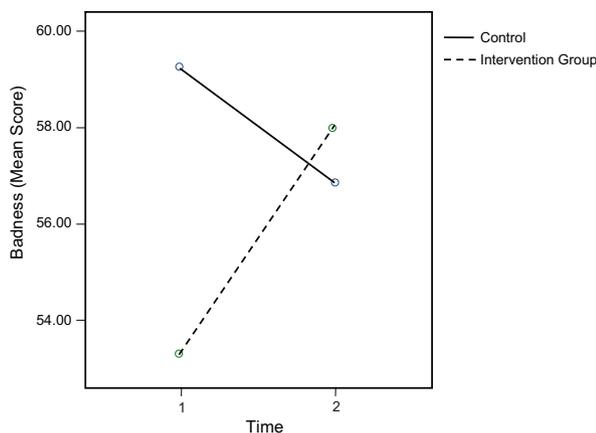


**TABLE 3. Repeated measures analysis of variance for perceived badness (stress appraisal) (N = 155)**

| Source           | df  | MS      | F      | $\eta$ | p    |
|------------------|-----|---------|--------|--------|------|
| Between subjects |     |         |        |        |      |
| Group            | 1   | 433.493 | 1.159  | 0.008  | .283 |
| Error            | 153 | 373.936 |        |        |      |
| Within subjects  |     |         |        |        |      |
| Time             | 1   | 109.377 | 0.926  | 0.006  | .337 |
| Time x group     | 1   | 962.327 | 8.146* | 0.051  | .005 |
| Error            | 153 | 118.140 |        |        |      |

\* $p < .01$ .

**FIGURE 3. Stress appraisal scores.**



the stress appraisal scores were significantly correlated with the frequency of coping at both time points. In the intervention group, the stress appraisal scores were not correlated with the frequency of coping at time 1. However, after the intervention, the intervention group stress appraisal scores and frequency of coping scores were significantly correlated ( $r = 0.47$ ,  $p = .01$  two-tailed).

## DISCUSSION

This study examined the efficacy of a mindfulness-based intervention to reduce stress in school-age girls through mindful movement. The first hypothesis tested between- and within-group differences in perceived stress, coping, self-esteem, and self-regulation for two groups at baseline and after the intervention at 8 weeks. No significant differences between groups were found. Over time, the intervention group was more likely than the control group to report higher perceived stress scores and greater frequency of coping. Both groups reported significantly greater self-esteem and self-regulation over time.

The effect of mindfulness meditation and yoga in children and adolescents is unclear. Self-esteem and self-regulation scores were high at baseline; however, the timing of the testing may have affected the scores. Baseline testing occurred at the start of the school year and the post-test was approximately two months later. The increased self-esteem and self-regulation scores may have reflected the participants' feelings of competence as the school year progressed.

The hypothesis of decreased stress was not supported. In fact, the unexpected finding of increasing stress was found in the intervention group. Both groups reported relatively low levels of perceived stress. The sample in this study differs from other studies of mindfulness or yoga with children or adolescents in that this was an essentially well, nonclinical sample of school-

age girls without baseline medical or psychological diagnoses.

Although this finding may have been a regression to the mean, the increasing stress scores in the intervention group warranted further consideration. The two subscales of the Feel Bad Scale were evaluated. Although no increase in the frequency of stressors was found, the participants in the intervention group were significantly more likely to report feeling worse about a stressor. The scale operationalized stress appraisal by measuring how badly one would feel about the occurrence of a stressor. This study did not specifically measure mindfulness. Because mindfulness training aims to enhance awareness to the stress reaction to better cope with stress, it is unclear whether the scale was measuring stress or awareness of the feelings associated with stress. The awareness of stress may facilitate coping, explaining the significant correlation between stress appraisal and coping frequency after the intervention. It also is possible that this increased awareness of stress actually precipitated more stress.

Mindfulness in its basic definition is a "moment to moment awareness" (Kabat-Zinn, 1990/2005). However, the understanding of mindfulness with adults includes the qualification of that awareness as nonjudgmental and accepting (Bishop, 2002). Yoga with adults was found to be the only home mindfulness technique significantly correlated with an increase in nonjudgment (Carmody & Baer, 2007). These qualities of awareness may be elusive for children because of their cognitive, emotional, or social level of development or the limits of an 8-week intervention.

The developmental tasks of school-age children include self-reflection through social comparison (Eccles, 1999), self-evaluation of competence (Harter, 1982), and mastery of culturally important skills (Erikson, 1950/1963), which suggest an inherent judgment of oneself in relation to others. This phenomenon may hinder a nonjudgmental and accepting attitude of mindful awareness. Bögels et al. (2008) measured mindfulness with adolescents and found an increase in mindfulness after a 12-week modified MBCT program. The Mindful Attention Awareness Scale conceptualized mindfulness as an awareness of the present moment without the qualities of nonjudgment or acceptance (Brown & Ryan, 2003).

A transient increase in stress may be a part of the process of becoming mindful as one begins to recognize the usual habits of the reaction to stress (Hayes & Feldman, 2004). The process of the development of mindfulness has undergone little study, but as awareness of feelings progresses, one may become aware of difficult emotions leading to increased perceived stress. This exposure to thoughts and feelings through mindfulness may actually contribute to distress as automated reactions are lessened (Chödrön, 2001).

Symptoms of depression were noted to temporarily worsen after the second phase of mindfulness training with adults (9 to 18 weeks). This period also was studied with written journals that were analyzed and found to reflect the processing of emotions. The increased symptoms of depression during this period predicted lower levels of depression after the intervention and were considered part of the process of mindfulness (Hayes & Feldman, 2004).

Qualitative analysis of MBCT with adults described an initial experience of negativity and challenge (Mason & Hargreaves, 2001). Similar findings were found in a study of an 8-week MBSR program on stress and burnout in 25 nurses who described an increasing awareness of emotions and memories as training progressed that was difficult but useful (Cohen-Katz et al., 2005).

The nature of childhood stress may be one of uncontrollability, and the increased awareness of the situation without the necessary cognitive and emotional ability or social support to manage the encounter may increase one's stress. Children report daily stressors as expected and uncontrollable (Jacobson, 1994).

During mindfulness training, an adult sample of low-income women with abnormal Papanicolaou smears had an 84% attrition rate, which was explained by the authors as related to unpredictable lives of this population and the unconventional nature of the program (Abercrombie, Zamora, & Korn, 2007). Perhaps interventions that include components to mitigate external stressors in conjunction with mindfulness training may be more effective in certain situations and for certain individuals. Future mindfulness meditation interventions with children may need to be multidimensional and include mental health support, school, and parents. Semple et al. (2009) included parents in information sessions and instruction in mindfulness with an unclear effect. Brooks (2006) recommends developing social competence and relationships between students and adults and cultivating involvement in the school environment. Teachers and nurses may be trained in mindfulness and decide the best adaptation of mindfulness training and practice within the specific school. For example, Barnes et al. (2008) measured the effects of breathing meditation on the systolic blood pressure and heart rate of African American adolescents at risk for hypertension. The 10-minute meditations were guided by school teachers during health classes for 12 weeks.

The second hypothesis tested the relationship between the dose of the intervention (session attendance and amount of home yoga practice) and study outcomes. The amount of home yoga practice significantly predicted a higher level of reported perceived stress. This finding may reflect a participant characteristic or situation. The participants who did the most yoga

may have felt more stress because they perceived the yoga as mandatory school homework. Homework was described by school-age children as a stressor (Ryan-Wenger et al., 2005). A better label for the homework would have been "home practice." Because mindfulness was not measured, it also is possible that the participants who practiced yoga the most achieved a greater level of mindfulness that manifested in awareness of stress, as previously discussed. Carmody and Baer (2007) found that the amount of yoga practiced by adults over eight weeks at home was more strongly related to mindfulness than the other formal mindfulness techniques.

Studies of mindfulness with children measured dose as session attendance. Compared with participants who did not complete the designated number of sessions, Bögels et al. (2008) found increased effect sizes for those who completed the intervention (five of eight sessions), and Bootzin and Stevens (2005) found increased sleep quality with those who completed the intervention (four of six sessions). Britton et al. (2010) studied a subset of this sample to evaluate the contribution of the mindfulness portion of this multidimensional intervention. The frequency of mindfulness meditation practice was correlated with improved sleep quality. Lee et al. (2008) found that compared with the intention to treat sample, those who completed the intervention (10 of 12 sessions) were found to have a decrease in externalizing symptoms by parent report.

### Limitations

Limitations of this study included sampling, intervention delivery, and measurement. The homogenous sample of primarily white school-age girls precludes generalization to other populations. The large number of participants in sessions may have affected the receipt of the intervention because of behavioral disturbances, lack of adequate space, and limited individual attention. The power analysis and the limited number of available days at the school required larger class sizes than anticipated (20 to 30 girls). A ratio of six to eight well children to one interventionist is suggested for future studies. Future research manuals need to include curriculum flexibility while maintaining fidelity and include plans to manage disruptions and behavior, especially as meditation time increased.

Limitations of measurement included the lack of the ability to measure mindfulness, self-report questionnaires, and only two time points. Self-report questionnaires risk inaccurate recollection (van den Brink, Bandell-Hoekstra, & Abu-Saad, 2001), and anxiety may affect recall of negative events (Rocha, Marche, & von Baeyer, 2009).

The inclusion of parent or teacher observation may have added important information regarding child

behavior, as well as confirmation of home yoga practice. An additional time point for measurement would have added important information about the process of mindfulness in relation to stress. Further studies are needed with well children to understand mindfulness from a developmental perspective, including measures of developmental assets (Search Institute, 1997/2006) such as optimism and perceived support and qualitative data to explore the experience and process of mindfulness in children.

To truly prevent adult diseases and enhance healthy lifestyles, interventions must begin in childhood. Recent reviews of meditation and yoga for children suggest an increasing interest in integrative health care for well children and the recognition of the need for evidence-based guidelines.

*I am grateful to Drs. Joyce Pulcini, Angela Amar, and Susan Bauer-Wu for guidance with this study, the Alphi Chi Chapter of Sigma Theta Tau, and the school nurses, staff, and students who participated in the study.*

**To truly prevent adult diseases and enhance healthy lifestyles, interventions must begin in childhood.**

## REFERENCES

- Abercrombie, P., Zamora, A., & Korn, A. (2007). Providing a mindfulness-based stress reduction program for low-income multiethnic women with abnormal pap smears. *Holistic Nursing Practice, 21*, 26-34.
- Barnes, V., Pendergrast, R., Harshfield, G., & Treiber, F. (2008). Impact of breathing awareness meditation on ambulatory blood pressure and sodium handling in prehypertensive African American adolescents. *Ethnicity & Disease, 18*, 1-5.
- Beauchemin, J., Hutchins, T., & Patterson, F. (2008). Mindfulness meditation may lessen anxiety, promote social skills, and improve academic performance among adolescents with learning disabilities. *Complementary Health Practice Review, 13*(1), 34-45.
- Benson, H., Wilcher, M., Breenverg, B., Huggins, E., Ennis, M., Zuttermeister, P., ... Friedman, R. (2000). Academic performance among middle school students after exposure to a relaxation response curriculum. *Journal of Research and Development in Education, 33*, 156-164.
- Biegel, G., Brown, K., & Shapiro, S. (2009). Mindfulness-based stress reduction for the treatment of adolescent psychiatric outpatients: A randomized clinical trial. *Journal of Consulting and Clinical Psychology, 77*(5), 855-866.
- Birdee, G., Yeh, G., Wayne, P., Phillips, R., Davis, R., & Gardiner, P. (2009). Clinical applications of yoga for the pediatric population: A systemic review. *Academic Pediatrics, 9*, 212-220.
- Bishop, S. (2002). What do we really know about mindfulness-based stress reduction? *Psychosomatic Medicine, 64*, 71-84.
- Black, D., Milam, J., & Sussman, S. (2009). Sitting-meditation interventions among youth: A review of treatment efficacy. *Pediatrics, 124*, e532-e541.
- Bögels, S., Hoogstad, B., van Dun, L., de Schutter, S., & Restifo, K. (2008). Mindfulness training for adolescents with externalizing disorders and their parents. *Behavioural and Cognitive Psychotherapy, 36*, 193-209.
- Bootzin, R., & Stevens, S. (2005). Adolescents, substance abuse, and the treatment of insomnia and daytime sleepiness. *Clinical Psychology Review, 25*, 629-644.
- Britton, W., Bootzin, R., Cousins, J., Hasler, B., Peck, T., & Shapiro, S. (2010). The contribution of mindfulness practice to a multi-component behavioral sleep intervention following substance abuse treatment in adolescents: A treatment-development study. *Substance Abuse, 31*, 86-97.
- Brobeck, E., Marlund, B., Haraldsson, K., & Berntsson, L. (2007). Stress in children: How fifth-year pupils experience stress in everyday life. *Scandinavian Journal of Caring Science, 21*, 3-9.
- Brooks, J. (2006). Strengthening resilience in children and youths: Maximizing opportunities through the schools. *Children & Schools, 28*(2), 69-76.
- Brown, K., & Ryan, R. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822-848.
- Brown, R., & Gerbarg, P. (2005). Sudarshan Kriya Yogic breathing in the treatment of stress, anxiety, and depression. Part II: Clinical applications and guidelines. *Journal of Alternative and Complementary Medicine, 11*, 711-717.
- Burke, C. (2010). Mindfulness-based approaches with children and adolescents: A preliminary review of current research in an emergent field. *Journal of Family Studies, 19*, 133-144.
- Butler, L., Waelde, L., Hastings, T., Chen, X., Symons, B., Marshall, J., ... Spiegel, D. (2008). Meditation with yoga, group therapy with hypnosis, and psychoeducation for long-term depressed mood: A randomized pilot trial. *Journal of Clinical Psychology, 64*, 806-820.
- Carmody, J., & Baer, R. (2007). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine 30-37*.
- Carter, J. S., Garber, J., Ciesla, J. A., & Cole, D. A. (2006). Modeling relations between hassles and internalizing and externalizing symptoms in adolescents: A four-year prospective study. *Journal of Abnormal Psychology, 115*, 428-442.
- Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy peoples: A review and meta-analysis. *The Journal of Alternative and Complementary Medicine, 15*, 593-600.
- Chödrön, P. (2001). *The places that scare you: A guide to fearlessness in difficult times*. Boston, MA: Shambhala Publications.
- Cohen-Katz, J., Wiley, S., Capuano, T., Baker, D., Deitrick, L., & Shapiro, S. (2005). A qualitative and quantitative study, part III. *Holistic Nursing Practice, 19*, 78-86.
- Compas, B. (2001). Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin, 127*, 87-127.
- Compas, B., Malcarne, V., & Fondacaro, D. (1988). Coping with stressful events in older children and young adolescents. *Journal of Consulting and Clinical Psychology, 56*(3), 405-411.
- daSilva, G., Lornzi-Filho, G., & Lage, L. (2007). Effects of yoga and the addition of Tui Na in patients with fibromyalgia. *Journal of Alternative and Complementary Medicine, 13*, 1107-1013.
- Eccles, J. (1999). The development of children ages 6 to 14. *The Future of Children, 9*, 30-44.
- Erikson, E. (1963). *Childhood and society*. New York, NY: W.W. Norton & Company. (Original work published 1950).
- Faul, F. (2008). gpower [Computer software]. Kiel, Germany: Universitat Kiel.
- Galantino, M., Galbavy, R., & Quinn, L. (2008). Therapeutic effects of yoga for children: A systematic review of the literature. *Pediatric Physical Therapy, 20*, 66-80.

- Granath, J., Ingvarsson, S., von Thiele, U., & Lundberg, U. (2006). Stress management: A randomized study of cognitive behavioural therapy and yoga. *Cognitive Behavioral Therapy, 35*, 3-10.
- Grant, K. E., Compas, B. E., Thurm, A. E., McMahon, S. D., Gipson, P. Y., ... Westerholm, R. (2006). Stressors and child and adolescent psychopathology: Evidence of moderating and mediating effects. *Clinical Psychology Review, 26*, 257-283.
- Greeson, J. (2009). Mindfulness research update: 2008. *Complementary Health Practice Review, 14*(1), 10-18.
- Griffith, M. A., Dubow, E. F., & Ippolito, M. F. (2000). Developmental and cross-situational differences in adolescents' coping strategies. *Journal of Youth and Adolescence, 29*, 183-203.
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Meta-analysis of mindfulness-based stress reduction. *Focus on Alternative and Complementary Therapies, 57*, 35-43.
- Gunnar, M., Wewerka, S., Frenn, K., Long, J., & Griggs, C. (2009). Developmental changes in hypothalamus-pituitary-adrenal activity over the transition to adolescence: Normative changes and associations with puberty. *Development and Psychopathology, 21*, 69-85.
- Hampel, P., & Peterman, F. (2006). Perceived stress, coping, and adjustment in adolescents. *Journal of Adolescent Health Care, 38*, 409-415.
- Harter, S. (1982). The perceived competence scale for children. *Child Development, 53*, 87-97.
- Harter, S. (1985). *The Self-Perception Profile for Children: Revision of the Perceived Competence Scale for Children*. Denver, CO: University of Denver.
- Harter, S. (1986). Processes underlying the construction, maintenance, and enhancement of the self-concept in children. In: *Psychological perspectives on the self* (Vol 3, pp. 136-181). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hayes, A., & Feldman, G. (2004). Clarifying the construct of mindfulness in the context of emotion regulation and the process of change in therapy. *Clinical Psychology: Science and Practice, 11*, 255-262.
- Horowitz, J. A., Vessey, J., Carlson, D. L., Bradley, J. F., Montoya, C., McCullough, B., ... David, J. (2004). Teasing and bullying experiences of middle school students. *Journal of the American Psychiatric Nurses Association, 10*, 165-172.
- Huang, C.-Y., & Menke, E. (2001). School-aged homeless sheltered children's stressors and coping behaviors. *Journal of Pediatric Nursing, 16*, 102-109.
- Jacobson, G. (1994). The meaning of stressful life experiences in nine-to-eleven-year-old children: A phenomenological study. *Nursing Research, 43*, 95-99.
- Jain, S., Rai, L., Valecha, A., Jha, U., Bhatnagar, S., & Ram, K. (1991). Effect of yoga training on exercise tolerance in adolescents with childhood asthma. *Journal of Asthma, 28*, 437-442.
- Jenkins, S., Rew, L., & Sternglanz, R. (2005). Eating behaviors among school-age children associated with perceptions of stress. *Issues in Comprehensive Pediatric Nursing, 28*, 175-192.
- Kabat-Zinn, J. (2005). *Full catastrophe living*. New York, NY: Random House. (Original work published 1990).
- Kliewer, W., & Sandler, I. (1992). Locus of control and self-esteem as moderators of stressor-symptom relations in children and adolescents. *Journal of Abnormal Child Psychology, 20*, 393-413.
- Kuttner, L., Chambers, C., Hardial, J., Israel, D., Jacobson, K., & Evans, K. (2006). A randomized trial of yoga for adolescents with irritable bowel syndrome. *Pain Res Manage, 11*, 217-223.
- Lazarus, R. (2006). Emotions and interpersonal relationships: Toward a person-centered conceptualization of emotions and coping. *Journal of Personality, 74*, 9-46.
- Lee, J., Semple, R., Rosa, D., & Miller, L. (2008). Mindfulness-based cognitive therapy for children: Results of a pilot study. *Journal of Cognitive Psychotherapy: An International Quarterly, 22*(1), 15-28.
- LeMoal, M. (2007). Historical approach and evolution of the stress concept: A personal account. *Psychoneuroendocrinology, 32*, 53-59.
- Lewis, C., Siegel, J., & Lewis, M. (1984). Feeling bad: Exploring sources of distress among pre-adolescent children. *American Journal of Public Health, 74*, 117-122.
- Luthar, S. (2003). The culture of affluence: Psychological costs of material wealth. *Child Development, 74*, 1581-1593.
- Mandanmohan, J., Udupa, K., & Bhavanani, A. (2003). Effect of yoga training on handgrip, respiratory pressures and pulmonary function. *Indian Journal of Physiology and Pharmacology, 47*, 387-392.
- Manjunath, N., & Telles, S. (2004). Spatial and verbal memory test scores following yoga and fine arts camps for school children. *Indian Journal of Physiology and Pharmacology, 48*, 353-356.
- Manjunath, N., & Telles, S. (2001). Improved performance in the Tower of London test following yoga. *Indian Journal of Physiology and Pharmacology, 45*, 351-354.
- Mason, O., & Hargreaves, I. (2001). A qualitative study of mindfulness-based cognitive therapy for depression. *British Journal of Medical Psychology, 74*, 197-212.
- McEwen, B. (2005). Stressed or stressed out: What is the difference. *Journal of Neuroscience, 30*, 315-318.
- Michalsen, A., Grossman, P., Acil, A., Langhorst, J., Ludtke, R., Esch, T., ... Dobos, G. (2005). Rapid stress reduction and anxiety among distressed women as a consequence of a three-month intensive yoga program. *Medical Science Monitor, 11*, CR555-CR561.
- Napoli, M., Krech, P., & Holley, L. (2005). Mindfulness training for elementary school students: The Attention Academy. *Journal of Applied School Psychology, 21*(1), 99-125.
- Orlando, M., Ellickson, P. L., & Rand, K. J. (2001). The temporal relationship between emotional distress and cigarette smoking during adolescence and young adulthood. *Journal of Consulting and Clinical Psychology, 69*, 959-970.
- Ospina, M. (2008). Clinical trials of meditation practices in health care: Characteristics and quality. *The Journal of Alternative and Complementary Medicine, 14*, 1199-1213.
- Ott, M. J. (2002). Mindfulness meditation in pediatric clinical practice. *Pediatric Nursing, 28*, 487-490.
- Robins, R., & Trzesniewski, K. (2005). Self-esteem development across the lifespan. *Current Directions in Psychological Science, 14*, 158-162.
- Rocha, E., Marche, T., & von Baeyer, C. (2009). Anxiety influences children's memory for procedural pain. *Pain Research Management, 14*(3), 233-237.
- Rosaen, C., & Benn, R. (2006). The experience of transcendental meditation in middle school students: A qualitative report. *Explore, 2*, 422-425.
- Rutter, M. (2006). Implications of resilience concepts for scientific understanding. *Annals of the New York Academy of Sciences, 1094*, 1-12.
- Ryan-Wenger, N. (1990). Development and psychometric properties of the schoolagers' coping strategies inventory. *Nursing Research, 39*, 344-349.
- Ryan-Wenger, N. (2002). Impact of the threat of war on children in military families. *Journal of Pediatric Health Care, 16*, 245-252.
- Ryan-Wenger, N., Sharrer, V., & Campbell, K. (2005). Changes in children's stressors over the past 30 years. *Pediatric Nursing, 31*(4), 282-291.
- Search Institute. (2006). *40 Developmental Assets*. Minneapolis, MN: Search Institute. Retrieved from <http://www.search-institute.org/development-assets-tools>
- Semple, R., Lee, J., Rosa, D., & Miller, L. (2010). A randomized trial of mindfulness-based cognitive therapy for children: Promoting mindful attention to enhance social-emotional resiliency in children. *Journal of Child and Family Studies, 19*, 218-229.
- Semple, R., Reid, E., & Miller, L. (2005). Treating anxiety with mindfulness: An open trial of mindfulness training for anxious children. *Journal of Cognitive Psychotherapy, 19*(4), 379-392.

- Sharrer, V. W., & Ryan-Wenger, N. M. (1994). A longitudinal study of age and gender differences of stressors and coping: Strategies in school-age children. *Journal of Pediatric Health Care, 9*, 123-130.
- Sharrer, V. W., & Ryan-Wenger, N. M. (2002). School age children's self-reported stress symptoms. *Pediatric Nursing, 28*, 21-27.
- Sibinga, E., Stewart, M., Magyari, T., Welsh, C., Hutton, N., & Ellen, J. (2008). Mindfulness-based stress reduction for HIV-infected youth. *Explore, 4*, 36-37.
- Simonds, J., Kieras, J., Rueda, M., & Rothbart, M. (2007). Effortful control, executive attention, and emotional regulation in 7-10-year-old children. *Cognitive Development, 22*, 474-488.
- Singh, N., Lancioni, G., Subhashni, D., Singh, J., Winton, A., Sabaawi, M., ... Singh, J. (2007). Adolescents with conduct disorder can be mindful of their aggressive behavior. *Journal of Emotional Behavior Disorders, 15*(1), 56-63.
- Skinner, E., & Zimmer-Gembeck, M. (2007). The development of coping. *Annual Review of Psychology, 58*, 119-144.
- Skybo, T. (2005). Witnessing violence: Biopsychosocial impact on children. *Pediatric Nursing, 31*, 263-270.
- Skybo, T., & Buck, J. (2007). Stress and coping responses to proficiency testing in school-age children. *Pediatric Nursing, 33*(5), 410-417.
- Smith, C., Hancock, H., Blake-Mortimer, J., & Eckert, K. (2007). A randomized comparative trial of yoga and relaxation to reduce stress and anxiety. *Complementary Therapies, 15*, 77-83.
- Strine, T., Okor, C., McGuire, L., & Balluz, L. (2006). The associations among childhood headaches, emotional and behavioral difficulties, and health care use. *Pediatrics, 117*(5), 1728.
- Stroud, L., Foster, E., Papandonatos, G., Handwerker, K., Granger, D., Kivlighan, K., & Niaura, R. (2009). Stress response and the adolescent transition: Performance versus peer rejection stressors. *Development and Psychopathology, 21*, 47-68.
- Stueck, M., & Gloeckner, N. (2005). 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 Development and Care, 175*, 371-377.
- Taxis, J. C., Rew, L., Jackson, K., & Kouzekanani, K. (2004). Protective resources and perceptions of stress in a multiethnic sample of school-age children. *Pediatric Nursing, 30*(6), 477-489.
- Thompson, M., & Gauntlett-Gilbert, J. (2008). Mindfulness with children and adolescents: Effective clinical application. *Clinical Child Psychology and Psychiatry, 13*(3), 395-407.
- Thomsen, A. (2002). Parent reports of coping and stress responses in children with recurrent abdominal pain. *Journal of Pediatric Psychology, 27*(3), 215-226.
- Tsao, J., Meldrum, M., Kim, S., Jacob, M., & Zeltzer, L. (2007). Treatment preferences for CAM in children with chronic pain. *Evidence Based Complementary and Alternative Medicine, 4*, 367-374.
- van den brink, M., Bandell-Hoekstra, E. N. G., & Abu-Saad, H. (2001). The occurrence of recall bias in pediatric headache: A comparison of questionnaire and diary data. *Headache, 41*, 11-20.
- Waelde, L., Thompson, L., & Gallagher-Thompson, D. (2004). A pilot study of a yoga and meditation intervention for dementia caregiver stress. *Journal of Clinical Psychology, 60*, 677-687.
- Wagner, B., Compas, B., & Howell, D. (1988). Daily and major life events: A test of an integrative model of psychosocial stress. *American Journal of Community Psychology, 16*(2), 189-205.
- Walker, L. S., Smith, C. A., Garber, J., & Claar, R. L. (2006). Appraisal and coping with daily stressors by pediatric patients with chronic abdominal pain. *Journal of Pediatric Psychology, 31*(1-11), 1-11.
- Washburn-Ormachea, J. M., Hillman, S. B., & Sawilowsky, S. S. (2004). Gender and gender-role orientation differences on adolescents' coping with peer stressors. *Journal of Youth and Adolescence, 31*, 31-40.
- West, A. (2008). *Mindfulness and well-being in adolescence: An exploration of four mindfulness measures with an adolescent sample (Unpublished doctoral dissertation)*. Mount Pleasant, MI: Central Michigan University.
- White, K., & Farrell, A. (2005). Anxiety and psychosocial stress as predictors of headache and abdominal pain in urban early adolescents. *Journal of Pediatric Psychology, 31*(6), 582-596.
- Woolery, A., Meyers, H., Sternlieb, B., & Zeltzer, L. (2004). Yoga intervention for young adults with elevated symptoms of depression. *Alternative Therapies in Health and Medicine, 10*, 60-63.
- Zylowska, L., Ackerman, D., Yang, J., Futrell, N., Horton, N., Hale, T., ... Smalley, S. (2008). Mindfulness meditation training in adults and adolescents with ADHD: A feasibility study. *Journal of Attention Disorders, 11*(6), 737-746.