Facilitating Speech-Language Pathology Graduate Students’ Ability To Manage Stress: A Pilot Study

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Stress is a reality of life, and most people encounter various stressors on a daily basis. These stressors can range from simple items (e.g., trying to find misplaced keys or deciding where to eat lunch) to large life-altering occurrences (e.g., the loss of a loved one, loss of a job, or divorce). Many people cope effectively with small, occasional stressors. Indeed, a certain level of stress is necessary for growth, and some individuals become more productive under stressful conditions (Lincoln, Adamson, & Covic, 2004; Rizzolo, Zipp, Stiskal, & Simpkins, 2009; Ross, 2011).

When stress is not well managed, however, it can become chronic, and a host of debilitating and life-threatening conditions may ensue, such as impaired immune system functioning; increased inflammation; decreased bone density; memory loss; weight gain; and increased blood sugar, cholesterol levels, and...

ABSTRACT: Purpose: The authors of this study explored the perceived levels of stress, as measured by the Perceived Stress Scale (Cohen, Karmarck, & Mermelstein, 1983), experienced by speech-language pathology students in their 1st semester of graduate school and investigated techniques that could help these students manage their perceived stress effectively.

Method: As part of a required course, 50 1st-semester graduate students in communication sciences and disorders received instruction in general stress management techniques (e.g., breath techniques, refuting irrational ideas, maintaining a stress journal). Twenty-six of these students also participated in 1 yoga class per week for 6 weeks. For the students in the yoga classes, a 1-group single-treatment counterbalanced design (Hegde, 1994) was used. This design has 2 conditions—a no-treatment and a treatment condition—so each participant experienced both conditions and served as her own control. Half of the students participated in yoga during the 1st half of the semester, and the other half participated in yoga during the 2nd half of the semester.

Results: Students who participated in the yoga classes had relatively high levels of stress as they began graduate school and that use of general stress management techniques did not lower their perceived stress level. However, participation in at least 5 of the 6 yoga classes resulted in significantly lowered levels of perceived stress. This was especially true for the students who participated in yoga at the beginning of the semester.

Conclusion: Training institutions should recognize the stress that graduate students might be experiencing and help them learn techniques for managing stress before their stress levels become chronic. Carefully designed yoga classes appear to be an effective method for doing this.

KEY WORDS: yoga, graduate students, stress management, speech-language pathology
triglycerides (McCall, 2007). Additionally, high levels of stress can adversely affect individuals’ productivity and overall attitudes (Lincoln et al., 2004; Ross, 2011).

**Occupational Stress**

One significant source of stress is that caused by an individual’s occupation. Occupational stress develops “when the work environment produces negative psychological and physiological effects” (Severn, Searchfield, & Huggard, 2012, p. 3) and can lead to professional burnout, compassion fatigue, and a reduction in compassion satisfaction (Severn et al., 2012). Burnout can result in “reduced personal and professional accomplishment, feelings of hopelessness, exhaustion, disconnectedness, difficulties in dealing with work or doing ones job effectively” (Severn et al., p. 3).

According to Severn et al. (2012), compassion fatigue occurs when professionals witness or have knowledge of a trauma experienced by another person, which can result in a number of negative consequences that affect the professionals in their own lives as well as in their ability to perform their jobs optimally. Severn et al. defined compassion satisfaction as the joy and satisfaction that a person finds in performing a job well. Obviously, occupational stress can result in serious consequences that affect not only the professional, but also the people the professional is obligated to serve.

The effects of occupational stress and professional burnout have been studied for individuals in various educational professions (e.g., regular educators and special educators; Fimian, Lieberman, & Fastenau, 1991; Harris, Prater, Dyches, & Heath, 2009) and medical professions (Severn et al., 2012). Despite the fact that speech-language pathologists (SLPs) work in both educational and medical settings and are exposed to stressors similar to those experienced by educators and medical personnel, Fimian et al. stated in 1991 that little research had focused on how occupational stress and burnout affect SLPs. Eighteen years later, Harris et al. (2009) echoed similar concerns: A very small number of studies have been directed toward how stress and burnout affect SLPs.

College students are another group of individuals who are at risk for developing chronic and occupational stress. Baker (2012) indicated that “approximately 80% of college students identify themselves as ‘moderately stressed’ or ‘burned out’” (p. 2). Rizzolo et al. (2009) suggested that students who are in health science programs might be at particular risk for developing stress-related symptoms because they not only have to deal with the academic rigors of their programs but also are involved in patient care.

Additionally, according to Harris et al. (2009), future SLPs, our current students, may be anticipating negative job circumstances that will lead to occupational stress at the same time that they are experiencing the stress of being a student.

Although the effects of stress and how it affects students’ ability to learn academically have been studied for students in physical and occupational therapy programs (Rizzolo et al., 2009), our computer searches found only one article related to speech-language pathology students. Specifically, we searched ComDisDome using the terms “stress and speech-language pathology”; CINAHL using the terms “stress management and students, speech-language pathology” and “burnout and students, speech-language pathology”; and PsychInfo using the terms “speech-language pathology, college students/or students, and occupational stress/or stress management.”

The one article we found from these searches investigated the perceptions of stress experienced by Australian students majoring in speech pathology during their clinical placements and the coping skills they used to deal with it (Lincoln et al., 2004). The authors asked bachelor’s-level students to complete questionnaires at three different times (i.e., at the end of their 3rd year, in the first semester of their 4th year, and at the end of their 4th year). A questionnaire regarding time organization and management was administered at all three times. During the second testing session, the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) and a 60-item coping inventory were also administered. On the basis of the data collected, Lincoln et al. (2004) suggested that although the students reported moderate levels of stress, the levels of stress were not high enough to result in negative consequences to the students during their clinical placements. Additionally, student responses indicated that they engaged in appropriate coping strategies. The authors concluded that their respondents’ good time management and coping strategies allowed them to manage stress appropriately, which was a good indication that these students would be able to avoid professional burnout.

Although the findings of Lincoln et al. (2004) are optimistic, they were based on students in a bachelor’s-level degree program in Australia. Little is known about the levels of stress experienced by graduate-level students in the United States. Cultural differences (e.g., educational level and setting, age, country of origin) that reduce the ability to generalize Lincoln et al.’s results to American graduate students exist between these two groups. Additionally, Lincoln et al. administered the PSS only one time, so changes in perceived levels of stress over time are not known.
SLPs are at risk for occupational stress and professional burnout, yet we as a profession have spent little time studying either the causes or the effects of occupational stress on SLPs (Harris et al., 2009), nor have we examined the stress that our students may be experiencing. Rizzolo et al. (2009) suggested that students’ feelings of stress start while they are in school and can continue throughout their professional life. Many factors influence individuals’ success in a profession and their ability to enjoy their careers over their lifetimes and to provide their clients with the most optimal services possible. Some of these factors appear to be the ability to manage stress appropriately and to avoid professional burnout. If training program instructors aim to produce successful and resilient SLPs, then we are remiss in our duties if we do not investigate the levels of stress that our students are experiencing and seek to educate them about healthy strategies for managing possible future occupational stress.

**Stress Management**

Various methods for managing stress and for reducing the risks associated with chronic stress exist (Davis, Eshelman, & McKay, 2008). One method suggested by Davis et al. (2008) is to maintain a stress diary in which an individual records when a stressful event occurs and the resulting physical or emotional reaction to it. This allows an individual to begin tracking events that are stressful, noting when they occur and how he or she reacts to them.

The ability to recognize and refute irrational thoughts is another method that can help build optimism and decrease an individual’s perceived levels of stress (Davis et al., 2008; Seligman, 2002). Belief in irrational ideas (e.g., I will never be able to pass this test and then I’ll fail out of school and my life will be over) can lead to such negative consequences as anxiety, depression, and chronic stress.

Various breathing techniques have also been found to be effective in calming the nervous system and decreasing stress (Davis et al., 2008; McCall, 2007). Breathing to sustain life is controlled through the involuntary autonomic nervous system; fortunately, no person with a healthy respiratory system has to think about each breath that is taken. However, breath can also be controlled voluntarily. By increasing one’s rate of breath voluntarily, a person can trigger the flight or fight response. Conversely, by slowing and deepening one’s rate of breath, a person can trigger the relaxation response (Borysenko, 1987; McCall, 2007). Slow, deep breaths can result in a relaxed nervous system and a calm mind. Breathing techniques can be as simple as slowing the breath while counting each exhale or sighing deeply several times after a normal inhale (Davis et al., 2008).

Benson and Klipper (2001) incorporated breath work in their directions on evoking the relaxation response. Benson and Klipper instructed an individual to first choose a word or phrase that is firmly embedded in the person’s belief system. Then, the individual should sit with eyes closed in a comfortable position and attempt to relax all muscles and breathe quietly through the nose while bringing awareness to the breath by silently repeating the chosen word with each exhalation.

Another stress reduction technique is yoga (Bondura & Pargman, 2009; McCall, 2007; Ornish, 2007). Indeed, in his extensive review of the literature on yoga, Broad (2012) concluded that “the portrait of yoga that emerges from decades of mood and metabolic studies is of a discipline that succeeds brilliantly at smoothing the ups and downs of emotional life” (p. 102). Yoga is an ancient discipline that has recently gained in popularity in the United States; it is estimated that approximately 20 million individuals now participate in yoga (Hawkins, Stegall, Weber, & Ryan, 2012).

When people are stressed, they often carry this stress in their bodies, especially in the areas of the back, chest, shoulders, neck, and face (Borysenko, 1987). Borysenko (1987) described an anxiety cycle in which a stressor activates the flight or fight response, muscles tense, and the breath rate increases. If the physical tension is not released, the body continues to send signals to the autonomic nervous system that the person is in a stressful situation, and a vicious anxiety cycle is activated. Over time, not only do the consequences of chronic tension that has already been discussed begin to appear, but muscles can become chronically tensed, leading to physical pain. The physical postures (i.e., asana) practiced in yoga can help reduce physical stress in the body. Yoga postures use primarily stretching and strengthening techniques and, when applied appropriately, increase a person’s flexibility and leave the practitioner with a sense of calm, relaxation, and refreshment (Smith, Greer, Sheets, & Watson, 2011).

Perhaps the most important stress management tool offered by yoga is pranayama, or the science of the breath (McCall, 2007). Kraftsow (1999) described a lineage of yoga known as Viniyoga. One of the primary tenets on which Viniyoga is based is the primacy of the breath (Kraftsow, 1999, 2002). Viniyoga teaches that the breath, through the movement of the primary and secondary muscles of respiration, initiates movement in asana and links awareness to the spine. So, through practicing asana, a person can become more aware of the breath and the flow of the
Purpose of the Study

Practicing SLPs are at risk for developing professional burnout (Fimian et al., 1991; Harris et al., 2009), and speech-language pathology students may experience elevated levels of stress during their graduate studies (Harris et al., 2009; Rizzolo et al., 2009). Knowledge of the perceived stress levels experienced by speech-language pathology graduate students and techniques that can help them deal with stresses experienced is minimal. The purpose of this study, therefore, was to increase the knowledge base regarding students’ perceived levels of stress and appropriate techniques that can be used to assist students to manage their stress.

Many techniques exist for managing stress (Davis et al., 2008; Ross, 2011), yet few studies have investigated which, if any, of these techniques work for speech-language pathology graduate students. Additionally, many studies have supported the effectiveness of yoga as a tool for managing stress, yet few have used college students as participants (Moss, 2003). The specific purposes of this study, therefore, were to (a) administer the PSS to document perceived levels of stress in students who were beginning their graduate studies in speech-language pathology, (b) investigate the effectiveness of a general program of stress reduction for these students, and (c) determine if the addition of yoga classes designed to decrease stress to the general program of stress reduction would help lower these students’ perceived levels of stress during their first semester of graduate school.

Method

Participants

All 1st-year students in the master’s-level speech-language pathology program at a midwestern university were invited to participate in the study. Of the 50 possible participants, 27 agreed to participate in yoga classes, and 23 others agreed to serve as the comparison group. The 27 students who agreed to participate in yoga were randomly divided into two subgroups by assigning each student a number and using a table of random numbers to place them either in the group that met the first 6 weeks of the semester (Subgroup 1a) or in the group that met the second 6 weeks (Subgroup 1b; the rationale for this grouping is given in the yoga portion of the Procedure section). In this manner, three groupings of students were formed: 13 in Subgroup 1a, 14 in Subgroup 1b, and 23 in Group 2. One participant in Subgroup 1b asked to withdraw from the study after the first session because she preferred more active forms of exercise for stress reduction. Therefore, analyses were conducted on 26 participants in the yoga condition. The number of participants in Group 2 was reduced to 20 in the first testing session and to 19 in the third testing session based on attendance during the time of testing. (The order of sessions is described in the Procedure section.)

All students who completed the study either as yoga or comparison participants were Caucasian females and full-time students. Only one student in Subgroup 1b indicated that she had any significant previous experience with yoga. The majority of the study participants lived in off-campus student housing with roommates or, if they were married, with their spouses. The mean age of the participants in Subgroup 1a was 21.85 years, with a range of 20 to 23 years; three were married. The mean age of participants in Subgroup 1b was 22.5 years, with a range of 21 to 27 years; one was married. The students in Group 2 had a mean age of 23 years, with a range of 21 to 31 years; four were married. The average undergraduate GPA for this group of first-semester graduate students was approximately 3.8 on a 4.0 scale.

Measures

Students’ perceived levels of stress were measured using the PSS, which is a 10-item scale that is designed to assess individuals’ perceived levels of stress. The PSS has been proven to be a valid and reliable scale (Cohen & Janicki-Deverts, 2012). Specifically, Cohen and Janicki-Deverts (2012) reported high values of internal reliability (i.e., .78 and .91) and indicated that high levels on the PSS have been associated with a wide range of health consequences that are associated with chronic stress (e.g., elevated markers of biological aging, higher cortisol levels, suppressed immune functioning). Cohen et al. (1983) stated that when using the PSS, “the best predictions occur within a one- or two-month period” (p. 393). The length of the yoga classes (in our study) was 6 weeks and so fell within this range of best predictive validity. Additionally, Cohen and Janicki-Deverts compared the results of data collected more than 20 years apart (i.e., 1983, 2006, and 2009) on large national samples and found consistency between the results, meaning that the PSS continues to be an effective measurement tool 30 years after it was first published.
We also asked the students to complete a questionnaire regarding stress management following completion of the study. Items on the questionnaire were designed by the first author to elicit information from the students regarding their knowledge of stress management, their utilization of stress management techniques, and how effective they found these techniques to be (see Appendix A).

**Procedure**

All 50 of the first-year graduate students attended a professional seminar, which is a required component of their clinical experience. This class met once a week for 50 min for one semester (18 weeks). All PSS testings and completion of the final survey were completed in a university classroom in which the participants met regularly.

**General stress management.** The general stress management unit was a component of the professional seminar course. All 50 students completed the PSS at the beginning of the first class. Additionally, all students were given assignments based on techniques found in Davis et al.’s (2008) workbook on stress management. Specifically, all students were required to maintain a stress diary for a month wherein they noted when a stressful event occurred, what their physical and emotional reactions were to the event, and what they did to reduce the stress. Students were also expected to choose one of the following stress management techniques to practice: deep, focused breathing while counting the breath; normal inhalation followed by a sighing exhalation done 8–12 times; or mantra meditation (i.e., selecting a word or syllable that is meaningful and repeating it silently with focused attention on the mantra). Students also had the option of practicing the relaxation response as outlined by Benson and Klipper (2001). Students were expected to practice their chosen technique at least one time a day 5 days a week for a month and to complete a record of how they felt before and after practicing the technique.

The first two professional seminar classes of the fall semester were devoted to lectures by the first author, who is a tenured faculty member with more than 30 years of experience as a certified SLP. These two classes discussed the causes and effects of chronic stress as well as methods of managing stress (i.e., keeping a stress journal; how to change the situation or your reaction to the situation; refuting irrational ideas; the relaxation response; the importance of breath and breathing techniques; meditation; and mindfulness practices). The assignments listed above were given at the end of the first class.

After the classes were completed, the students in the course were divided into three smaller groups. Each group attended one professional seminar class over the next 3 weeks so they could engage in the following active learning experiences: refuting irrational thoughts, practicing mindful eating, and engaging in a breathing exercise.

Following the stress management unit, all of the students also participated in a time management unit. This unit was led by a member of the university’s advisement center and followed the same format as the stress management unit. The first class was a large lecture in which students were informed of the importance of time management skills and were given some general ideas on how to manage their time wisely. Then, the students in the course were divided into three smaller groups, and each group met one more time during the month to engage in small-group discussions of time management techniques.

**Yoga.** A one-group single-treatment counterbalanced design (Hegde, 1994) was used with the participants who engaged in the yoga classes. Hegde (1994) described this design as having two conditions: a no-treatment condition and a treatment condition. Under this design, each participant experiences both conditions and serves as his or her own control. A difference score is determined between each participant’s pre- and postcondition (i.e., treatment vs. no treatment) scores. All difference scores are then pooled and averaged. Average scores for each condition are compared to determine the effect of treatment versus no treatment.

A potential threat to internal validity in this design is a sequencing effect in which the order of conditions is a factor in the outcome. To avoid a sequencing effect, participants must be divided into two subgroups in which the order of the treatment and no-treatment conditions is counterbalanced. Therefore, we had Subgroup 1a complete 6 consecutive weeks of one 60-min yoga class per week, starting at the beginning of the fall semester. Subgroup 1b received the no-treatment condition during the first 6-week block. At the end of the first 6-week block, all of the participants (i.e., all participants in both yoga subgroups and the comparison participants) completed the PSS a second time. Subgroup 1b then completed 6 weeks of one 60-min yoga class per week starting the week after Subgroup 1a completed their yoga classes, and Subgroup 1a received the no-treatment condition. The second set of classes was also held on consecutive weeks with the exception of a 1-week break between the fifth and sixth class due to Thanksgiving break. At the end of the second 6-week block, all of the participants again completed the PSS. At this time, the participants also completed the questionnaire appropriate for their group (i.e., yoga vs. comparison).
All yoga classes were held in the same gym, which was provided for the instructor by the university’s wellness program. Yoga mats were supplied for the students. The same yoga instructor (the first author) taught all of the classes. The instructor has taught yoga classes for 15 years and is registered as a yoga instructor through Yoga Alliance and is certified as a yoga therapist through the American Viniyoga Institute. The yoga sessions were originally designed as part of the final project that the instructor completed for her training to become a yoga therapist. The intent of the sessions was to use Viniyoga principles to reduce stress through the use of carefully sequenced postures and breath work. The same sequence of postures was followed in each class, with more challenging adaptations added in the third through sixth sessions (see Appendix B).

Data Analysis

Respondents rated each PSS item on a 5-point scale with 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often. Four items are worded in a positive manner and were reverse scored. Scores on all items were totaled; the higher the total score, the higher the perceived level of stress.

To determine the initial levels of perceived stress that were experienced by the first-semester speech-language pathology graduate students, we compared these participants’ mean PSS scores from the first testing session to the unadjusted mean PSS scores reported by Cohen and Janicki-Deverts (2012) for women, for individuals under age 25 years, and for members of the White race.

A paired-samples t test was calculated to determine the effect of the yoga treatment versus no-treatment conditions. PSS difference scores between pre- and posttesting were the dependent variable for the paired t test. Eighteen of the 26 participants in the yoga classes completed at least five of the six classes. Because sample size fell below what is needed for a parametric test of statistical significance, we calculated a nonparametric related-samples Wilcoxon signed-ranks test in order to determine the effect of attendance on the PSS pretest and posttest scores.

To determine if a sequencing effect existed between Subgroups 1a and 1b, a nonparametric independent-samples Mann–Whitney U test was calculated.

A one-way analysis of variance (ANOVA) with time of testing as the independent variable and total PSS score as the dependent variable was calculated for the comparison group to determine the effect of the general stress management program. Two, 2 (yoga vs. comparison group) × 2 (time, pre vs. post PSS scores) ANOVAs with repeated measures on the last factor were calculated to determine if differences in PSS scores existed between the comparison and yoga groups over time. One ANOVA was calculated with all students in the yoga group; the other was calculated with only those students who attended at least five of the six yoga classes. Alpha was set at .05 for all statistical analyses.

All responses to each of the questions on the questionnaires completed by the students who were involved in yoga classes and those who were not were transcribed by the first author into an Excel spreadsheet. After this, the first author independently determined themes arising from the students’ responses to each question. The second author reviewed and concurred with these themes. An undergraduate research assistant reviewed the transcribed responses to ensure the accuracy of the transcriptions. The research assistant was then trained to understand the meaning of the theme codes. When she indicated that she understood each code, she independently coded each response given by all participants in both the yoga and comparison groups. A unit-by-unit agreement index was calculated for each question by dividing the number of codes agreed on by the first author and the research assistant by the number of agreed-on codes plus the number of disagreed-on codes.

RESULTS

PSS Scores

The mean initial PSS score for the comparison participants was 18.95 (SD = 4.75) and for the participants in the yoga condition was 17.41 (SD = 5.93). Cohen and Janicki-Deverts (2012) reported that in 1983, the mean PSS score for women was 13.68 (SD = 6.57), for individuals under 25 years of age was 14.54 (SD = 5.95), and for members of the White race was 12.80 (SD = 6.23). In 2009, the mean scores for the same groups were 16.14 (SD = 7.56), 16.78 (SD = 6.86), and 15.70 (SD = 7.51), respectively.

Paired-samples t test results for the students in the yoga classes indicated that there was no statistically significant effect of the yoga classes, t(25) = 1.23, p = .23. Given that the number of yoga classes attended could reasonably have an influence on the effectiveness of this stress management technique, we calculated a related-samples Wilcoxon signed-ranks test using the data from the 18 participants with high attendance (i.e., those who attended at least five of the six sessions). A statistically significant result at p = .04 was found. The mean pretest PSS score for these 18 participants was 16.83 (SD = 5.15), and the mean posttest PSS score was 13.39 (SD = 6.53). To
determine effect size, we calculated Cohen’s $d$ (Meline, 2006). The result was $d = 0.58$, which indicates a medium effect size. To determine if a sequencing effect existed between Subgroups 1a and 1b, we calculated an independent-samples Mann–Whitney $U$ test. The resulting decision was to reject the null at $p = .027$ (see Table 1 for means and standard deviations). Cohen’s $d$ was calculated to determine the effect size of this significant result. Cohen’s $d = 1.17$, which indicates a large effect size.

The one-way ANOVA for the comparison groups’ PSS scores over the three testing sessions indicate that there was no significant change in PSS scores over time, $F(2, 54) = .12, p = .89$. Because there was no significant difference in scores over time, the first and last PSS scores were used for this group as their pre and post scores in both $2 \times 2$ (time, pre-vs. post-PSS scores) ANOVAs (see Table 2). Results of the ANOVA comparing all students in the yoga sessions to the comparison group indicated that there was no significant main effect of time, $F(1, 43) = 2.21, p = .15$, or of group, $F(1, 43) = 2.38, p = .13$. The Time × Group interaction was also not significant, $F(1, 43) = 1.73, p = .20$. Results of the ANOVA comparing only students who attended at least five of the six yoga classes to the comparison group indicated that there was a statistically significant main effect of time, $F(1, 35) = 6.19, p = .02$, but not of group, $F(1, 35) = 3.23, p = .08$. The Time × Group interaction, however, was significant, $F(1, 35) = 5.37, p = .03$.

Table 2 provides means and standard deviations of PSS scores for the yoga group and comparison groups at pre- and posttesting. As inspection of this table indicates, the mean PSS scores for the comparison group stayed virtually the same from pre- to posttesting, whereas those of the yoga group decreased notably. Cohen’s $d$ (Meline, 2006) was calculated to determine the effect size of the difference in the mean PSS scores for the students in the yoga group and the comparison group at posttesting. Cohen’s $d = .81$, which indicates a large effect size.

**Agreement Index**

The first author and the undergraduate research assistant independently coded responses to the questionnaires. Agreement indices ranged from 86% to 100% for responses from the yoga participants and from 87% to 97% for responses from the comparison participants. All responses that were scored differently were discussed, and final data used were themes that both the first author and the research assistant agreed on.

The response rate for the questionnaires was 100% for both groups. Of the 26 students in the yoga group, 88% stated that they had learned something about stress management during the course of the semester, and 12% said they had not. Responses from the comparison group indicated that 71% said that they had learned something about stress management during the course of the semester, and 29% said they had not. The number of respondents in the comparison group equaled 24 because all of the students were present during the time that the questionnaires were completed, and the one student who had asked to be withdrawn from the yoga conditions responded as a comparison participant. Twenty-two of the 23 yoga participants and all 17 of the comparison participants who indicated that they had learned something about stress answered the question asking

<table>
<thead>
<tr>
<th>Subgroup 1a</th>
<th>10</th>
<th>16.7</th>
<th>4.30</th>
<th>1</th>
<th>10.30</th>
<th>3.77</th>
<th>7</th>
<th>14.30</th>
<th>6.43</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgroup 1b</td>
<td>8</td>
<td>17.0</td>
<td>7.38</td>
<td>7</td>
<td>17.25</td>
<td>7.38</td>
<td>14</td>
<td>19.25</td>
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**Table 2.** Mean and standard deviation for the pre- and post-PSS scores of the students attending at least five yoga classes and the students in the comparison group.

<table>
<thead>
<tr>
<th>Yoga group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Comparison group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>18</td>
<td>17.83</td>
<td>6.01</td>
<td></td>
<td>19</td>
<td>18.79</td>
<td>4.83</td>
</tr>
<tr>
<td>Posttest</td>
<td>18</td>
<td>13.39</td>
<td>6.53</td>
<td></td>
<td>19</td>
<td>18.63</td>
<td>6.34</td>
</tr>
</tbody>
</table>
what they had learned. The major themes (i.e., ≥20% response rate) emerging from the responses are shown in Table 3.

Participants in both groups indicated that they had learned about breath techniques. One participant wrote that “breathing is a major mechanism in helping control stress and anxiety.” A second theme that arose from both groups was the importance of taking time for oneself. A representative response was: “Taking time to relieve stress is important to perform well in other aspects of your life.” The theme regarding time management only arose out of the comparison participants’ responses. As one participant advised, “To battle stress, don’t just shut down. Start working on something small and check things off your list.”

Fifty-four percent of the students in the yoga group indicated that they had engaged in stress management activities other than yoga during the past month, and 75% of the comparison students indicated that they had engaged in stress management activities during the past month. The main themes (i.e., response rates ≥20%) regarding what these activities were are shown in Table 3. Participants in both groups indicated that other forms of exercise were important to control stress. Other stress management techniques that participants in both groups indicated they used were breathing techniques (“I used breathing techniques when I felt stressed and they did help. I like them because they can be done anywhere”) and taking time out for oneself (“Taking time away from homework to watch tv or just relax”). Time management activities only emerged as a major theme in the responses of participants in the comparison group. One participant in this group indicated that she “made better long-term and especially short-term plans. They help me to realize what needs to be done daily to be prepared for school and prevent me from putting things off and staying up all night.”

Also found in Table 3 are the main themes emerging from the responses of both groups regarding advice they would give other students about stress management. The most frequently occurring theme that emerged from the responses of the participants in the yoga group centered on taking time for yourself. This theme also arose, although to a lesser extent, in the responses of the comparison group. Some of the advice given in this theme was to “take time to do what works best for you to let out some stress every day” and “take five minutes a day to just relax and not think about stressors in your life.” The primary theme in the responses of the comparison group, and to a lesser extent, the responses of the yoga group, was to manage time wisely (e.g., “Most importantly for students is to stay on top of homework/projects. It is probably the biggest cause of stress and if you do not fall behind, stress will lessen”). Finally, both groups recommended maintaining a positive mind-set (e.g., “Everyone goes through it and survives so just keep positive and keep trying”).

Eighty-one percent of the participants in the yoga group responded that yoga was helpful to them in managing stress, 4% responded that it may have been

<table>
<thead>
<tr>
<th>Question/Theme</th>
<th>Yoga group</th>
<th>Comparison group</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, what did you learn (about stress management)?</td>
<td>Breath techniques</td>
<td>50% (n = 11)</td>
</tr>
<tr>
<td></td>
<td>Take time for self</td>
<td>50% (n = 11)</td>
</tr>
<tr>
<td></td>
<td>Muscular relaxation</td>
<td>23% (n = 5)</td>
</tr>
<tr>
<td></td>
<td>Time management</td>
<td>&lt;20%</td>
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<tr>
<td></td>
<td>Positive mind-set</td>
<td>&lt;20%</td>
</tr>
<tr>
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<td>Other exercise</td>
<td>50% (n = 7)</td>
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<td></td>
<td>Breath techniques</td>
<td>43% (n = 6)</td>
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<td>Time for self</td>
<td>21% (n = 3)</td>
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<tr>
<td></td>
<td>Time management</td>
<td>&lt;20%</td>
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<tr>
<td>What advice would you give other students to help them manage stress?</td>
<td>Take time for self</td>
<td>42% (n = 10)</td>
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<td>Positive mind-set</td>
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helpful, and 15% said that it was not helpful. The major themes emerging from the responses of the participants who indicated that yoga was helpful involved the physical component of the practice (55%), the use of breath techniques (36%), the development of mental focus and calm (45%), and the fact that they had actually taken time for themselves to relax (23%).

An example of a statement about the stress-reducing aspect of the physical postures is that “the releasing of tension in my body prepared me for my week ahead; started me on a clean slate.” The theme regarding the use of breath techniques was found in responses such as “I really think it was just the quiet and breathing that slow me (my mind) down.” Comments such as “I felt calm and centered, I felt relaxed and focused after sessions—I loved it” and “It was nice to be in a calm place mentally and physically and it helped for me to approach school work in a calm manner than frantic and stressed” reflected the theme of development of mental focus and calm. The theme of taking time for oneself was seen in statements such as “Taking time to myself and not thinking about all the things I had to do. Clearing my mind by doing something fun and I enjoy gave me a chance to re-energize and take a break from school and work.”

Twenty of the yoga participants responded to the question about what aspects of the class were least helpful and why. The only response theme that was cited by greater than 20% of the respondents was the time of the class (40%, n = 8). The class was held from 6:30 to 7:30 p.m., and students found this to be an inconvenient time. When asked what suggestions they had for improving the class, 25 responded. One theme emerged with 20% or greater frequency: change the time of the class (36%, n = 9).

**DISCUSSION**

A comparison of the mean PSS scores of the participants in the current study to those reported by Cohen and Janicki-Deverts (2012) indicated that in every case, the mean scores of the current participants were higher than those found by Cohen and Janicki-Deverts in 1983 and in 2009 for women, for individuals under 25 years of age, and for members of the White race. The difference in scores was greater between those of the current participants and those from 1983 than it was between those of the current participants and those from 2009. The difference between the mean scores of the current participants and Cohen and Janicki-Deverts’ 2009 participants was minimal. As Ornish (2007) stated, since the 1980s, “many people are finding that life seems to have become even more stressful” (p. 115). Additionally, Cohen and Janicki-Deverts consistently found that women reported higher mean PSS scores than did men, and mean PSS scores tended to decrease with age. The authors stated that their data “help identify populations who are most likely to experience the highest levels of stress and associated disease risk” (Cohen & Janicki-Deverts, 2012, p. 1,330). This suggests that, based on their PSS scores, the participants in the current study did indeed perceive their stress levels to be fairly high compared to other groups of individuals.

The results of the paired-samples t tests with the pre- and post-PSS difference scores of the participants in the yoga group, of the one-way ANOVA of time of testing with the comparison group, and of the 2 (group) × 2 (time) ANOVA with all yoga participants indicate that there was no effect of any of the stress management techniques, including yoga, on participants’ perceived levels of stress. When the PSS scores of the yoga participants with high attendance were analyzed, however, a statistically significant effect was found for the yoga classes. The mean PSS scores of participants who had high attendance in yoga classes were significantly lower after the 6 weeks of yoga classes were completed than they were before the yoga classes were initiated. Additionally, the 2 (group) × 2 (time) ANOVA with high-attending yoga participants indicated that there was a significant main effect of time of testing, with posttest scores lower than pretest scores, and a statistically significant Group × Time interaction, with little change in mean PSS scores from pretest to posttest for the comparison participants but a notable decrease in mean PSS scores over time for the high-attending yoga participants. These results indicate that yoga can be an effective method of lowering participants’ perceived stress levels, but only if the participant attends at least five classes within a 6-week course of sessions. This result makes logical sense and is consistent with Ornish’s (2007) and Goleman’s (2011) statements that the longer and more frequently a person practices stress management techniques, the more benefits the person receives.

Responses to the final questionnaire shed some explanatory light on the results for both the comparison and yoga groups. Almost 20% more of the participants in the yoga group versus those in the comparison group indicated that they had learned something about stress management during the course of the semester. Half of the participants in the yoga group cited learning about the importance of the breath for managing stress, a third of the participants who believed that yoga had been beneficial for stress management cited breath work as one of the reasons...
for this, and 43% of these individuals indicated that they engaged in breath work in addition to yoga. Furthermore, under the guidance of the instructor, all of the participants in the yoga group practiced mindful breathing throughout each class as well as a specific breath ratio that was designed to reduce stress at the end of each yoga class. Only one third of the comparison participants indicated that they had engaged in breathing techniques to help them manage stress. Thus, the participants in the yoga group were more actively engaged in breathing techniques, which have been cited by many authorities (e.g., Benson & Klipper, 2001; Davis et al., 2008; McCall, 2007; Ornish, 2007) as important tools for managing stress, than were the control participants. As one participant explained, “Breathing techniques do help!”

Another major theme in the responses of the participants in the yoga group regarding the advice they would give other students about managing stress was to take time for themselves to relax. This was also a major theme found in the responses of the comparison participants. Fifty percent of the participants in the yoga group indicated that they had learned the importance of this behavior, almost 25% of the participants who believed that yoga had been beneficial for them to manage their stress cited this as one of the reasons, 21% indicated that they had taken time for themselves to relax outside of yoga, and 69% of them took at least 1 hr a week for 5 to 6 weeks to engage in yoga classes designed to help them manage stress. Only 28% of the participants in the comparison group indicated that they had created time in their schedules to relax.

Many people do not make time for stress management techniques in their lives. As Ornish (2007) stated, however, the times that we are busiest and most apt to neglect our stress management practices are often exactly the times when these techniques are most needed. The fact that the most prevalent theme occurring in the responses of the participants in the yoga group regarding the advice they would give other students about managing stress was to take time to relax, along with their actions cited above, indicate that these participants agreed with Ornish.

The participants in the comparison group learned about stress management techniques through class lecture and one small-group session where they practiced three stress management techniques. The rest of their experiences were practiced independently. Ross (2011) discussed the importance of the social dimension of stress management. She stated that having a support group of coworkers has been associated with reduced levels of stress, and “it is therefore imperative that supervisors and directors of employment organizations incorporate staff support groups into the routine work week and encourage all employees to attend group sessions” (p. 224). She went on to suggest that participation in different leisure time activities can help caregivers “achieve a balance between work, and home and leisure-time activities” (p. 225). The group setting of yoga with the express purpose of reducing stress and the support of the instructor and the other participants in the class could have added to the positive effects of the intervention.

Additional insights as to why the yoga classes were effective can be found in the questionnaire responses of the participants in the yoga group. Eighty-one percent of them indicated that they believed that yoga had been an effective method of managing stress. Of these, 55% indicated that it was the physical component of the practice that was helpful. Ornish (2007) indicated that one of the best ways to build flexibility is by practicing yoga. He went on to state that flexibility is an important but often overlooked element of fitness that “enhances your ability to do just about everything. Not only that, it also decreases stress, improves your mood and posture” (p. 150).

A majority of the participants in the comparison group indicated that they had learned about stress management techniques, in particular, about the importance of good time management skills, and 25% of them indicated that they had used time management skills to help them manage their stress. When asked what advice they would give other students regarding stress management, 67% of their responses involved the theme of managing time wisely. The lack of change in the comparison students’ PSS scores across the semester, however, indicates that learning about the importance of, and using, time management skills did not have an effect on the students’ perceived levels of stress.

The results of the independent Mann–Whitney U test that was calculated between yoga Subgroups 1a and 1b indicate that a sequencing effect existed: The high-attending participants in the first 6-week session had significantly greater decreases in PSS scores than did those in the second 6-week session: There was essentially no change in PSS scores as a result of participating in yoga for the participants in the second 6-week session. Several possible explanations could account for this finding. First, the best time to establish a stress reduction routine that includes yoga classes might be in the beginning of the initial semester of graduate school. An early introduction to the importance of stress management and guided participation in weekly yoga sessions could have allowed these participants to learn how to manage perceived stress effectively as the semester began and to apply what they were learning as the semester progressed.

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Indeed, although the mean PSS score of these participants increased over the 6 weeks that they were not in yoga, their final scores were still notably lower than they had been at the beginning of the semester.

The stress levels of students who did not participate in yoga until the middle of the semester were similar to those of the participants in the comparison group. As discussed earlier, all of the participants had beginning PSS scores that indicated fairly high levels of stress. After the stress of graduate school begins to be established, a stress reduction program that is more intensive than one yoga class a week for 6 weeks might be needed to reduce and control stress effectively. Indeed, several students commented in the final questionnaire that one way to improve the yoga classes was to offer them more frequently.

Another explanation for the sequencing effect could be that there was an initial difference between the two subgroups. Participants were randomly assigned to the subgroups, however, and their beginning mean PSS scores were not different from each other. Therefore, the participants in these subgroups appeared to be equivalent.

The possibility also exists that there was an additive effect of doing general class work on stress management and engaging in yoga classes. The first 6 weeks of the semester were when the lectures on stress management occurred, the stress management assignments were given and completed, and the small-group sessions that included participation in several stress management techniques were held. Perhaps yoga classes were more effective in reducing stress when they were coupled with these activities than when yoga classes were the only stress management activity offered.

The general stress management activities were completed within several weeks of when the second set of yoga classes was offered and, when responding to the final questionnaire, 54% of the participants in the yoga group indicated that they had engaged in stress management techniques other than yoga in the past month. Because all of the participants engaged in general stress activities, and the majority reported that they had continued to practice them, it is likely that there also would have been some carryover of these activities to the participants who engaged in the second series of yoga classes.

**Limitations and Directions for Future Research**

The only tools used to measure stress in the current study were the PSS and the final questionnaire, both of which were subjective measures of the participants’ perceived levels of stress and perceptions of the effectiveness of various stress reduction techniques, including yoga. The PSS, however, has been shown to be a valid and reliable tool, and high scores on the PSS have been associated with the presence of physiological and behavioral markers of high levels of stress (Cohen & Janicki-Deverts, 2012). Furthermore, Ornish (2007) reported findings of medical studies on the effects of stress on telomeres (i.e., the “DNA at the end of your chromosomes that directly affect how quickly your cells age,” p. 116). The studies summarized by Ornish indicate that although stress negatively impacted telomeres, the participants’ subjective opinion of the stress they were under was more important than objective measures of stress they were experiencing. That is, “if you feel stressed, you are stressed” (Ornish, 2007, p. 117).

Cohen and Janicki-Deverts (2012) also indicated that the perception of stress can result in “negative affective states (e.g., feelings of anxiety and depression), which then exert direct effects on physiological processes or behavioral patterns that influence disease risk” (p. 1,320). Despite the importance of self-perceptions of stress, data collected from other physiological markers of stress would provide interesting information regarding changes in stress levels due to participation in yoga classes.

Another limitation of the current study is that there was no measure of treatment fidelity. The instructor, who is an experienced yoga instructor and who had led similar classes for other groups of yoga students, followed a consistent script for all sessions. Additionally, in their responses to the final questionnaire, several participants suggested that “a bigger variety of moves,” “more variety from week to week with moves,” and “more positions and less repetition” would have improved the class. These factors indicate that the script for classes was followed consistently.

A related limitation is the potential for evaluator bias. The first author collected and analyzed all of the data. The PSS, however, is an objective test with specific instructions for scoring, which minimizes the possibility of evaluator bias in scoring. The other measurement tool was the posttreatment questionnaire. Two trained individuals (the first author and a research assistant) independently scored the response to this tool, and an acceptable unit-by-unit agreement index was found between the two sets of scores.

A final limitation is the potential threat of differential subject selection between the yoga and comparison groups. Institutional review board approval only allowed the students who consented to participate in the yoga classes to serve as yoga participants. This ethical consideration disallowed a random assignment of participants to the yoga and comparison groups. The design used for those who participated in yoga...
ensured that each student acted as her own control, thus negating the threat of selection bias for the yoga subgroups. Because there was no random assignment to yoga versus the comparison group, however, a threat to internal validity due to selection bias could exist here. The fact that neither 2 (time) × 2 (group) ANOVA found a significant effect for group, and that other demographic information between groups (e.g., educational level, gender, age), was similar suggest that participants in these groups were not notably different from each other in factors that could have influenced their perceived levels of stress.

The sequencing effect that was observed also provides suggestions for additional research questions that should be asked in future studies. Some of these questions include the following: Are the greatest stress reduction effects found for individuals who begin yoga at the start of their graduate career? Is it important to instruct students on other stress reduction techniques as well as yoga, or is yoga alone an effective stress reduction mechanism? If additional techniques increase the effectiveness of yoga, which ones are most potent in doing so? What would the effects be of increasing the number of yoga classes offered per week or increasing the duration of yoga classes in terms of the number of weeks or semesters in which they were available for student participation?

Conclusion

Goleman (2011) described the Yerkes-Dodson law: Too little stress results in boredom and disengagement and too much stress results in a state of overload and frazzle. Neither of these states leads to optimal performance. In order to work at peak levels, the right level of stress—or good stress—is needed. This stress results in “flow.” According to Goleman, “Flow represents a peak of self-regulation, the maximal harnessing of emotions in the service of performance or learning” (Loc 563 of 1052). To optimize our students’ learning and performance during their school years and into their years as professionals, we as mentors and teachers need to assist them in recognizing the importance of controlling stress in their lives and help them develop activities that are effective in managing stress. Carefully designed yoga classes appear to be one such activity.

REFERENCES


and psychological functioning in college students (Doctoral dissertation). Available from World Cat. (OCLC 56567699)


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APPENDIX A. STUDENT QUESTIONNAIRES

Final Questionnaire for Students in Comparison Group

Did you learn anything about stress management over the course of this semester?  Yes  No
If yes, what did you learn?
Did you engage in any stress management activities during the past month?  Yes  No
If you did, what were these other activities and did you find them to be helpful?
What advice would you give other students to help them manage stress?

Final Questionnaire for Students in the Yoga Group

Did you learn anything about stress management as a result of taking part in this study?  Yes  No
If yes, what did you learn?
How many yoga sessions did you attend? _______
Did you find the yoga sessions to be helpful to you for managing stress?  Yes  No
If you found them to be helpful, what aspect was the most helpful?
Why did you find this aspect helpful?
What aspect of the classes were least helpful and why?
What suggestions do you have for improving the classes?
Did you engage in any other stress management activities during the past month?  Yes  No
If you did, what were these other activities and did you find them to be helpful?
What advice would you give other students to help them manage stress?

Note. The questionnaires for the students in the comparison group and for the students in the yoga group were two separate questionnaires. Each student received the appropriate questionnaire based on group and completed it independently.
APPENDIX B (p. 1 OF 2). SEQUENCE OF VINIYOGA CLASSES

1. Easy cross-legged seated posture, focus on feeling breath and progressively lengthening inhale (IN) and exhale (EX), then release conscious control of the breath.

2. Tadasana, standing posture, lift up on toes while raising arms over head (IN), lowering arms and toes (EX) three times, then lift up while raising arms over head (IN), stay three breaths, lower arms and toes (EX).
   a. For sessions 3–6, after first three repetitions add:
      i. Lift on IN and retain breath 2 counts, EX down 2 counts.
      ii. Lift on IN and retain breath 4 counts, EX down 4 counts.
      iii. Lift on IN and retain breath 6 counts, EX down 6 counts.

3. Warrior 1 – Step right foot forward, feet hips’ width apart. IN into pose, bending right knee and raising arms over head. EX out of pose, straightening knee and lowering arms, 3 times, then hold pose 3 breaths. Repeat both sides
   a. For sessions 3–6, after first three repetitions add:
      i. IN into pose and retain breath 2 counts, EX out 2 counts.
      ii. IN into pose and retain breath 4 counts, EX out 4 counts.
      iii. IN into pose and retain breath 6 counts, EX out 6 counts.

4. Standing forward bend –
   a. Sessions 1 & 2: From standing with slightly bent knees, EX forward hands to floor, IN up half way sliding hands up back of legs to knee level, EX down, IN back to standing 3 times. Then stay in full forward bend 6 breaths.
   b. Sessions 3–6: From standing, EX and move into chair pose bringing hips to level of the knees, chest to thighs, hands to floor. IN lift upper body with arms over head, if possible, or on knees. EX to standing forward bend, IN to standing. Repeat 3 times.

5. Triangle pose – Stand legs apart, right foot pointing out, left foot turning in slightly. EX bring right hand to right leg, left top arm up, IN back to standing. Repeat 3 times. Stay with right hand on right leg, IN left arm overhead opening ribs, EX arm back along hips. Repeat 3 times. Stay with arm along hips 3 breaths. IN to standing. Repeat other side.

6. Wide-leg standing forward bend – Stand legs spread wide, EX bring hands down legs toward ankles, IN half way up, repeat 3 times. Stay down 3 breaths. IN to standing.

7. Chakravakasana – On hands and knees, IN bring chest forward, EX sit back on heels, forearms and forehead on floor. Repeat 6 times.

8. Cobra
   a. Sessions 1 & 2: Lie on stomach, hands by low ribs, feet and legs on floor. IN lift upper body off floor only as far as back will lift it, EX down. Repeat 3 times.
   b. Sessions 3–6: a. Lie on stomach, hands palms up on sacrum. IN bring one arm forward as lift upper body salute with the hand. Alternate arms 3 times each side for a total of 6 repetitions.
   c. Session 3–6: b. Lie on stomach, hands palms up on sacrum. IN bring both arms forward and straight out, EX pull arms back squeezing shoulder blades together, IN both arms forward and up, EX sweep arms back to starting position lowering upper body. Repeat 3 times.

9. Flow – Begin standing on knees, EX into child’s pose, IN up to hands and knees, EX to downward facing dog, IN down to hands and knees, EX child’s pose. Repeat 3 times.
   a. Sessions 3–6: In downdog add holding the breath out after EX for 2 counts. Increase breath in downdog by one each repition for 4 repetitions.

10. Rest in child’s pose.

11. One-leg forward seated bend. Right leg extended, left foot drawn into inner thigh of extended leg. Arms over head, EX bend forward bringing arms to feet, IN up 3 times. Then stay down for 3 breaths. Repeat other side
   a. Sessions 3–6: During stay increase length of EX and try to hold outbreath out 2 counts each breath for 3 breaths.

12. Bridge pose – On back, knees bent and hips’ width apart. Arms at sides, palms down. Push on heels and IN rolling up onto shoulders, EX rolling down. Repeat 3 times.

13. Full seated forward bend. Hands on legs, EX sliding hands down legs, IN slide hands up legs. Repeat 3 times. Then hold pose for 3 breaths, IN back up.
   a. Sessions 3–6: During stay increase length of EX and try to hold outbreath out 2 counts.

14. From back with knees into chest, IN raise arms to floor over head while simultaneously straightening legs, EX arms down, knees back into chest. Repeat 3 times each time taking one more breath in legs up position.

15. On back, knees bent, soles of feet together. EX bring knees 1/3 of the way together, IN open. Repeat 3 times. Then bring knees 2/3 of the way together, repeat 3 times, then bring knees all the way together 3 times.
APPENDIX B (p. 2 OF 2). SEQUENCE OF VINIYOGA CLASSES

17. On back, left leg straight, bend right knee. EX twist right knee to the left, IN back to center. Repeat 3 times, then stay in twist 3 breaths. Repeat other side.

18. On back, hold kneecaps with hands, draw knees into chest (EX), extend knees arms’ length (IN), repeat 6 times.

19. Lie on back, arms at sides palms up, feet hips’ width apart. IN through nose, then EX sighing breath out. Repeat 3 times. Then relax 2–3 min.

20. Sit in easy cross leg. First two sessions, increase IN and EX until inhaling 6 counts and exhaling 6 counts. Then progressively decrease and release control of breath.

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Note. These classes were based on classes designed by the first author for her final project, “Stress Reduction for Women,” which was required to complete her American Viniyoga Institute yoga therapy training program. The author thanks Gary Kraftsow, Mary Hallway, and Clare Collins for their teachings and support.