

Is There More to Yoga Than Exercise?

J. Andy Smith, MA; Tammy Greer, PhD; Timothy Sheets, PhD; Sheree Watson, PhD

Context • Yoga is increasing in popularity, with an estimated 15 million practitioners in the United States, yet there is a dearth of empirical data addressing the holistic benefits of yoga.

Objective • To compare the physical and mental benefits of an exercise-based yoga practice to that of a more comprehensive yoga practice (one with an ethical/spiritual component).

Design • Students with mild to moderate depression, anxiety, or stress and who agreed to participate were assigned to one of three groups: integrated yoga, yoga as exercise, control.

Participants • A total of 81 undergraduate students 18 years and older at a university in the southeastern United States participated in the study.

Main Outcome Measures • Depression, anxiety, stress, hope, and salivary cortisol.

Results • Over time, participants in both the integrated and exercise yoga groups experienced decreased depression and stress, an increased sense of hopefulness, and increased flexibility compared to the control group. However, only the integrated yoga group experienced decreased anxiety-related symptoms and decreased salivary cortisol from the beginning to the end of the study.

Conclusions • Yoga, practiced in a more integrated form, ie, with an ethical and spiritual component, may provide additional benefits over yoga practiced as an exercise regimen. (*Altern Ther Health Med.* 2011;17(3):22-29.)

J. Andy Smith, MA, is a doctoral student; Tammy Greer, PhD, is an associate professor; Timothy Sheets, PhD, is an assistant professor, and Sheree Watson, PhD, is an associate professor, all at The University of Southern Mississippi, Hattiesburg.

Corresponding author: Tammy Greer, PhD
E-mail address: tammy.greer@usm.edu

Hatha yoga, from the Raja branch of yoga,¹ is a good candidate as an alternative and complementary therapy to enhance physical and psychological well-being. In contrast to other branches of yoga, Hatha yoga focuses on development of the body and physical fitness. The Hatha yoga that is most commonly practiced in the West emphasizes this exercise component involving postures that predominately stretch and strengthen the musculature. Consequently, most Western research on yoga has focused only on the physical benefits of the practice, finding benefits similar to those of moderate exercise.² However, a comprehensive Hatha yoga practice involves an exercise component along with breath control, meditation, spiritual, and ethical components. There is limited research on the effectiveness of Hatha yoga when practiced in a more comprehensive way, ie, with a meditation and ethical/spiritual component in addition to an exercise component.

The dearth of empirical data addressing the holistic benefits of yoga is surprising considering the 15 million practitioners of the various forms of yoga in the United States³ who profess advantages that extend well beyond traditional benefits of exercise. With claims in the popular literature so varied and numer-

ous, ranging from stress relief to weight loss and including increased energy, improved skin tone, and relief from asthma,⁴⁻⁸ yoga practitioners likely expect more than just muscular and cardiovascular benefits.

There is reason to believe that a more comprehensive Hatha yoga practice may have benefits beyond that of exercise alone. Meditation, for example, has been associated with diminished stress and worry⁹⁻¹¹ and decreased anxiety¹²⁻¹⁶ and depressive symptomology¹⁷⁻¹⁹ in diverse populations, including medical students, residents of inner city neighborhoods, and college students. A sense of spiritual well-being, derived from the ethical teachings, is correlated with aspects of hopefulness (ie, positive readiness, interconnectedness, and temporality²⁰), and a sense of hopefulness has been found to be important in a variety of outcomes including decreased depression and suicidality²¹ and improved immune functioning, coping skills,²² and academic outcomes.²³ Inclusion of an ethical and spiritual component in a yoga practice may have an impact on spiritual well-being variables such as hopefulness and therefore may offer benefit beyond that of either meditation or yoga taught as exercise alone.

Whereas each of the various components of yoga—exercise, meditation, ethical/spiritual teachings—has the potential to benefit the yoga practitioner in unique ways, it has not been determined whether a combination of the components, as would exist in a comprehensive yoga practice, would offer benefits beyond that of yoga as exercise. It is important to compare yoga as a comprehensive practice to yoga as exercise because the current popularity of yoga and its treatment in the popular press may result in study participants beginning their regimens with exaggerated expectations of benefits, yielding a placebo effect.

Beyond any placebo effect, though, it seems reasonable to expect that a multifaceted regimen addressing physical as well as psychological and spiritual components of well-being, such as would be offered in a comprehensive yoga practice, could potentially increase the resources available to facilitate a change in psychological distress. Therefore, for this study, indicators of physical, psychological, and spiritual well-being were measured for (1) individuals who participated in an integrated yoga practice, having an exercise component, breathwork, a meditation component, and ethical and spiritual teachings; (2) individuals who participated in yoga as exercise; and (3) a control group that met only to fill out questionnaires. It was hypothesized that those in the integrated yoga group would experience greater benefits than those in the yoga-as-exercise and questionnaire control groups on psychological well-being variables as well as indicators of spiritual well-being but would score similar to the yoga-as-exercise group on physical fitness variables.

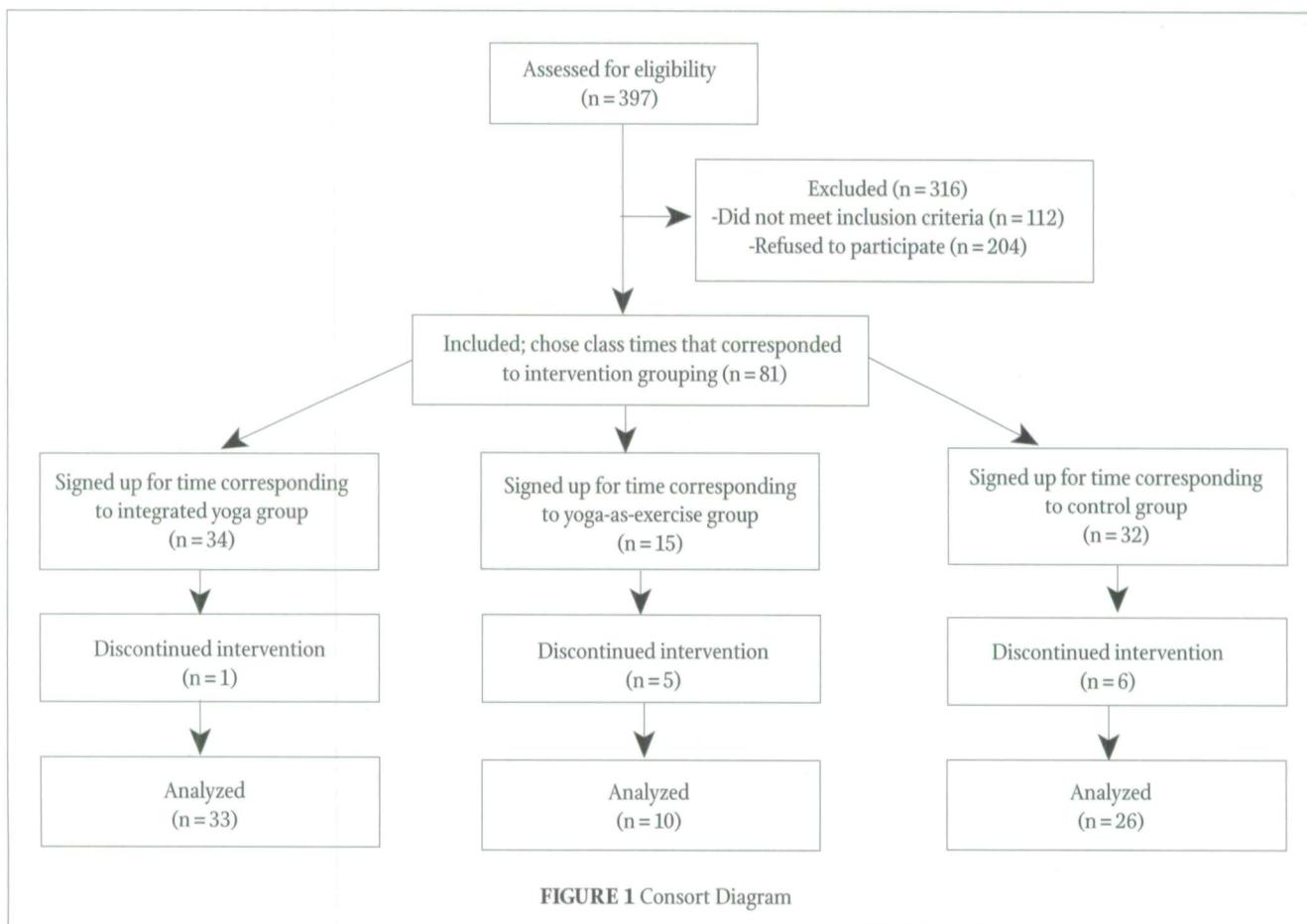
METHOD

Participants

Undergraduate students aged 18 years and older at a university in the southeastern United States were recruited to participate in the study through an online recruitment vehicle and through a brief presentation of the study requirements during

class time when allowed by instructors. Students received extra credit for participating in the study. All students were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct."²⁴ The Institutional Review Board of the university approved all procedures before the study was conducted.

Students were prescreened using the Depression Anxiety Stress Scales²⁵ (DASS) and were assessed for any physical limitations that would put them at risk in this study. Exclusionary criteria included pregnancy or plans to become pregnant, use of a pacemaker, or any physical impediment that would prevent participation in moderate physical activity. Students with raw scores falling into the mild, moderate, or severe range of scores on any one scale (depression, anxiety, or stress) were asked to participate. Students with scores falling into the extremely severe range of scores on any DASS scale were provided a list of local mental health care providers for referral. Eighty-one individuals agreed to participate in the study, having the following means (and ranges) of scores on depression, anxiety, and stress: 6.08 (0-16), 5.04 (0-14), and 9.18 (0-18), respectively (Figure 1). Completion of the study required completion of assessments before the intervention, midintervention (fourth week), and after the intervention by all participants, in addition to completion of at least seven of the 14 yoga sessions by the intervention groups.



Procedure

After screening, participants were contacted by phone. The experimenter verified that the participant was negative for all exclusionary criteria. The experimenter gave participants times for group meetings without divulging any information regarding class content. Participants self-selected into groups by scheduling a meeting time that fit their respective schedules. Participants whose schedules did not permit class participation were asked to participate in the questionnaire control condition. All participants were then assigned an appointment for the first meeting with the experimenter. Table 1 provides a demographic profile of the participants.

TABLE 1 Demographic Characteristics of the 69 Study Participants

Age	Mean=21.15	Standard deviation=4.15
Gender	Male=49.5%	Female=50.5%
Race	White=56.8%	Other=43.2%

During the first meeting and before intervention group participation, participants were administered the Herth Hope Scale²⁶ (HHS) and required to provide morning cortisol samples to assess pre-yoga cortisol levels. Flexibility, resting heart rate, blood pressure, and weight also were measured. After measures were administered, participants began group sessions. At the first group session, participants were given information about the class. They also answered a preintervention question about their expected benefit from group participation.

Before and after each group session, participants were administered the Exercise-induced Feeling Inventory²⁷ (EIF). After session 7 and again after session 14, participants completed the DASS and HHS, salivary cortisol was measured, flexibility tests were administered, and information about resting heart rate, blood pressure, and weight was obtained.

Multiple researchers participated in phone screenings, recruitment, and administration of measures, as well as data entry and analysis. The primary experimenter taught both yoga groups. To ensure that experimenter bias did not influence results, an observer trained in functional behavior analysis observed the experimenter without the experimenter's knowledge. The observer was blind to the purpose of the study and using time sampling techniques rated the experimenter for affiliative behaviors exhibited in interactions with both groups. The observer coded the number of instances of the experimenter's touching the participants, smiling, and speaking to the groups. Two-way chi-square analyses revealed no significant group differences on these variables. Time spent in various postures, time spent stretching, and time spent in a postclass relaxation were also equated across groups. All three groups—integrated yoga, yoga-as-exercise, and questionnaire control group—received common experiences of interacting with researchers as physical measures were assessed, collecting physiological measures, and completion of questionnaires that may have enhanced self-awareness. Both yoga groups participated in yoga postures that

included stretching and strengthening exercises as well as breath work. The integrated yoga group received training in the *yamas* (restraints) and *niyamas* (observances) involving ethical/spiritual teachings. A list of *asanas* and details about yoga group sessions are provided in the Appendix.

Yoga Groups. Both yoga groups engaged in a Hatha yoga style that was heavily influenced by the Kripalu method of yoga practice. Yoga groups began each session with warm-up, stretching, and breathing exercises to prepare for yoga postures. As participants executed poses (Appendix), they received hands-on instruction to ensure they were performing the poses correctly and safely. Participants were guided through a traditional sun salutation and were then taught poses specific to the *yama* or *niyama* of the day.²⁸ Following the postures, participants were instructed to lie in corpse pose and were guided through a relaxation exercise for approximately 10 minutes. Each yoga session lasted approximately 60 minutes. There were two sessions per week for 7 weeks, with two make-up sessions in the eighth week. Homework assignments were distributed once per week. During the first session, participants were taught basic stretches and asked not to share information about their class until the conclusion of the study.

Integrated Yoga Group. At the beginning of each session, warm-up, stretching, and breathing exercises were accompanied by a meditation for the day that was based on one of the *yamas* or *niyamas* of yogic philosophy. Participants were instructed to reflect on this statement as they executed the day's poses and were reminded of the phrase as well as appropriate associated reflections pertaining to the poses being taught.

Yoga-as-exercise Group. In the yoga-as-exercise group, the spiritual meditation was omitted, and participants were guided through a meditation using mindful breathing.

Questionnaire Control Group. The questionnaire control group met during three sessions to fill out study questionnaires, but they did not participate in any type of intervention.

Psychological Measures

Depression Anxiety Stress Scales. The short form of the DASS²⁹ was used to screen potential participants for current levels of depression, anxiety, and stress. The DASS short form contains 21 items, each of which loads onto one of three scales. Participants rated items related to depressive, anxious, or stressed symptomatology from 0 to 3, and scores were summed on each of the three scales. Overlap between the stress and anxiety scales suggests that the stress scale measures general distress, including a sense of overarousal and difficulty confronting the demands of daily life. Scores could range from 0 to 21 on each scale, with higher scores indicating higher levels of depression, anxiety, and/or stress.

Herth Hope Scale. The Herth Hope Scale (HHS)²⁶ is designed to quantify the amount of hopefulness that an individual may generally apply to him- or herself. Respondents are presented with 30 items and asked to rate the degree to which the items apply to them: "strongly disagree," "disagree," "agree," or "strongly agree." The instrument is designed to measure three dimensions of hopefulness:

cognitive-temporal, affiliative-contextual, and affective-behavioral. The HHS has been shown to negatively correlate with the Beck Hopelessness Scale ($r = -.69$), and it has been shown to have good reliability, with alpha coefficients ranging from .75 to .94.²⁹

Exercise-induced Feeling Inventory. The EIF²⁷ was developed to measure four states associated with acute exercise participation: revitalization, tranquility, positive engagement, and physical exhaustion. Respondents rate 12 items on a scale from 0 (do not feel at all) to 4 (feel very strongly). Internal consistency coefficients range from .77 to .91.³⁰ To analyze the yoga session-induced changes in affect experienced by participants before vs after the yoga sessions, affect scores were averaged across sessions one to four, five to eight, and nine to 12. This resulted in pre-post affect scores for three discreet time periods. Subscales of the EIF were analyzed at each of the three time periods. On this particular variable, only the first 12 sessions were analyzed due to excessive absences during the last two class meetings that coincided with the administration of final exams.

Physiological Measures

Salivary Cortisol. Participants provided saliva samples, which were collected in plastic vials and stored according to assay manufacturer's instructions. Participants collected saliva at home, following a method used by Roberts et al.³¹ The experimenter explained the procedures for collection to the participants before the initial collection. Immediately upon waking, participants collected saliva for 4 minutes on the mornings of the pre-, mid-, and posttest measurements. They were instructed to refrigerate samples immediately after collection and to keep them refrigerated until they presented them to the experimenter at the session. The sealed containers were then refrigerated at the laboratory until a trained technician analyzed the

assays. Samples were prepared according to the manufacturer's instructions.

Physical Measures

Flexibility. Participants performed tests of flexibility, including a sit-and-reach test, a trunk flexibility test, and a shoulder flexibility test.³² During the sit-and-reach test, the participant sat on the floor with the feet flat against a sit-and-reach measurement box. The participant extended the hands as far forward as possible in a slow and controlled manner as the experimenter gauged the distance reached. This was repeated three times, and the highest score was recorded for analysis. To test trunk flexibility, the participant lay prone on the floor. With hands in the small of the back, the participant was asked to raise the head as high as possible in a slow, controlled manner. This was repeated three times, and the highest score was recorded for analysis. To test shoulder flexibility, the participant lay prone on the floor while holding a wooden dowel in the hands, extending from the shoulders. The participant was asked to raise the hands as high as possible in a slow, controlled manner keeping the upper body on the floor. This was repeated three times, and the highest score was recorded for analysis.

Heart Rate, Blood Pressure, and Weight. Participants' resting heart rate, blood pressure, and weight also were measured. Lowered heart rate and blood pressure and appropriate weight proportions are considered to be indicators of overall good physical health. Heart rate and blood pressure were measured with an automated blood pressure cuff. Participants' blood pressure and heart rate were measured after the participant had remained prone and immobile for approximately 10 minutes. Weight was measured using a calibrated balance scale. Table 2 displays preexisting differences among groups on these dependent variables.

TABLE 2 Preexisting Group Differences on the Dependent Variables

Variable	Integrated Yoga*	Yoga-as-exercise*	Questionnaire Control*
Depression*	12.79	10.71	5.87
Anxiety*	10.48	9.14	5.69
Stress	19.17	16.43	14.65
Hope	68.79	68.07	71.78
Cortisol	23.80	21.96	22.12
Sit-and-reach (cm)	32.76	29.85	31.50
Trunk flexibility (cm)	39.56	38.62	39.78
Resting heart rate	73.06	69.25	73.68
Diastolic blood pressure (mmHg)	73.00	71.83	73.85
Systolic blood pressure (mmHg)	122.15	125.25	123.75
Weight (lbs)	157.37	151.30	177.55
Expected benefit*	3.30	3.00	2.62

Results from one-way analyses of variance.

*Significant F at $P < .05$. Tukey's Honestly Significant Difference to compare means was used as a follow-up to significant F values with pairwise differences ($P < .05$) in bold.

RESULTS

Main Analyses

Our primary variables of interest addressed the psychological and physiological sequelae following an integrated yoga vs yoga-as-exercise practice. Therefore, we were especially interested in changes in scores on depression, anxiety, stress, hopefulness, and salivary cortisol. Secondly, scores on physical variables such as flexibility and blood pressure and weight were analyzed, as these measures were likely to be peripherally related to our measures of primary interest. Results were analyzed using a mixed model analysis of variance (or analysis of covariance [ANCOVA] when there were preexisting demographic differences). In the mixed model analyses, study group was the grouping variable (integrated yoga group, yoga-as-exercise group, questionnaire control group), and time of administration of questionnaires and physiological measures (before intervention, midintervention, after intervention) were the repeated measures variable. Significant interactions were followed first with an analysis of simple effects to test for differences within each group across time. Significant changes across time were followed by Tukey's Honestly Significant Difference (HSD) to determine where differences occurred. Mean differences that are reported are significant based on Tukey's HSD.

Psychological Variables of Primary Interest

Depression. There was a significant time x group interaction ($F_{(4, 134)} = 4.34, P = .002$) on participants' depression scores on the DASS. This interaction is graphed in Figure 2a. A follow-up analysis indicated that the integrated yoga group ($M_{\text{Before}} = 12.77, SE = 1.37, M_{\text{Mid}} = 9.23, SE = 1.20, M_{\text{After}} = 7.94, SE = 1.26; F_{(2, 134)} = 8.14, P = .005$) and the yoga-as-exercise group ($M_{\text{Before}} = 11.40, SE = 2.41, M_{\text{Mid}} = 5.19, SE = 2.13, M_{\text{After}} = 5.00, SE = 2.21; F_{(2, 134)} = 10.139, P = .002$) reported less depression over time but the control group did not.

Anxiety. A significant time x group interaction ($F_{(4, 134)} = 2.756, P = .031$) for anxiety scores was obtained. This interaction is graphed in Figure 2b. The integrated yoga group ($F_{(2, 134)} = 7.442, P = .007$) but not the yoga-as-exercise group or the questionnaire control group reported decreased anxiety across time ($M_{\text{Before}} = 10.458, SE = 1.078$ vs $M_{\text{After}} = 6.65, SE = 1.106$).

Stress. A significant time x group interaction ($F_{(4, 134)} = 4.038, P = .004$) was obtained indicating a reduction in stress for the integrated yoga group ($F_{(2, 134)} = 13.01, P < .001$) and the yoga-as-exercise group ($F_{(2, 134)} = 8.669, P < .001$) but not for the questionnaire control group. This interaction is graphed in Figure 2c. Both the integrated yoga group ($M_{\text{Before}} = 18.858, SE = 1.498, M_{\text{Mid}} = 15.232, SE = 1.358, M_{\text{After}} = 11.746, SE = 1.428$) and the yoga-as-exercise group ($M_{\text{Before}} = 16.996, SE = 2.632, M_{\text{After}} = 6.804, SE = 2.506$) reported decreases in stress across time.

Hope. A significant time x group interaction ($F_{(4, 134)} = 3.809, P = .006$) was obtained. This interaction is graphed in Figure 2d. Both the integrated yoga group ($M_{\text{Before}} = 68.55, SE = 1.65, M_{\text{After}} = 73.26, SE = 2.04; F_{(2, 134)} = 7.82, P = .006$) and the yoga-as-exercise group ($M_{\text{Before}} = 67.80, SE = 2.94, M_{\text{Mid}} = 68.91,$

$SE = 3.39, M_{\text{After}} = 76.50; F_{(2, 134)} = 10.71, P = .001$) reported increases in hope across time.

Physiological Variable of Primary Interest

Salivary Cortisol. Because cortisol levels are highly variable between individuals and sensitive to many factors, in order to evaluate the effect of study group on cortisol levels, cortisol values before the intervention were covaried in a mixed model ANCOVA, with values at midintervention and those after the intervention as levels of the repeated measures variable and study group as the between subjects factor. Results indicated a time x group interaction ($F_{(2, 47)} = 3.37, P = .032$), revealing an effect of time only for the integrated yoga group ($F_{(2, 47)} = 14.01, P < .001$), with cortisol levels decreasing from midintervention to after the intervention. The interaction is graphed in Figure 3.

Physical and Psychological Variables of Secondary Interest

Body Flexibility. Significant time x group interactions occurred for the sit-and-reach test ($F_{(4, 128)} = 6.61, P < .001$) and the trunk flexibility test ($F_{(4, 128)} = 6.24, P < .001$), with the integrated yoga group ($M_{\text{Before}} = 32.77, SE = 1.17, M_{\text{Mid}} = 35.64, SE = 1.21, M_{\text{After}} = 38.16, SE = 1.12; F_{(2, 128)} = 28.59, P < .001$) displaying increased flexibility on the sit-and-reach test across all three time periods and the yoga-as-exercise group displaying increased flexibility across two time points ($M_{\text{Before}} = 31.39, SE = 2.18, M_{\text{After}} = 36.28, SE = 2.07; F_{(2, 128)} = 8.20, P < .001$).

Trunk flexibility increased across all three time points as well for the integrated yoga group ($M_{\text{Before}} = 39.63, SE = 1.19, M_{\text{Mid}} = 42.11, SE = 1.15, M_{\text{After}} = 43.92, SE = 1.11; F_{(2, 128)} = 24.30, P < .001$) and across two time points for the yoga-as-exercise group ($M_{\text{Before}} = 37.89, SE = 2.21; M_{\text{After}} = 41.22, SE = 2.06; F_{(2, 128)} = 4.73, P = .031$).

Cardiovascular Wellness. Analyzing diastolic and systolic blood pressure separately, there were no significant effects for blood pressure. However, there was a significant main effect of time for resting heart rate ($F_{(2, 118)} = 3.18, P = .045$). The mean heart rate before the intervention of 70.75 decreased to a mean of 70.45 at during the intervention and then increased to a mean of 73.74 at after the intervention.

Body Weight. There was a significant main effect of group on body weight ($F_{(2, 64)} = 5.331, P = .007$). However, there were no other significant effects.

Affective Changes Associated With Acute Exercise. There was a significant main effect for pre-post class revitalization ($M_{\text{Pre}} = 1.55, M_{\text{Post}} = 2.57; F_{(1, 39)} = 78.54, P < .001$) and positive engagement scores ($M_{\text{Pre}} = 1.75, M_{\text{Post}} = 2.28; F_{(1, 39)} = 23.55, P < .001$), indicating that participants in both yoga groups experienced increases on these variables. There was also a significant main effect for pre-post class tranquility ($M_{\text{Pre}} = 1.00, M_{\text{Post}} = 3.10; F_{(1, 39)} = 103.13, P < .001$), indicating that participants in both yoga groups experienced a calming effect during the sessions. Analysis of the physical exhaustion subscale also indicated a main effect from pre to postclass ($M_{\text{Pre}} = 1.71, M_{\text{Post}} = 1.09; F_{(1, 39)} = 36.59, P < .001$), indicating less exhaustion after compared to before yoga classes.

Time 1 2 3

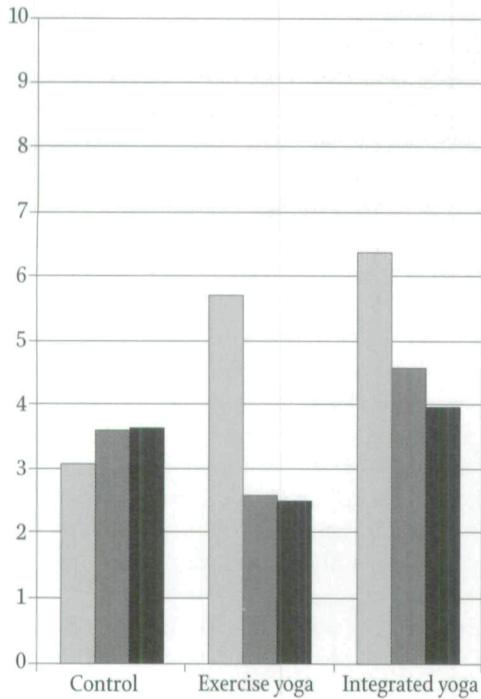


FIGURE 2a Depressive Symptomatology

Self-reported depressive symptomatology was reduced in both the yoga-as-exercise and integrated yoga groups but not for the questionnaire control group (all *P* values <.05).

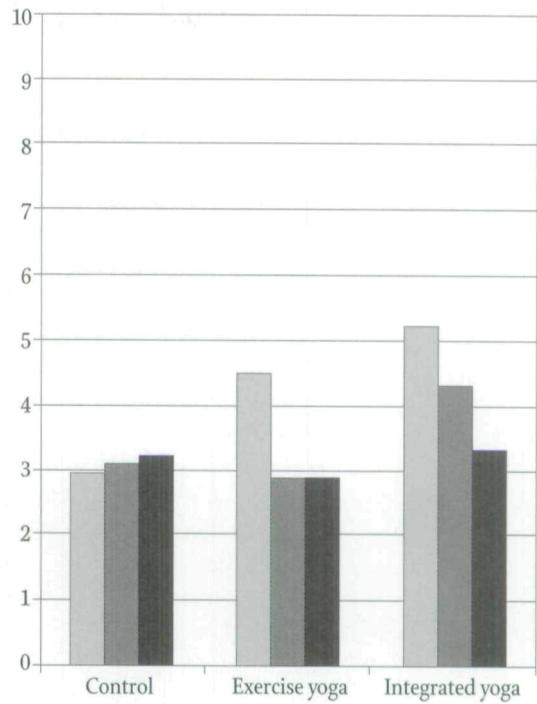


FIGURE 2b Anxiety Symptomatology

Self-reported anxiety symptomatology was reduced in the integrated yoga group but not in the yoga-as-exercise group or in the questionnaire control group (all *P* values <.05).

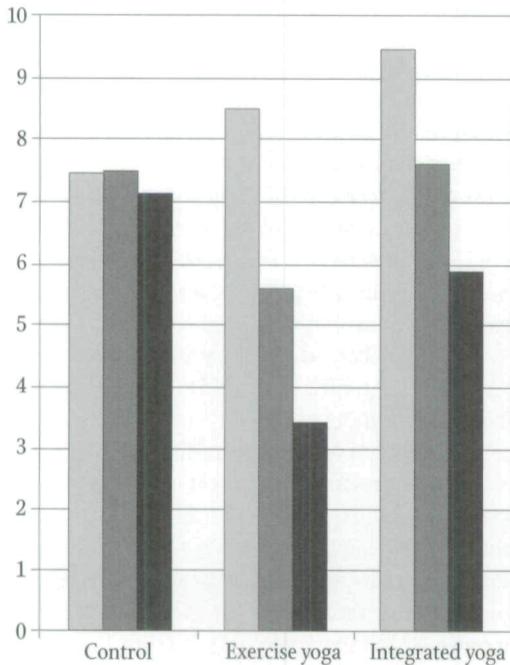


FIGURE 2c Stress Symptomatology

Self-reported stress symptomatology was reduced in both the yoga-as-exercise and integrated yoga groups but not for the questionnaire control group (all *P* values <.05).

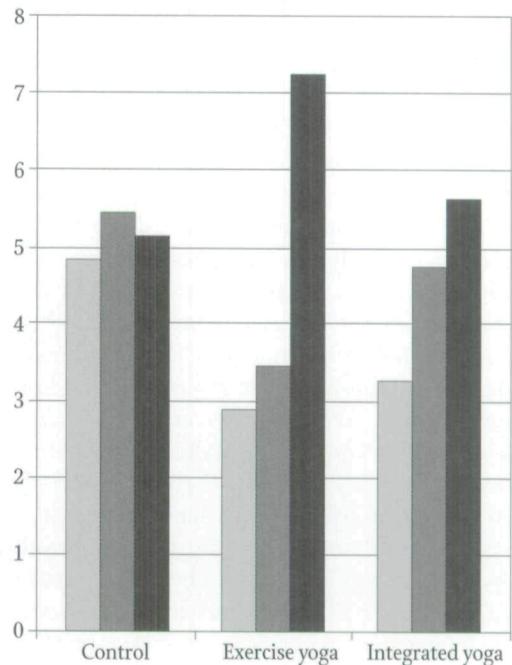


FIGURE 2d Hopefulness

Hopefulness was increased in both the yoga-as-exercise and integrated yoga groups but not for the questionnaire control group (all *P* values <.05).

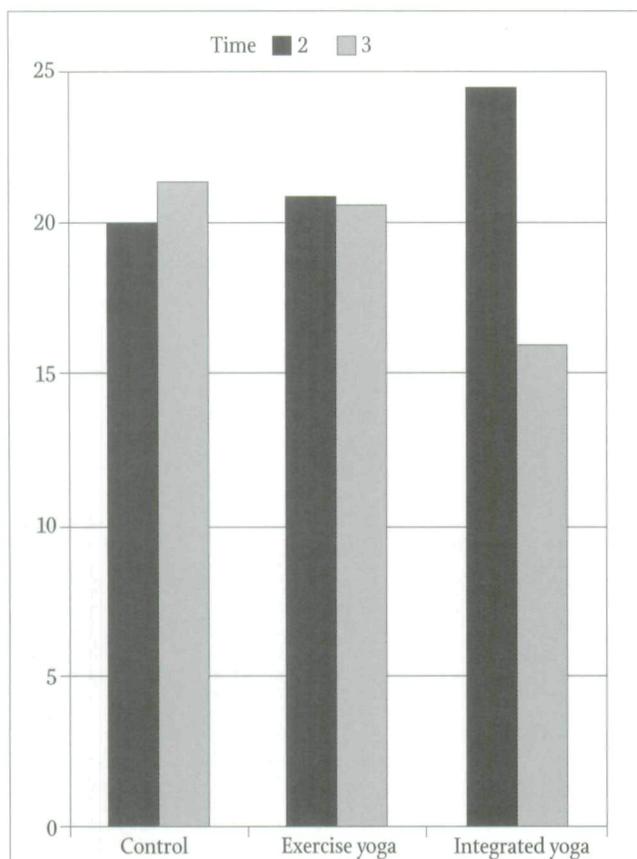


FIGURE 3 Morning Salivary Cortisol

Morning salivary cortisol levels decreased only for the integrated yoga group ($P < .05$).

DISCUSSION

The purpose of the current study was to determine whether participation in an integrated yoga practice involving meditation, exercise, and spiritual teachings would benefit physical, psychological, and spiritual well-being to a greater extent than yoga practiced primarily as a form of exercise. In general, findings indicated that both the integrated and exercise approaches to yoga yielded benefits over and above those of a control group on self-report measures of depression, stress, and hopefulness. However, only the integrated yoga group experienced significant decreases in anxiety-related symptoms and salivary cortisol, with cortisol means decreasing from midintervention levels of 23.80 to postintervention levels of 16.52. Cortisol levels postintervention were comparable to normal values reported by Laudat et al³³ of 15.5 (± 0.8) nmol/L. Increased levels of cortisol are associated with hypertension, hyperglycemia, immunosuppression, increased central adiposity associated with increased risk of myocardial infarction and cerebrovascular incident, decreased bone mineral density, and impaired cognitive function. Therefore, an approximately 31% decrease in cortisol likely represents a meaningful improvement in the body's principle chronic stress hormone. The integrated yoga group's decrease in cortisol is in alignment with, reflects, and supports the signifi-

cant decreases in anxiety-related symptoms.

The physical benefits of both practices were similar, with practitioners in both classes demonstrating increased flexibility. Participants in both the integrated yoga and yoga-as-exercise groups also reported feeling calm, relaxed, and refreshed after each class.

The subjective experience reported by the participants as they exited the study suggested that they enjoyed the groups but also that the participants in the integrated yoga group experienced, as one participant called it, "a sense of peace" and a cathartic emotional response that was not observed in the yoga-as-exercise group. We did measure spiritual well-being more directly using the Spiritual Well-Being Scale,³⁴ but none of the groups demonstrated a significant change on that measure. Future studies might include other measures of spirituality to determine whether this variable is affected by a yoga practice. The *yamas* and *niyamas* of traditional Eastern yoga that were included in the integrated yoga group might have presented the participants with novel approaches to moral lessons that, while not contrary to Judeo-Christian teachings, may have caused a certain amount of dissonance for the participants that would require more time than was allotted in this study to reconcile. This would be consistent with traditional yogic philosophy, which proposes that spiritual growth is an ongoing, complex process without definitive answers to moral and ethical dilemmas. Future studies might include a Judeo-Christian framework and language that may make the spiritual teachings more easily integrated into the existing spiritual schema of the participants in a Western class. For instance, Christian participants might use a biblical passage in their meditation and focus for the class as opposed to one of the *yamas* or *niyamas*.

The researcher was also the instructor for the groups and therefore was not blind to the study group condition. Thus, to eliminate experimenter bias and demand effects as a potential confounder, an observer trained in functional behavior analysis unobtrusively observed and rated the experimenter in his administration of two sessions each of both the integrated yoga group and the yoga-as-exercise group. The observer was unaware of the hypotheses of the study, and the yoga instructor was unaware that he was being observed. Analysis of the observer ratings revealed no significant differences in the amount of time spent meditating, in poses, or in relaxation. Further, there were no differences in the amount of time spent directing the classes (ie, speaking to the groups), smiling, and engaging in physical contact with the participants. Although using the same yoga instructor for both groups may have been a potential limitation, these analyses indicate that it is unlikely that the results were due to instructor effects and were more likely to be caused by participation in the groups.

Also, it is unlikely that any bias in the grouping of participants resulted in differences among these groups. Although participants were not randomly assigned to grouping condition, they chose from a list representing time periods during which they were free to participate in an hour-long session. Participants

APPENDIX Yoga Poses Used

Sun salutation poses that were used in every session for both yoga groups:

Tadasana/mountain
Uttanasana/standing forward bend
Urdhva Mukha Uttasana/flat back
 Plank
Chaturanga Dandasana/low push-up
 Cobra
Adho Mukha Svanasana/downward-facing dog
 Standing forward bend
Urdha Mukha Uttasana/flat back
Tadasana/mountain

Poses for both yoga groups that differed depending on yoga session:

Session	Pose
1	Repeats of sun salutation to learn poses
2, 7	Warrior II Warrior III
3, 8	<i>Ustrasana</i> /camel <i>Matsyasana</i> /fish Alternate-nostril breathing (in for 4, hold for 4, out for 4)
4, 9, 12	<i>Tadasana</i> /mountain <i>Vrksasana</i> /tree Warrior I Warrior III <i>Tadasana</i> /mountain
5, 10	<i>Dhanurasana</i> /bow Child <i>Ustrasana</i> /camel Downward-facing dog <i>Setu Bandhasana</i> /bridge Backbend <i>Supta Baddha Konasana</i>
6, 11	Warrior II <i>Tadasana</i> /mountain
Make-up	Repeated Sessions 1 and 3

had no way of knowing which group corresponded to each time period, so no participants self-selected into any particular group.

Because the results from both yoga groups were similar, it is of note that the integrated yoga group enjoyed some benefits beyond those of the yoga-as-exercise group. To better differentiate which aspect of the integrated practice is responsible for these changes, a future study might compare the component parts of the practice (ie, meditation, exercise, spiritual teachings). Meditation and exercise may have beneficial effects on anxiety and stress, and it is possible that the integrated yoga's involvement of both interventions, combined with a spiritual framework, creates a synergistic effect that the yoga-as-exercise class lacks.

These findings are interesting; however, they should be rep-

licated to determine whether cortisol as well as other physiological stress markers would yield similar results with larger groups. A comparison also should be made with a group that practices an alternative form of moderate exercise, such as walking, in order to determine whether the benefits are related primarily to the yoga class itself or the physical activity involved.

REFERENCES

1. Feuerstein G. *The Yoga Tradition: Its History, Literature, Philosophy, and Practice*. Prescott, AZ: Hohm Press; 1998.
2. Raub JA. Psychophysiological effects of Hatha yoga on musculoskeletal and cardiopulmonary function: a literature review. *J Altern Complement Med*. 2002;8(6):797-812.
3. No authors listed. Yoga Journal releases 2008 "Yoga in America" market study. *Yoga Journal*. http://www.yogajournal.com/advertise/press_releases/10. Accessed March 16, 2011.
4. Hurst A. Easy moves. *Southern Living*. 2004;39:52.
5. McGinnis M. Yoga's got muscle. *Prevention*. 2004;56:33.
6. Parker-Pope T. Market stress? Try yoga—It might also relieve your asthma, ailing back. *Wall Street Journal: Eastern Edition*. 2002;240:D1.
7. Schaeffer R. Deeper sleep. *Natural Health*. 2000;30:42.
8. Schaeffer R. Make your skin glow with yoga. *Natural Health*. 2002;32:38.
9. Gillani N, Smith J. Zen meditation and ABC relaxation theory: an exploration of relaxation states, beliefs, dispositions, and motivations. *J Clin Psychol*. 2001;57(6):839-846.
10. Janowiak JJ, Hackman R. Meditation and college students' self-actualization and rated stress. *Psychol Rep*. 1994;75(2):1007-1010.
11. Williams KA, Kolar MM, Reger BE, Pearson JC. Evaluation of a wellness-based mindfulness stress reduction intervention: a controlled trial. *Am J Health Promot*. 2001;15(6):422-432.
12. Gaylord C, Orme-Johnson D, Travis F. The effects of the transcendental meditation technique and progressive muscle relaxation on EEG coherence, stress reactivity, and mental health in black adults. *Int J Neurosci*. 1989;46(1-2):77-86.
13. Kabat-Zinn J, Massion AO, Kristeller J, et al. Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*. 1992;149(7):936-943.
14. Miller JJ, Fletcher K, Kabat-Zinn J. Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *Gen Hosp Psychiatry*. 1995;17(3):192-200.
15. Pearl JH, Carozzi AF. Effect of meditation on empathy and anxiety. *Percept Mot Skills*. 1994;78(1):297-298.
16. Roth B, Creaser T. Mindfulness meditation-based stress reduction: experience with a bilingual inner-city program. *Nurse Pract*. 1997;22(3):150-176.
17. Fabbro F, Muzur A, Bellen R, Calacione R, Bava A. Effects of praying and a working memory task in participants trained in meditation and controls on the occurrence of spontaneous thoughts. *Percept Mot Skills*. 1999;88(3 Pt 1):765-770.
18. Shapiro SL, Schwartz GE, Bonner G. Effects of a mindfulness-based stress reduction on medical and premedical students. *J Behav Med*. 1998;21(5):581-599.
19. Teasdale JD, Segal Z, Williams JM. How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behav Res Ther*. 1995;33(1):25-39.
20. Mickley JR, Soeken K, Belcher A. Spiritual well-being, religiousness and hope among women with breast cancer. *Image J Nurs Sch*. 1992;24(4):267-272.
21. Minkoff K, Bergman E, Beck AT, Beck R. Hopelessness, depression, and attempted suicide. *Am J Psychiatry*. 1973;130(4):455-459.
22. Herth KA. The relationship between level of hope and level of coping response and other variables in patients with cancer. *Oncol Nurs Forum*. 1989;16(1):67-72.
23. Snyder CR, Shorey HS, Cheavens J, Pulvers KM, Adams VH III, Wiklund C. Hope and academic success in college. *J Educ Psychol*. 2002;94(4):820-826.
24. No authors listed. Ethical principles of psychologists and code of conduct. *Am Psychol*. 2002;47(12):1597-1611.
25. Lovibond S, Lovibond P. *Manual for the Depression Anxiety Stress Scales* 2nd ed. Sydney, Australia: Sydney Psychology Foundation; 2002.
26. Herth K. Abbreviated instrument to measure hope: development and psychometric evaluation. *J Adv Nurs*. 1992;17(10):1251-1259.
27. Gauvin L, Rejeski W. The exercise-induced feeling inventory: development and initial validation. *J Sport Exerc Psychol*. 1993;15:403-423.
28. Sturgess S. *The Yoga Book: A Practical and Spiritual Guide to Self-Realization*. London, England: Watkins Publishing; 2002.
29. Herth K. The relationship between hope, coping style, concurrent losses, and setting to grief resolution in the elderly widow(er). *Res Nur Health*. 1990;13(2):109-117.
30. Szabo A, Mesko A, Caputo A, Gill E. Examination of exercise-induced feeling states in four modes of exercise. *Int J Sport Psychol*. 1998;29:376-390.
31. Roberts AD, Wessely S, Chalder T, Papadopoulos A, Cleare AJ. Salivary cortisol response to awakening in chronic fatigue syndrome. *Br J Psychiatry*. 2004 Feb;184:136-141.
32. Johnson BL, Nelson JK. *Practical Measurements for Evaluation in Physical Education*. 4th ed. New York, NY: Macmillan Publishing Company; 1986.
33. Laudat MH, Cerdas S, Fournier C, Guiban D, Guilhaume B, Luton JP. Salivary cortisol measurement: a practical approach to assess pituitary-adrenal function. *J Clin Endocrinol Metab*. 1988;66(2):343-348.
34. Ellison CW, Jonker-Bakker I. Spiritual well-being: conceptualization and measurement. *J Psychol Theol*. 1983;11(4):330-340.

Copyright of Alternative Therapies in Health & Medicine is the property of PH Innovisions Journal Operating LLC and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.