1995

The effects of Hatha yoga on trait anxiety

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THE EFFECTS OF HATHA YOGA ON TRAIT ANXIETY

A Thesis

Presented to

**The Faculty of the Department of Human Performance
and the Department of Psychology
San Jose State University**

In Partial Fulfillment

**of the Requirements for the Degree
Master of Arts**

By

Jeanne Romano

May, 1995

UMI Number: 1374619

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ABSTRACT

THE EFFECTS OF HATHA YOGA ON TRAIT ANXIETY

by Jeanne Romano

The effect of Hatha yoga on trait anxiety scores was examined using the State Trait Anxiety Inventory in a cross-sectional design. An Iyengar style Hatha yoga practice group of minimal experience (0-4 weeks) was compared to groups with 5 weeks-6 months, 7-12 months, and 13-24 months of regular yoga practice. Data on participation in other stress management techniques was also collected. A 1-way ANOVA with a post hoc Scheffe was used to determine if groups who had practiced regularly would have lower scores than the novice group, and if that effect would be more pronounced as practice months increased. Significant results were not found, but a trend in the hypothesized direction was shown. Successive practice groups also showed an increase in total time spent in stress management activities in general. A longitudinal design using a larger population was recommended for further research on yoga as an agent in managing anxiety.

Acknowledgments

I would like to thank my advisor, Dr. Bethany Shifflett, for her valuable guidance and support. Through her enthusiasm and desire to facilitate growth, I have expanded my understanding of research and critical thinking in general.

I appreciate the interest and assistance provided by the other members of my committee, Dr. Robert Hicks and Dr. Barbara Conry.

I am grateful to the directors and instructors of 4th Street Yoga, the California Yoga Center, the Iyengar Institute of San Francisco, Mid-Peninsula Yoga, Namaste Yoga Studio, Piedmont Yoga Studio, the Yoga Center of Marin, Yoga Fitness, The Yoga Room, and the Yoga School of San Francisco for assisting in my search for subjects and for encouraging this research.

Finally, I would like to thank my husband, Tony, for his patience with me and this process, and for providing me the opportunity and encouragement to pursue advanced education.

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CHAPTER I

Introduction

In 1936 Hans Selye introduced the concept of stress reactions as a detriment to health (Selye, 1980). We, as a society, still struggle to manage these reactions. Selye describes stress as the natural and automatic response of the body to a demand for adaptation. This reaction is healthy and necessary when we are physically or emotional endangered, and it is physiologically reversed when we implement the necessary action (Selye, 1956). If, however, the response is thwarted, the body continues the preparation for battle with elevated blood pressure, heart rate, breathing rate, metabolism, and blood flow to large muscle groups. Selye calls this the General Adaptation Syndrome which can result in overworked adrenal glands, shrinking capacity of the immune system, and stomach ulcerations. The effects on these organs are cumulative, and eventually there is a loss in the ability to respond effectively, which sometimes results in complete exhaustion and immobility.

What initiates this alarm reaction besides real physical threat? According to Pelletier (1977), social change, work environment, and technological innovation requiring rapid and frequent adaptation, trigger the stress response. These daily stressors can predispose us to such common problems as allergies, cardiovascular disease, cancer, arthritis, and respiratory disease. Holmes and Rahe (1967) documented this phenomenon in their Social Readjustment Scale which rates the stressfulness of over forty life changes such as death of a spouse, being fired from work, and retirement. The

Physical Symptom Checklist (Scheier & Carver, 1987) relates stress to physical symptoms such as headache, fatigue, nausea, and stomach pain. Stress is so prevalent as a precipitating factor that it is possible that these particular diseases may actually be the long-term effects of stress (Allen, 1983).

The best way to minimize the stress reaction is to recognize personal stress symptoms throughout the day, and to seize the opportunity to change the course of events (Selye, 1956). There are several indexes of the human stress response that help monitor stress level. One major index of stress is anxiety, characterized by "subjective feelings of tension, apprehension, nervousness, and worry" (Spielberger, Gorsuch & Lushene, 1970). Anxiety has two forms: an unpleasant emotional state that is elicited by a specific circumstance, or the tendency to regularly react anxiously. The first is state anxiety, which is situation specific. The second is trait anxiety, the propensity to become anxious. Those with high trait anxiety define more situations as threatening and therefore experience state anxiety more often and more intensely than those with low trait anxiety.

The body's automatic physiological reversal of this mobilization response to stress occurs when the organism has taken action against the threat (Benson, 1975). This reversal is called The Relaxation Response and can also be voluntarily initiated with training. Practice can make this response more habitual. Although Benson acknowledges several methods of intervention, he recommends Transcendental Meditation (TM). Much of the research on anxiety reduction refers to Benson's work, and has focused on meditation, progressive relaxation, biofeedback, and more recently, exercise.

Research indicates that physiological and psychological indicators of stress can be modified by each of these treatments. A meta analysis on

exercise and anxiety (Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991) disclosed that a minimum of 9 weeks of practice was needed to reduce the propensity to react anxiously (trait anxiety) and that there was a significantly greater likelihood of decreased anxiety after 16 weeks of practice. Other characteristics of a long term anxiety reduction response from exercise have been scarcely addressed. Is there a cumulative effect such that we can expect even lower scores after another 16 weeks? Or, does anxiety level drop to a certain point and not decline any further? Which exercises are effective, and why? One cross-sectional study of runners found a significant incremental decrease in anxiety as the number of months of regular running increased (Nouri & Beer, 1989), thus indicating an inverse relationship of training period and level of anxiety.

Hatha yoga, as a moderate intensity exercise, has been under-researched, possibly because there is some confusion about what it is. Yoga, the term commonly used to refer to the exercise, is actually a broad category. Studies on rules of "right living," meditation, relaxation, and breathing techniques, as well as the physical activity of performing yoga postures can be found categorized under this subject title. These elements are all part of an ancient 8-step philosophy called Raja Yoga which may date back as far as 5000 B.C. when it was systematized (Satchidananda, 1990). The 8 steps are:

- 1) Universal ethical principles (Yama)
- 2) Rules of personal conduct (Niyama)
- 3) The practice of Yoga postures (Asana)
- 4) The practice of Yoga breathing techniques (Pranayama)
- 5) Control of the senses (Pratyahara)
- 6) Concentration of the mind (Dharana)

7) Meditation (Dhyana)

8) Absorption in the Infinite (Samadhi) (Mehta, Mehta & Mehta, 1990)

In toto, yoga is a systematic approach to becoming one with, or attaining the highest level or state of consciousness of which man is capable" (Funderburk, 1977, p. vi). This state is described as bliss, complete knowledge, happiness and one-ness with God. The intent of yoga is to understand and overcome any obstacles that might interfere with attaining this higher level of consciousness. The obstacles presented by the body are the focus of Hatha Yoga; that is, physical control of the body, and the coordination of body and mind through the feedback mechanism of the breath.

Although Hatha yoga embraces all eight steps of Raja Yoga, it emphasizes the third step, the practice of postures, or asanas. This practice includes a set of physical exercises specifically designed to develop strength, flexibility, balance and a very controlled mental focus (Schatz, 1992). In body positioning, Hatha yoga is similar to gymnastics, but it is relatively stationary. Therefore, the terms "poses" and "postures" are used for the positions of strength or flexibility that are held for between 15 seconds and 20 minutes.

Since the purpose of this project is to investigate only step 3, the physical portion of yoga, any further references to yoga are to Hatha yoga asana practice. Figure 1 contains a sample of yoga poses. For even the most basic of these poses there are numerous adaptations designed to allow a student of any level of flexibility and strength to experience the stretching and strengthening benefits of the pose. Figure 2 (Couch, 1990, p. 46) is an example of such an adaptation. Beginners sometimes utilize a table, a wall or a block to assist the proper positioning. Perfecting the yoga postures requires

Figure 1: Yoga Poses

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- 7.21 Side Angle Pose
 7.22 Side Angle Pose—narrow stance
 7.23 Side Angle Pose—back against wall

UTTHITA PARSVAKONASANA

SIDE ANGLE POSE

1. Placement. Stand in Mountain Pose. On an exhalation jump to separate your feet approximately four to four and one-half feet (or so your feet line up under your wrists). Turn your left foot in 30 degrees and your right foot out 90 degrees. Check that your right heel is in line with the arch of your back foot. Keep your kneecaps lifted and your front and back thighs active.

2. Pose. On an exhalation bend your right knee until your thigh and calf form a right angle. Check to see that your knee is directly over your heel. Exhale and stretch the right side of your body from your right hip as you extend your torso along your right thigh. Place your right fingertips or palm on the floor to the outside of your right foot, and extend your left arm overhead in line with your left leg. Turn from your hips to face the ceiling. Keep your face and throat relaxed and your gaze soft. Hold for ten to twenty seconds, breathing evenly. Release by coming back to standing. Turn your right foot in and left foot out, and practice on the opposite side. When you are done, jump your feet back to Mountain Pose.

3. Variation. Taking your front leg to a right angle may be difficult in the beginning, so narrow your stance to three and one-half feet wide. Bend your right leg so that your lower leg is at a right angle to the floor. Hold the inside of your right lower leg with your right hand. Press your right arm against your leg and open your chest. Keep your back leg active, lengthening from your buttock through your heel.

4. Aid. Stand as in #1 with your back against a wall and your left heel touching the wall. Place two thick books (or more, if necessary) to the outside of your right foot. Move into Side Angle Pose following the directions in #2, placing your right palm (or fingertips) on the books.

Benefits: Side Angle Pose (Utthita Parsvakonasana) provides an intense stretch to both legs and to the sides of the body. It also opens the hips and stretches the groins.

Figure 2: Yoga Pose Adaptation.

Reprinted by permission (Couch, 1990, p. 46)

strength, muscle coordination, and a single-pointed focus similar to some forms of meditation. Since the postures are typically held for several minutes, the mind is trained to focus on internal body sensations, muscular control, and breath regulation, thus increasing body awareness. Conscious relaxation is developed by learning to breath naturally and deeply while executing even strenuous postures. Most yoga classes are completed with a relaxation period, often with breathing exercises or guided visualization.

Since Hatha yoga incorporates other familiar stress management techniques such as controlled breathing and a meditation-like attention, it is a strong candidate for research regarding anxiety reduction via exercise. Although reducing an active state of anxiety (state anxiety) is useful, it is only a temporary measure lasting up to a few hours. By contrast, reducing trait anxiety was hypothesized to reduce the onset and magnitude of anxiety, and was therefore the focus of this research.

Statement of the problem

Exercise has been shown to reduce trait anxiety and is beginning to become part of stress management programs being implemented in schools, businesses, and rehabilitation centers (Archer, 1986; Pelletier & Lutz, 1988; Ornish, 1990). Most exercise research conducted on a psychologically normal, or non-clinical population, has studied aerobic exercise (Petruzzello, et al., 1991), although there is some evidence that non aerobic exercise reduces anxiety (Berger, & Owen, 1988; Jones, 1981). Previous research has not thoroughly addressed yoga as an exercise option or the long term effect of exercise on trait anxiety.

Statement of the purpose

The purpose of this research was to examine the effects of Hatha yoga exercise on trait anxiety. Specifically, the study examined whether stress was reduced when a person regularly practiced yoga for up to 24 months.

Statement of the research hypotheses

The research hypothesis was that mean trait anxiety scores for novice yoga practitioners would be higher than those of the regularly practicing yoga groups. It was hypothesized that the effect of Hatha yoga on trait anxiety scores would be a function of the number of months of regular practice; the yoga practice term would be inversely related to trait anxiety level.

Statement of the null hypotheses

The null hypothesis was that mean trait anxiety scores for novice yoga practitioners would not differ from the other yoga groups' scores. There

would be no significant difference in mean trait anxiety scores among groups of regularly practicing yoga subjects, regardless of the number of months of regular practice.

Assumptions

The range of months selected to designate the treatment groups of regular practice would detect the effect of yoga on anxiety levels. Defining "regular practice" as a minimum of 2 practices a week totaling at least 3 hours was a minimum commitment to produce the desired effect. The subjects would be unaware of the purpose of the study and would complete the anxiety scale without consideration of the researcher's intent.

Delimitations

Only adult females were included in the study. The regular yoga practitioners were drawn only from classes designated as level 1, 2, or 3 (beginning and two levels of intermediate) at Iyengar Hatha yoga studios in the San Francisco Bay area. Subjects had practiced yoga regularly for up to 2 years. Trait anxiety levels were measured by the State Trait Anxiety Inventory.

Limitations

The following limitations have been identified: Inherent to the cross sectional design is the possibility that subjects who have exercised longest may have started with lower anxiety levels. The use of convenience groups limits the ability to generalize. Subjects may have been practicing other stress management techniques. The volunteer effect could influence the anxiety

scores. The anxiety measures may have been slightly underestimated for all subjects due to the timing of administration of the survey.

A minimum commitment to yoga was ensured by the definition of "regular practice," but no maximum boundary was utilized. Since subjects provided a retrospective assessment of exercise habits, inaccuracies or exaggerations were possible. Only the effect of number of months of regular yoga practice was examined statistically, yet practice frequency and duration (which were examined descriptively) may interact. Since yoga practice habits are very individual and variable, it was not possible to totally isolate the effect of number of practice months by holding frequency, duration, or intensity constant. Efforts were made to control for frequency and duration by careful selection of ranges of practice months that delineated the yoga groups.

Definitions and operational definitions

Asanas. Asanas are physical poses used in Hatha yoga practice to explore the inner body, the mind, and the spirit (Couch, 1990).

Anxiety. "Anxiety is the apprehension cued off by a threat to some value that individuals hold essential to their existence as a personality. The threat may be to physical life (the threat of death), or to psychological existence (the loss of freedom, meaninglessness)" (May, 1983). Anxiety level in this research was measured by subject score on the trait portion of the State Trait Anxiety Inventory (Spielberger et al., 1970).

Autogenic training. Autogenic training is "a series of techniques designed to induce states of deep mental and physiological relaxation." It is a type of self hypnosis to arouse feelings of warmth and heaviness to induce states of

deep relaxation (Allen, 1983, p. 189).

Anxiolytic. Counteracting or diminishing anxiety (Thomas, 1989, p. 120).

Benson's Relaxation Response. The physiological reverse of the body's reaction to stress. It can be induced by several methods, but Transcendental Meditation is most commonly associated with Benson (Benson, 1975).

Hatha Yoga. Exercise consisting of stretching, strengthening and balancing postures. Techniques of breathing, visualization, focus and relaxation are used in conjunction with the poses (Schatz, 1992).

Iyengar yoga. A technique of practicing Hatha yoga developed, taught and documented by B. K. S. Iyengar (Iyengar, 1966).

Meditation. "Meditation is fundamentally an exercise for directing attention... on things that are either unchanging or repetitive." (Allen, 1983, p. 167).

Pranayama. Control of the breath: inhalation, exhalation, and retention. Practiced for clarity of thought, to strengthen the lungs, and generate energy (Mehta, et al., 1990, p. 155).

Progressive relaxation. Systematic isometric contractions of specific major muscle groups. The contraction is held for 5 to 10 seconds, then released for 45 seconds to bring awareness of the contrasting states. One muscle group is operated on at a time, moving systematically throughout the body. (Allen, 1983, p. 223).

Stress. The natural and automatic response of the body to a demand for adaptation (Selye, 1980). "Stress is the state manifested by a specific syndrome which consists of all the nonspecifically induced changes within a biologic system. Thus stress has its own characteristic form and composition but no particular cause. The elements of its form are the visible changes due

to stress, whatever its cause. They are additive indicators which can express the sum of all the different adjustments that are going on in the body at the time" (Selye, 1956, p. 54).

Visualization and guided imagery. Imagining or creating mental pictures of a situation or scene involving all of the senses (Allen, 1983, chap. 14).

Yoga. "Traditionally, the word Yoga by itself refers to Raja Yoga, the mental science." (Satchidananda, 1990). Yoga in this study refers to the physically oriented stage of yoga called Hatha yoga.

Significance of the study

Research has shown that exercise is a viable treatment for anxiety-related illness and illness prevention. Compared to drug therapy, it has the additional benefits of being low cost, enjoyable, and having no side effects. In a holistic approach to health, avoidance of stress related illness is practiced rather than treatment of the full blown symptoms. This holistic approach requires more responsibility on the part of the individual regarding attention to preventative measures such as exercise.

The proposed research provides more information on the effectiveness of yoga as a stress management tool which can offer another alternative in a stress management program. It will help explain the length of time an individual needs to derive benefit from yoga.

Summary

Continued stress has been strongly associated with a gradual weakening of the body, which may result in physical or mental disorders (Selye, 1956; Pelletier, 1977; Ornish, 1990). The source of stress (stressor) is any

circumstance that the individual interprets as a request for adaptation, with the amount of resulting stress a function of how threatening this demand is. Controlling or reversing the stress reaction involves learning to recognize its presence and regularly practice an effective management technique such as meditation, progressive relaxation, biofeedback or exercise (Benson, 1975).

Practice promotes incorporation of a technique into daily living, until it becomes a more automatic response to stress. Regular exercise has been shown to reduce trait anxiety typically after a minimum of 9 weeks of training (Petruzzello et al., 1991). Most of the research has been performed with aerobic exercise, usually running, and little has been done on non-aerobic exercise with a healthy population. Few studies have investigated the effect of continued training beyond the point of the initial anxiety reduction (Nouri & Beer, 1989).

Hatha yoga is a relatively unresearched, non-aerobic exercise that develops strength, flexibility, self awareness and relaxation (Mehta, et al., 1990; Schatz, 1992). It incorporates techniques of meditation, breathing, progressive relaxation and visualization. The intention of this study was to examine the effectiveness of Hatha yoga as a viable non-aerobic anxiety treatment, and to describe the pattern of the effect found in practitioners of up to 2 years time.

CHAPTER II

Review of Literature

Introduction

The first of five sections in the literature review will examine the pervasiveness of stress in our society. Then, research on traditional treatments for stress is reviewed, as well as comparisons made to exercise treatments. Third, a review of the influence of exercise characteristics on stress reduction such as type, duration, and intensity is presented. Hatha yoga will also be reviewed as a moderate intensity exercise which combines elements of the traditional anxiety treatments of meditation, breathing skills, and progressive relaxation. Results of prior yoga research are presented regarding its general health related benefits, and its effect on anxiety. A summary concludes the chapter.

Stress in society

The following five studies supported Pelletier's assertion (1977) that stress could be experienced from everyday events. Stress is not only a problem for middle aged executives; it begins in late adolescence (Pelletier, 1977) and crosses all walks of life. Initiated by medical research, interest had grown in understanding causal circumstances of stress. The pervasiveness of the problem helped bring about the recognition of a need for programs based on knowledge gained from research.

In a survey conducted on 457 undergraduates (177 men, 280 women) from university introductory psychology classes, only 16% reported they had an acceptable level of stress in their lives (Campbell, Svenson & Jarvis, 1992).

Women perceived a higher level of stress than men. When asked how they felt they could positively influence their stress level, women expressed a need to control their commitments, their exercise frequency, and general worry, while men suggested an increased use of exercise. The main reasons given for not utilizing such stress management techniques were a lack of time and self discipline. Additionally, older men (over 22 years) reported less stress than younger men; women over 22 years registered the highest levels of stress.

Examining circumstantial causes of stress, Fuchs and Hahn (1992) studied the effects of stress on illness for 330 unemployed former East Germans seeking employment in Western society. Self report questionnaires were administered upon arrival in Western Europe to 144 women and 186 men aged 17 to 67 years old. A second measurement was taken 8 months later. The State Trait Anxiety Inventory A-trait scores were moderately correlated with the Health Complaints Rating Scale both times ($r=.56$, $r=.46$) indicating that those prone to anxiety suffered more illness symptoms. They also found that high trait anxiety may be influential only in specific stressful situations. At the second measurement, the unemployed with high anxiety suffered statistically more illness symptoms than those with low anxiety levels, but high anxiety scores did not affect the illness symptoms of those who had found employment.

The medical profession's interest in stress management was heightened by Selye's clinical description of the body's stress response, and by the growing need to treat patients for stress induced hypertension (Benson, 1975). Hypertension could lead to hardening of the arteries, strokes and heart attacks which together were responsible for about 50% of the deaths in the United States. Benson researched the ability to train an individual to activate the

parasympathetic nervous system, the body's natural mechanism for reversing the stress response. His work with Transcendental Meditation (TM), helped set the stage for physiologically based research in managing stress. In one of his early studies, a 6 week base-line blood pressure was established on volunteers from new registrants to a TM course. This convenience group was then taught TM to a criterion level of activating the relaxation response, and establishing a pattern of meditating twice each day. After several weeks (specific time not available), the mean blood pressure of the 36 subjects went from borderline hypertensive to normal. The effect continued as long as the subjects practiced TM. Those who stopped meditating registered a return to the higher level within 4 weeks.

Expanding on Selye and Benson's work, Pelletier (1977) was an early proponent of a holistic approach to health. Pelletier expresses that in Western society mind and body have been treated historically by different specialists--doctors for the body, psychologists and therapists for the mind. With 144 million new prescriptions for tranquilizers written each year, it was time to recognize the mind's effect on the body and the patient's need for a participatory and responsible role in his or her own health. Stressors produced stress in some individuals and not in others in the same situation, and certain stressors influenced the same person differently at different times. Awareness of stress signals by the individual and appropriate coping strategies were essential. Part of holistic medicine was recognizing dysfunctional patterns such as teeth clenching, then retraining the response.

About the same time as Pelletier's work, Gaardner (1975) encouraged physicians to incorporate psychophysiological techniques considered "alternative treatments" in the medical profession at the time. Alternative

therapies for stress such as biofeedback, autogenic training, yoga, and muscle massage were gaining popularity, and were being practiced without the guidance of the medical profession. These approaches were justified by three researched principles: (1) anxiety and muscle relaxation were mutually exclusive, (2) training in sensorimotor learning was effective, and (3) homeostatic adaptive control could be manipulated. To include these effective treatments, and to discourage harmful results, research was necessary to provide guidelines for indications and contraindications to patients from a medical standpoint.

Exercise and traditional techniques

The “non traditional” stress management technique of exercise has been compared to several of the “traditional” stress management techniques using physiological as well as psychological measures of effectiveness. The examples presented illustrate the complexity of the interaction of stress reducing factors. Seemingly contradictory results have been obtained by a slight variation in instrumentation or method.

In one such comparative study, Bahrke and Morgan (1978) randomly assigned 75 regularly exercising male subjects to two treatment and one control groups. The subjects’ mean age was 51.9 years, ranging from 22 to 71 years. The physical exercise group walked at 70% maximal heart rate on a treadmill for 20 minutes. The other treatment group used Benson’s TM method of the Relaxation Response; they listened to TM instructions, then practiced meditation for 20 minutes in a reclining chair. The control group relaxed for 20 minutes and could optionally read a magazine. Each group was measured before, just after treatment, and 10 minutes after that by the

State Trait Anxiety Inventory (STAI). All three groups showed a state anxiety reduction after treatment, indicating that the “time out” experienced by the control group that simply experienced a break from daily life, was just as effective as meditation and exercise.

Exercise was again compared to the Relaxation Response in a 12-week study by Berger, Friedman & Eaton (1988), but with some methodological changes. Random assignment placed 280 volunteer college students into groups: jogging, Benson Relaxation Response, a discussion group, or a control group of no treatment. This time the tension, depression and anger subscales of The Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) were used to measure anxiety levels. Bahrke and Morgan conducted a one-time measurement on regularly exercising subjects who were not practiced in any of the treatment conditions. Berger, et al. measured pre-post anxiety on subjects who were trained in their experimental treatment, and they performed the measurement on three different occasions. Joggers were required to practice for at least 20 minutes at least 3 times per week; the relaxation response group practiced a minimum of 20 minutes each at least 5 times a week; group interaction consisted of 75 minutes per week. The POMS was administered before and after group practice meetings and to the control group once a month to determine short-term change in anxiety. Contrary to Bahrke and Morgan’s study, each pre-post treatment day measured showed significant short-term anxiety reduction for the joggers and relaxation response subjects, but not for the discussion or control groups. The anxiety reduction effects of each treatment were stronger for women than men.

To investigate the gender differences just described, more analysis was performed on the preceding jogging, relaxation response, group interaction

data (Friedman & Berger, 1991). The Bem Sex Role Inventory (BSRI; Bem, 1974) provided scores on the subscales of masculinity, and femininity. Subjects were then designated as high or low on each scale by a median split. The research hypothesis was that compatibility of these traits with an activity would provide the environment for more enjoyment, higher adherence and therefore better anxiety reduction effectiveness. Overall, POMS scores showed the femininity trait did not significantly interact with treatment for either gender, whereas men and women joggers with high masculinity demonstrated a more elevated mood. Although all groups significantly benefited from relaxation, high masculinity men showed a greater reduction in tension and anger POMS subscales than low masculinity men.

Another traditional stress management treatment, progressive relaxation, was compared to exercise in its effect following stressful life events (Roth & Holmes, 1987). Volunteers from 1000 undergraduate college students who scored in the upper 20% of the Life Experiences Survey, were administered the Beck Depression Inventory, STAI, and Hopkins Symptoms Checklist. Measurements were taken pre-treatment, after 5 weeks, and at the end of the 11-week program on the randomly assigned treatment and control groups. Exercisers (n=18) ran at 75% of maximum heart rate, the second treatment group (n=19) performed progressive relaxation and guided imagery, and the no treatment group (n=18) simply completed paper and pencil instruments. Both treatment groups met for 1/2 hour 3 times a week. A treadmill test on the exercisers verified a gain in physical fitness. On the 5th week testing, only the exercise group showed a significant decrease in depression, and contrary to expectations, all three groups showed relief from only depression at week 11. The authors suggested this decrease in depression may have been the

simple result of time, although a 2 month follow-up showed a continued decrease in depression only for joggers.

Long and Haney (1988a, 1988b) compared the long-term effects of exercise and progressive relaxation on anxiety reduction in two studies. The first study involved 50 chronically stressed sedentary working women from the general public (mean age=39.8) who had been randomly assigned to the exercise or progressive relaxation group for 8 weeks (Long & Haney, 1988a). All had scored high on the Tension Thermometer instrument and exercised less than 3 times per week. Both groups met once a week for 90 minutes, and were asked to practice their treatment at least 3 times a week on their own. Self efficacy (Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs, & Rogers, 1982) and STAI A-trait were measured the first week. Results suggested that the two treatments were equally effective in reducing anxiety and increasing self efficacy. Contrary to expectations, a survey 2 months after the program showed that high self efficacy did not predict adherence, and that subjects with high self efficacy or low trait anxiety scores at the end of the program tended to stop practicing after the program ended.

In a follow-up survey 14 months later, 39 of the original 50 subjects were surveyed (Long & Haney, 1988b). As in the original study, A-trait measured anxiety, and the Ways of Coping Checklist (Lazarus & Folkman, 1984) measured problem- and emotion-focused coping strategies. Four significant findings were obtained. First, exercise was a viable alternative to relaxation for anxiety reduction. Secondly, more exercisers adhered post study than relaxation subjects, albeit not to the prescribed regimen of 3 times per week. Thirdly, both groups continued to decrease anxiety levels over the 14 months despite the reduced adherence. Fourthly, they found that greater self efficacy

at post treatment correlated with maintenance of treatment effects ($r=-.32$ for anxiety; $r=-.35$ for emotion-focused coping). Although they expressed concern over the validity of the efficacy instrument, their results suggested that treatment effects might be indirectly due to increased self efficacy rather than directly to the experimental treatments.

An expansion to the general relaxation response proposed by Benson (1975) was investigated by Schwartz, Davidson and Goleman (1978). They hypothesized that a specific treatment delivered a specific additive effect. They devised the Cognitive Somatic Anxiety Questionnaire to assess the cognitive and somatic sub-components of anxiety in 77 subjects. An intact group of participants of a physical exercise class ($n=44$) and a group practicing transcendental meditation ($n=33$) were rated on awareness of anxious thoughts and feelings (cognitive anxiety), and on awareness of body sensations experienced when anxious (somatic anxiety). Results indicated that meditators have less cognitive anxiety and more somatic anxiety than exercisers, but the groups did not differ in anxiety overall. They suggested that results are preliminary, since the subjects' pre-treatment levels of somatic and cognitive anxiety may have confounded the study.

A review of the comparative literature on stress reduction techniques was done by Lehrer & Woolfolk (1984). Although all techniques produce a general "relaxation response" as described by Benson, there were specific effects that may have overlaid a general response. For instance, autogenic training which focuses on the autonomic nervous system (i.e., warm hands, slow heart rate) had a greater effect on the autonomic nervous system measures than progressive relaxation and biofeedback, which have their greatest effect on the musculoskeletal system. Meditation had elements of

somatic and cognitive treatment and therefore affected both. Combinations of somatic and cognitive techniques appeared to work best at reducing overall anxiety level.

Exercise and anxiety reduction

A landmark review of exercise used in the pursuit of mental health listed the research problems that were inhibiting support for exercise as a serious treatment (Folkins & Sime, 1981). Issues of poor design included lack of a control group, lack of randomized groups, use of clinical populations, and absence of proof of fitness improvement. Interpretation of results required caution because of inconsistencies in duration and intensity of exercise used across studies. The influence of frequency of exercise was not addressed. In neglecting comparison of exercise characteristics, individual preferences and styles were overlooked. Folkins and Sime (1981) concluded that although exercise looked promising, there were few parameters around which to make specific recommendations for a tailored exercise program to reduce anxiety.

An extensive meta-analysis supported the positive comparison of the anxiolytic effects of exercise and traditional treatments (Petrusello, et al., 1991). Although methodological problems and the lack of experimental designs have weakened the influence of these research results, meaningful research has begun on the characteristics of exercise that are most effective. Statistical analysis of 124 studies provided several conclusions. For example, the duration of 21 to 30 minutes appeared to be necessary for either state or trait anxiety reduction. From the few studies done on non-aerobic exercise, the effect on state anxiety was found to be non-significant. Although studies in this meta-analysis reported non-aerobic exercise to have a positive effect on

trait anxiety, too few studies were found to offer any meaningful conclusions. Even single bouts of aerobic exercise reduced state anxiety. Trait anxiety reductions appeared to be significant after 9 weeks of training, but were larger still after 16 weeks. The influence of exercise intensity was still unclear. The possible theories on how exercise reduces anxiety (distraction, cognitive dissonance, self confidence, cardiac influence) were discussed, but they remained an area for future clarification.

A later review (Landers & Petruzzello, 1994), which included 55 additional studies not previously covered, produced several similar conclusions to the meta-analysis. They found that fitness had been operationally defined so differently in these studies that conclusions were difficult. Measures of blood pressure, trunk extensions and dip-ups had all been used. However, they concluded that low fit, high anxious subjects derived greater benefits than those more fit or low in anxiety. Analysis of exercise intensity produced mixed results with one study suggesting that moderate intensity reduced trait anxiety more effectively than vigorous exercise. Frequency of exercise was not analyzed. Landers and Petruzzello found that the short term anxiolytic effects of exercise last at least 2 hours.

Hayden and Allen (1984) found that the type of aerobic sport was unimportant to obtaining the desired effect of anxiety reduction. To bolster the credibility of exercise/anxiety research, they compared research measures with ratings by a subject's friend or colleague, a technique referred to as convergent validation, of anxiety levels by knowledgeable informants. College undergraduate student volunteers (24 males and 74 females) comprised a runners group, an exercise group, or a non exercise group depending on their current practices. All were administered the

Commitment to Running survey, the State Trait Anxiety Inventory, and the Beck Depression Inventory for behavior manifestations of depression. One week after testing, one independent informant per subject was asked to rate that subject's level of exercise and current levels of anxiety and depression. Runners and exercisers scores in anxiety and depression were similar, and were consistent with the informants' ratings. Non-exercisers reported significantly higher levels of anxiety and depression than the physically active groups.

Effects of aerobic exercise were found to be mediated by intensity. This effect was discovered by Berger and Owen (1992b) on intermediate level swimmers in a college swim class. Thirty-eight swimmers were randomly assigned either to swim or to perform timing and record keeping for the swimmers. The group alternated duties every other time they met. There were 38 students in a lecture control group. The STAI and POMS were given before and after treatments in week 6 and 13 to assess change in state anxiety and moods. Swimmers were instructed to swim for 20 minutes at 60-75% of age-adjusted maximum heart rate. Record keepers took their swimming partners' pulses after every two laps and counseled them regarding proper pace. Results showed that state anxiety was significantly reduced for women in the swimming and record keeping groups but not for men. A "time-out" effect (Bahrke & Morgan, 1978) for record keepers was anticipated, but was expected to be significantly smaller than the effect of swimming. Swimmers showed no mood elevation after treatment, which was contrary to previous research (Berger & Owen, 1992a). In examining the pulse rates of swimmers, they found a mean of 82% of maximum heart rate and they concluded that this intensity negated the positive effects.

Further investigation of exercise characteristics was sought in the relationships between anxiety, and exercise frequency and duration in a two-phase study (Berger & Owen, 1987). The STAI A-state, POMS, and CSAQ instruments were used in a 15-week college swim program (phase 1, N=52), and a 5-week swim program (phase 2, N=48). Both phases had beginning and intermediate level swimming sections. Exercise frequency and duration were varied by having phase 1 subjects swimming 2 days per week for 40 minutes each time, and phase 2 swimming 4 days a week for 55 minutes each. Total swimming time was the same for both phases. State anxiety scores were collected before and after swimming class one day at the beginning, in the middle, and at the end of the programs. Both phases showed similar significant reductions in state anxiety before-to-after swimming regardless of initial skill level, pre-class anxiety level, or level of exercise intensity and duration. Since both intensity and duration varied between phases, no individual conclusions about these characteristics could be made. In phase 2, POMS scores indicated mood elevation after swimming. Women showed a greater anxiety reduction than men in this phase. Long-term anxiety effects were measured comparing pre-class state anxiety scores of the first and last testing days of the programs. Neither phase showed a change, but the writer suggests that the trait scale would have been more appropriate; trait anxiety could decline while the state anxiety initiated in this specific situation may not.

Conversely, long-term trait anxiety effects were found in a study on joggers (Nouri & Beer, 1989). A cross sectional study of 18 - 62 year old men used the STAI A-trait form to assess anxiety levels and found that non-exercisers (no regular physical exercise, n=28) had the highest mean anxiety

scores, advanced joggers (more than 1 year of running at least 3 times a week, n=20) had the lowest, with drop-out joggers (former joggers, n=21), beginning (2 weeks to 4 months, n=15), and intermediate joggers' scores (4-12 months, n=16) falling in between. The trend in the five group scores indicated a cumulative effect. Advanced joggers also had significantly lower aggression scores than intermediate joggers or beginners as measured by the Buss-Durkee inventory for hostility and aggression.

Another year-long study measured physiological and psychological changes from a running program (Jones & Weinhouse, 1979). EKG, resting heart rate and blood pressure were the physiological measures taken on 12 working, adult volunteers (mean age=30.25, 7 men and 5 women). They also completed the Myers-Briggs personality questionnaire, and the Sixteen Personal Factors Questionnaire. Program guidelines were to run for 45 minutes 3 times a week at 75% of maximum cardiac output. Comparison of pre- and post-program scores showed clear psychological changes. Group means moved up on intelligence, stability, assertiveness and imagination over the year. The Myers-Briggs showed movement for personality traits of introversion to extroversion, sensing to intuitive, and from judging to perceptive. Self-reported anxiety showed a non-significant trend. Although all subjects completed the program, the sample size suggested inadequate power.

Few studies have been done on the effect of non-aerobic exercise on anxiety using a normal population (Petruzzello, et al., 1991). Jones (1981) used non-aerobic exercise as a control group for the investigation of aerobic exercise and meditation on anxiety. Noting that prior research suggested running had a meditative quality, the hypothesis was that the aerobic exercise

of running would be more broadly effective in reducing anxiety than non-aerobic exercise and would be more similar in effect to meditation. Students in self-selected college classes of running (n=33), racquetball (n=28) and meditation (n=24) were measured at the beginning and end of 10-week courses meeting twice a week for an hour. The STAI state and trait forms, and the Cognitive Somatic Anxiety Questionnaire revealed that racquetball reduced only somatic anxiety and increased state anxiety; running reduced somatic, cognitive and trait anxiety; and meditation reduced all measures of anxiety. Jones suggested that while the non-aerobic exercise of racquetball showed some anxiolytic effect, its comparatively poor performance may have been influenced by the competitive nature of the activity.

Non-aerobic exercise has been of interest for the treatment of clinical psychological disorders because of the temporarily reduced physical capacity of this population (Doyne, Ossip-Klein, Bowman, Osborn, McDougall-Wilson, & Neimeyer, 1987). An alternative was also needed for patients with anxiety disorders for whom aerobic exercise could elevate anxiety (Martinsen, Hoffart, & Solberg, 1989). The effect of aerobic and non-aerobic training was assessed in an 8-week study on 70 newly admitted patients with diagnosed anxiety disorders (Comprehensive Psychopathological Rating Scale, Phobic Avoidance Rating Scale, Agoraphobic Cognitions Scale) (Martinsen, et al., 1989). Randomly assigned subjects trained for 1 hour 3 times a week in either brisk walking and jogging, or the non-aerobic strength, flexibility and relaxation program. A bicycle ergometer test at the beginning and end of treatment disclosed an increase in VO₂ maximum for the aerobic group only. Both exercise groups equally reduced anxiety. For the aerobic group, there was no correlation between a

large increase in VO_2 maximum and a large anxiety reduction. Their conclusion was that something other than an increase in aerobic capacity was the active ingredient in anxiety reduction through exercise. Distraction, increase in self esteem and self efficacy were suggested as possible influences.

Health related benefits of yoga

The first three studies on yoga highlight its positive effect on the strength and flexibility aspects of fitness; then yoga's role in treatment of anxiety related disease is presented.

Recognizing the misconception that yoga was only a mild stretching activity, Couch (1990) discusses the muscular strength developed through yoga. Yoga is described as a counterbalancing of muscle groups where agonist and antagonist are equally strengthened and stretched. The antagonist muscle is working by contracting to hold the position and the stretch. Joint movement is extended allowing greater flexibility and freedom of movement. Muscles around joints are strengthened giving greater stability and resistance to injury. Postural alignment balances the load of the body, and promotes structural integrity. Yoga was described as a challenging, precision exercise requiring full absorption, the mechanism for heightened self awareness and mind/body control. Relaxation is achieved by first releasing muscular tension with poses, then relaxing using breath awareness and control. Awareness is heightened because focus is on noticing details of the body rather than judging proficiency. This further trains the mind for a more positive general reaction to life stresses.

Early research on yoga also suffered from the methodological problems mentioned above for exercise in general. It was often performed with few

subjects and/or without control groups, and therefore may be considered as pilot or preliminary work. A review of physiological reactions to yoga (Funderburk, 1977) provided results on fitness. When compared to a 6 week training in the 5BX Program for Physical Fitness, yoga training yielded significantly greater flexibility on a sit and reach test. Cardiovascular efficiency, as measured by the Harvard Step Test, increased after yoga training for 8 months. Basal heart rate decreased in yoga students as much as 5BX trained subjects. Percentage of volume of red blood cells in the blood (hematocrit) increased after 6 weeks of daily yoga.

In another study, yoga fitness was compared to tap dancing and dancercise (Hall, 1978). Pre-test measures of flexibility (sit and reach test), strength (abdominal, pushups, long jump), and endurance (Harvard Step Test) were taken on convenience subject groups of college students in activity classes. Tap dance, yoga and dancercise subjects (n=37, 62, 32 respectively) met twice a week. The duration of these beginning classes was: tap dance classes, 1 hour and 45 minutes; yoga classes, 75 minutes; and dancercise, 1 hour and 30 minutes. Post testing occurred after 12 weeks, and showed that equal change occurred for all measures in all groups. Hall concluded that fitness could be attained without vigorous exercise.

Yoga has been successfully used in the treatment of some of the ailments most commonly linked with stress, namely heart disease, asthma, and back pain (Pelletier, 1977). Ornish (1990), a heart specialist, uses yoga in his program to reverse heart disease. Medical research on irregular heart rhythms, cholesterol level and blood pressure have shown various stress management techniques derived from yoga to be effective. Many of these techniques were popularized by those who rediscovered them. Ornish points

out that yoga was the basis of Jacobson's progressive relaxation, Benson's relaxation response, Simonton's visualization and imagery treatment for cancer patients, and the Lamaze breathing techniques for childbirth. Hatha yoga was the combination of these techniques plus exercise, thus providing a synergistic effect. The heart disease program recommended 1 hour of yoga a day, but added that even 5 minutes would be better than none.

Yoga was compared to progressive relaxation for short term effects on self-efficacy, self-esteem, blood pressure and heart rate in a 3 week study (Cusumano & Robinson, 1993). Female Japanese college undergraduate volunteers were randomly assigned to a yoga or progressive relaxation treatment group (n=45, n=45). The Ryckman Physical Self-Efficacy Scale and Rosenberg's Self-Esteem Scale were administered along with the physiological measurements 1 week before classes began. Subjects attended one class each week to learn and practice either their yoga or relaxation treatment for 45 minutes. Blood pressure and heart rate were taken before and after each class. Because yoga affects the autonomic nervous system and progressive relaxation affects the peripheral nervous system, it was expected that yoga would be more effective than progressive relaxation in reducing blood pressure and heart rate. Another hypothesis was that yoga would positively affect both psychological measures more than progressive relaxation. The treatments produced similar significant positive effects on all measures except self-efficacy which declined for both groups during the study.

Asthma can be a stress induced disease (Pelletier, 1977). A 4 1/2 year study followed 570 randomly selected subjects with clinical bronchial asthma after their 2 or 4 weeks of yoga training (Nagendra & Nagarathna, 1986). The 2

week program consisted of 2.5 hours of yoga a day and the 4 week program required 1.25 hours of training per day. After the training, subjects submitted monthly records of their health status, practice schedule and medication dosages. Since groups entered the program at on-going intervals, the follow up provided between 3 and 54 months of data. From their reporting, subjects were divided into practice conditions for analysis: regular subjects practiced an average of 1 hour per day for at least 16 days per month; irregular subjects practiced 1 hour per day for fewer than 16 days per month; discontinued subjects stopped practice. Regular practitioners significantly reduced symptoms and reduced number of medication injections. No other group showed significant change.

A physician's guide to managing back and neck pain through yoga begins, "You'll learn a simple, practical system to heal your back, restructure your body, and cope with stress" (Schatz, 1992, p. 1). Yoga promotes coordination of the entire body and mind which develops skills for use with daily life's peaks and valleys. The recommended program began with relaxation to release tension and diminish pain. When symptoms have subsided, more active poses are used to increase the range of motion and to build strength and endurance to ward off future injury or discomfort. Although a whole-body regimen was provided, additional specific curricula were given for neck, upper spine, and lower spine rehabilitation. This resource contends that practice leads to increased self awareness, which allows for early detection of stress and to automatic coping via breath normalization, conscious relaxation of tight muscles and postural realignment.

Yoga and anxiety reduction

Research on yoga's anxiolytic effect is limited, but its efficacy has been measured both physiologically and psychologically. Physiological changes were used to measure stress reduction in beginning yoga students participating in either an in-person yoga class or yoga classes via local television, taught by the researcher (Collins, 1982) for 10 weeks. Male and female subjects for in-person classes (n=23) were volunteers from university adult education classes, and TV students (n=22) were from viewers of a local television station. One hour classes were presented 3 times a week for each group. TV viewers were able to call in with questions, and to receive written materials upon request. Peripheral cardiovascular activity was measured by electrothermograph, trapezius activity by electromyograph, and skin conductance by electrodermograph once before and after the course. There were no differences between treatment groups on any physiological measure, and no differences between men and women. All mean physiological scores statistically improved after training. Television training was shown to be just as effective as in-person training.

Physiological and psychological measurements were used in assessing anxiety reduction in 17 female college teachers (N=17, mean age=34.24) (Anatharaman & Kabir, 1984). Inexperienced yoga subjects were given the IPAT overt and covert measurement of anxiety, and their pulse rate and blood pressure were recorded. After 3 months of a recommended 1 hour per day practice of yoga, these measures were taken again. All physiologic measures showed significant improvement, but anxiety levels did not change.

In an effort to assist in the self treatment of chronic anxiety, Baker (1979) studied the additive effect of self recording to practicing yoga. Self recording

is a technique to gain self-knowledge and change, through the recording of behavior. Responders to a newspaper advertisement for a study of beginning yoga students were assigned to two different yoga treatment groups and one control group with 30 per group. The STAI A-trait, and a locus of control (Internal-External Scale by Rotter) were mailed to the volunteers. Twenty-five of the control group completed and returned the surveys, along with twenty from each yoga group. The yoga groups then completed eight lessons over a 1 month period and were asked to practice yoga 30 minutes daily, and to record comments about each practice session. The yoga-plus-self-recording group (n=20) recorded feelings of tension or anxiety to a diary throughout the day. Post treatment, subjects again received mailed copies of the instruments. Although yoga-plus-self-recording did not show a larger effect than the significant effect of yoga-only, the daily diaries showed a pattern of increased anxiety before the decrease. This may have been a result of increased body awareness causing a recognition of physical tension and inflexibility.

The long term practice effect of yoga was studied by a cross-sectional comparison of yoga students of 10 to 20 months (n=20) to non yoga practitioners (n=20) of the same age, health, and socio-economic status (Siek, Kowalski, Terelak & Walewska, 1986). These 22-25 year old college students were administered the STAI for trait anxiety measurement, the Taylor Manifest Anxiety Scale for a measure of physiologic state anxiety, and the Buss-Durkee questionnaire to measure eight manifestations of aggressive behavior. All yoga students had pursued yoga at the Warsaw Sport's Centre where classes consisted of standing poses incorporating breathing exercises, and relaxation. They were tested after a class. Both state and trait measures of anxiety were significantly lower for the yoga group, as were six of the eight

indicators of aggression.

A taxonomy of exercise characteristics conducive to anxiety reduction and mood elevation was tested on four exercise activities (Berger & Owen, 1988). Swimming (n=21), yoga (n=63), body conditioning (n=16) and fencing (n=20) varied in their conformity to the proposed factors of being (1) aerobic, (2) noncompetitive, (3) predictable, (4) rhythmical, and (5) enjoyable. The hypothesis was that the greater alignment with the taxonomy, the greater the effect on state anxiety as measured by STAI A-state, and mood measured by POMS. These instruments were administered before and after classes at the beginning, middle and end of the 14 week semester. Swimming, body conditioning, fencing, and the lecture control class (n=50) met twice a week for 40 minutes. Yoga met once a week for 80 minutes. The taxonomy was partially supported. On the POMS scores, fencing and body building increased vigor, swimming reduced tension and confusion, and yoga decreased anger, tension, depression, fatigue, and confusion. STAI results showed yoga to be the only exercise to decrease anxiety measured by the STAI. The taxonomy factor of being aerobic was then modified to "deep abdominal breathing" which they concluded was the active agent in aerobic exercise, and in yoga.

Lastly, exercise characteristics generating short term anxiety and mood change were studied comparing swimming, yoga, and a lecture control group (Berger & Owen, 1992a). College students enrolled in coeducational swimming classes (n=39) swam 25-30 minutes 2 times a week for 14 weeks. The yoga class (n=26) met once a week for 60 minutes. These treatment groups were encouraged to practice more on their own. The lecture class (n=36) met for 50 minutes 3 times a week. Mood scores were recorded by the

POMS before and after class on day 2 of classes, in week 6, and in week 12. Both exercises produced mood elevation while the lecture class did not. Specifically, the subscales of confusion, anger, and depression were positively effected, as well as the tension/anxiety subscale which is the POMS measure of state anxiety. These mood changes also correlated with increased attendance ($R=.49$); greater mood benefits were experienced with higher attendance. Gender differences were disclosed: women experienced similar mood benefits from yoga and swimming, while men decreased tension, fatigue and anger more from yoga than swimming. The study confirmed earlier research (Berger & Owen, 1988) that mood change, including reduction in state anxiety, through exercise does not require an aerobic activity.

Summary

The literature reveals that life's stressful situations can precipitate symptoms of anxiety, physical ailments and mental dysfunction (Campbell, et al., 1992; Fuchs & Hahn, 1992; Benson, 1975). Physicians and mental health professionals expressed the need for a combined mind/body approach for the treatment of such responses (Gaardner, 1975). This holistic approach to health is preventative, and encourages honing of awareness skills, active practice of stress management, and general personal responsibility to health (Pelletier, 1977).

An overview of traditional treatments to stress was given, and exercise compared favorably with these anxiety reduction techniques. Exercise, breathing techniques, progressive relaxation, and meditation all produced improvements in measures of blood pressure, heart rate, and self reported

anxiety (Bahrke & Morgan, 1978; Lehrer & Woolfolk, 1984). Research that broke anxiety into its component parts suggested that the more physically oriented treatments, such as exercise, were more effective with reducing somatic anxiety, while the more mental requirements of meditation affected cognitive anxiety more strongly (Schwartz, et al., 1978). Support was shown for the anxiolytic effect of non-aerobic (Jones, 1981), rhythmic, noncompetitive (Berger & Owen, 1988), moderate intensity exercise (Landers & Petruzzello, 1994).

Yoga was described as a moderate intensity exercise with both physical components (strength and flexibility training) and cognitive components (breathing and meditation training). It has been successfully utilized in managing stress related ailments (Ornish, 1990; Schatz, 1992), and has experimentally reduced both state and trait anxiety (Baker, 1979; Siek, et al., 1986). Longitudinal studies of up to 3 months have assessed its efficacy through both physiological and psychological measures.

Research on running suggests that trait anxiety decreases as the number of practice months increases (Nouri and Beer, 1989). No other exercise, nor classifications of practice periods have been studied. Research has not thoroughly addressed the long term mechanism of anxiety reduction through exercise, nor the efficacy of yoga as a long term stress management technique. It has lacked identification of trends or patterns in anxiety reduction as a function of long term regular exercise.

CHAPTER III

Methods

Introduction

A cross-sectional design was used to assess level of trait anxiety in adult females as a function of their number of months of regular yoga practice. Mean scores representing trait anxiety on the A-trait portion of the State Trait Anxiety Inventory (Spielberger, et al., 1970) were used to compare a novice yoga group with 0-4 weeks experience (NOV), to three regularly practicing yoga groups, each with a different number of months of regular yoga practice: 5 weeks-6 months (R1-6), 7-12 months (R7-12), and 13-24 months (R13-24). Data from these groups provided information on the effect of yoga on anxiety, and when variations might have occurred. This chapter describes the rationale for subject selection, the measurement instrument for trait anxiety, procedures, and method of statistical analysis, followed by a summary.

Subjects

Subjects for the yoga groups were female volunteers from San Francisco Bay area yoga studios that teach the Iyengar method of Hatha yoga. To obtain subjects with the desired range of months of practice, volunteers were solicited from the following levels of classes: Introduction to Yoga, Level 1 (beginners in yoga), Level 2 (some experience in yoga) and Level 3 (ability to work on backbends and inverted poses such as headstand) . Volunteers were included in the regularly practicing groups if they reported practicing yoga at or above the required minimum. For this study, regular yoga practice was defined as a minimum of two practices per week that comprised a weekly

total of at least 3 hours. Attendance at a yoga class was considered a practice, as well as any individual, self-guided practice. Subjects who reported having practiced regularly for more than 24 months were eliminated from the statistical analysis of the STAI scores (the ANOVA), but were identified and included in other descriptive analysis. Students who were beyond their first month of yoga, but not regular in their practice (NR) were also included in descriptive analyses.

Novice yoga subjects were adult female volunteers from Introduction to Yoga or Level 1 yoga classes who had up to 1 month experience of yoga. This source for the novice yoga group provided subjects comparable to regularly practicing yoga subjects in socioeconomic orientation, and age range since they were likely to be living or working in the vicinity, and had chosen a yoga studio over other less expensive alternatives for instruction. They may also have had a mind set about yoga similar to the yoga groups; lacking only the experience and expertise of yoga practice. That is, they all sought yoga as a potentially positive experience, which is considered a critical criterion in anxiety reduction through exercise (Berger, 1987).

Since prior research on swimming and jogging has shown different mood and anxiety reduction effects for men and women, only women were included in the study (Berger & Owen, 1992b; Berger et al., 1988). Much anxiety research has been performed on college students for the length of a school term. Lehrer (1984) has stated that college students could relax very easily with little or no training, making generalization to the "general" population difficult. This applies to an anxiety related study. Adult women subjects provided a more real world setting for anxiety testing. A non-clinical population was used in accordance with the theory that prevention is more

effective than treatment following symptom onset (Morgan & Goldston, 1987).

Instrumentation

State Trait Anxiety Inventory.

The trait portion (A-trait) of the State Trait Anxiety Inventory (STAI) was used to measure trait anxiety. The A-trait portion consists of 20 items representing how the subject *generally feels* in relation to statements describing apprehension, tension, nervousness, and worry. Response selections, graded 1 to 4 are: almost never, sometimes, often, almost always. A total A-trait score per subject was used with a high score indicating high anxiety. It took approximately 6 minutes to complete this survey (Appendix A). Since the anxiety instrument measures a personality trait for anxiety rather than anxiety elicited from a specific situation, it may be completed at any time of day (Spielberger, et al., 1970).

Trait anxiety was chosen to examine long term effects in the interest of a preventative approach to health, rather than in the treatment of symptoms. The STAI was selected over the Taylor Manifest Anxiety Scale, the Anxiety Scale Questionnaire (also known as the IPAT) by Cattell, and the Affect Adjective Check List by Zuckerman because of its ease of use, completeness of the manual, and strong reviews with respect to validation, reliability and implementation (Buros, 1978). Validity was reported by strong correlations with these measures (TMAS, $r=.80$; IPAT, $r=.75$; AACL, $r=.52$). The STAI has been used in over 3,000 studies, has been translated into 8 languages, and has established normative and reference data for several populations including working women (Spielberger et al., 1970).

Demographic data survey.

Demographic data was collected to describe the yoga subjects (Appendix B). Demographic data included age, race, educational background, and identification of occupation to assess the similarity of the groups. Current practice habits were collected for yoga, aerobic exercise, meditation, biofeedback, psychotherapy and pranayama (practice of breathing techniques). This captured other stress management techniques engaged in by subjects. A history of yoga practice habits was collected for discovery of possible trends.

Self-reported total number of months of regular yoga practice placed a subject into one of the three practice groups (5 weeks-6 months: R1-6; 7-12 months: R7-12; or 13-24 months: R13-24). The 0-4 weeks subjects (NOV) included only those who were in their introductory month of yoga. All subjects with more than 24 months of regular practice were included in one group (R>24); non regular practitioners in another (NR). Subjects were asked to select the main reason for both beginning and continuing yoga from a list compiled by the researcher in an earlier pilot study (Appendix I). The survey required approximately 4 minutes to complete.

Procedures

Design.

A cross-sectional design was used. Volunteers were solicited from Introduction to Yoga, and Levels 1-3 of yoga classes to obtain practitioners of varying months of regular practice. The selection of Iyengar yoga was due to its maturity as a technique, its well documented and technical style, certification for teachers, and dominance in the marketplace (Mehta, et al.,

1990; Iyengar, 1966; California Yoga Teachers Association, 1994). This source provided consistency in teaching technique, a non-competitive philosophy, a 90 minute class length, and class content by level.

The selection of number of months of practice that designated group boundaries was guided by two studies and the opinion of four Iyengar yoga experts. A meta-analysis of the effects of exercise on anxiety concluded that a minimum of 16 weeks of exercise was necessary to effect a change in trait anxiety (Petruzzello, et al., 1991; Landers & Petruzzello, 1994). A cross-sectional study showed significant differences in trait anxiety among groups of regular runners 2 weeks-4 months, 4-12 months, more than 1 year, and non-runners (Nouri and Beer, 1989). Non-runners scored highest, and 1 year runners scored lowest.

The consensus of four senior yoga teachers produced the following speculations about the effect of yoga practice over time:

1. The greatest decrease in anxiety occurs in the first 4-6 months of yoga because of the heightened sense of body awareness, and learning the rudiments of body control;
2. Students typically practice only in classes for the first 6 months. The addition of home practice occurs within the first year of yoga and builds commonly to 4-5 times a week after approximately 3 years;
3. Fitness level, skill level, frequency and intensity of practice increase over time, with plateaus occurring at approximately 6 months, 1 year, and 2 years of practice; and
4. Decreases in anxiety may occur at these plateaus because of the greater focus and breath control required to hold more difficult

poses longer.

Although practice frequency and duration could not feasibly be controlled with such expected variation, groups with up to 2 years of regular practice were used to keep the variation, and therefore confounding effects to a minimum. No information was available on actual yoga practice patterns to use as a guideline, only what had been recommended by teachers for practice, or required as a minimum level in research. These guidelines varied from 1 to 7 practices a week at ranges of 1 hour to 90 minutes. Estimates of the current month's practice patterns and practice history was collected to enhance the analysis of anxiety and possibly provide a profile of yoga practice.

Data Collection.

The researcher first contacted studio owners to obtain permission to access instructors from their studio. Individual yoga teachers were then contacted to request access to students in their classes for volunteers for the pilot and main study. At times, a personal visit with the instructor or an introductory information packet with a letter of recommendation was necessary before permission was attained (Appendix C). Instructors recommended specific classes because of typical attendance or suspected practice habits of the students. At the end of selected classes, the instructor introduced the researcher, who then solicited female volunteers for the study. Identical verbal instructions were given to pilot and primary study subjects by the researcher (Appendix D). The study was briefly introduced, and volunteers then completed the survey and the informed consent form. For those requesting a summary of research results, a mailing list was accumulated. If there were only a few minutes between classes, the researcher ensured access

to other nearby accommodations for completion of the forms, usually in a foyer or just outside the front entrance.

Pilot.

Approval from the San Jose State University Human Subjects Committee was obtained before any subjects were approached. A pilot study was conducted using students in classes of Introductory Yoga, and Levels 1, 2, and 3 at one Iyengar yoga studio. The pilot studio was selected for its large student population and its proximity to the research headquarters. A data collection schedule developed based on the following criteria:

1. The pilot studio offered Introduction to Yoga, and level 1, 2, and 3 classes;
2. Class offered before work, mid-day, or evening were used, including weekends; and
3. Teachers were randomly selected within available class time logistics.

As prearranged, the instructor presented the researcher to class members at the end of class. The researcher introduced the study and asked for volunteers. Subjects were moved to another room to complete the survey if it was necessary. Subjects received a pencil, the surveys (Appendices A and C) stapled together, and the consent form which outlined the purpose, risks, benefits and time requirements of the study as well as their rights as volunteer participants (Appendix E). Yoga instructors were also asked to complete a consent form (Appendix F). Survey results were offered to all participants. After completing all forms, the consent forms and requests for survey results were collected separately from the surveys.

Thirty-two subjects were surveyed for the pilot. This procedure provided

data to examine internal consistency, an opportunity to assess all data collection procedures, and sample data to check the completeness of all analyses planned for this study. Minor changes were made to clarify instructions and survey items based on observation and subject feedback.

Primary study.

The primary study was conducted using students from classes of Introduction to Yoga, and Level 1, Level 2 and Level 3 at Iyengar yoga studios. Studios were selected from the reference list in The Yoga Journal (California Yoga Teachers Association, 1994). They were located in approximately a 50 mile radius from downtown Los Altos, California, and were also known to have a large clientele. The studios' phone numbers, contact names, and schedules were obtained from this listing. A data collection schedule was developed based on the following criteria:

1. Class times were as evenly represented as possible to include before work, mid-day, evening classes, and weekends;
2. Teachers were randomly selected within available class time logistics; and
3. Order of studio usage was based on location of the studios and their proximity to each other.

As prearranged, the instructor presented the researcher to the class members at the end of class. The researcher introduced the study and asked for volunteers. Subjects were moved to another room to complete the survey if it was necessary. Subjects received a pencil, the surveys (Appendices A and C) stapled together, and the consent form which outlined the purpose, risks, benefits and time requirements of the study as well as their rights as volunteer participants (Appendix E). Yoga instructors were also asked to

complete a consent form (Appendix F). Survey results were offered to all participants. Survey results were made available to them by request. After completing all forms, the consent forms and requests for survey results were collected separately from the surveys.

Surveys of those who reported more than 24 months of regular yoga practice and those who were non regular in their practice were eliminated from the statistical analysis, but were identified and used in descriptive analyses. Surveys were numbered sequentially for unique identification. Scoring of items was done according to the STAI survey key which made adjustments for items stated in the positive. Survey data were entered into the SPSS computer software package for statistical analysis and internal consistency of the STAI instrument was estimated. To describe the type of subjects in each sample group, tables of means and standard deviations for age and anxiety score were used along with frequency distribution tables for education, race, and occupation . These were descriptively analyzed for similarity of groups.

Anxiety scores for each group were assessed for normality of distribution and homogeneity of variance. Assumptions were reasonably met, and a one-way factorial analysis of variance (ANOVA) was done to test for a statistically significant difference in anxiety level across practice groups. The post hoc Scheffe was used to check for significant points in time.

To investigate practice profiles by practice group, cross tabulations for number of practices per week and reasons for beginning and continuing yoga were examined by group. To look at the possible influence of practice habits on trait anxiety level, a Pearson Product Moment Correlation related weekly yoga practice time to anxiety scores.

Finally, group mean STAI anxiety scores were compared to a reference group's values calculated for 451 working women of heterogeneous age, race, education level, and job responsibility. (Spielberger, et al., 1970).

Occupation, race, age, education level, and practice of other stress management techniques were also examined in relation to the anxiety scores.

Summary

A cross sectional study spanning 24 months of regular yoga practice was used to measure the effect of Hatha yoga on trait anxiety in adult women. The trait portion of the State Trait Anxiety Inventory recorded trait levels for yoga practitioners of 5 weeks-6 months, 7-12 months, 13-24 months, and for the novice yoga group with less than 5 weeks of experience. These were the intervals at which change was speculated to occur based on prior exercise research and consultation with four yoga experts. A pilot study was conducted to provide internal consistency estimates on the STAI instrument and to determine the suitability of the procedures. Subjects signed an informed consent agreement before participating in the study. The STAI and demographic information was completed by subjects after yoga classes. After determining that parametric assumptions had been met, a 1-way ANOVA and post hoc Scheffe was run. In addition, the relationship between weekly practice time and trait anxiety, was calculated. Practice trends or phenomenon were analyzed by practice group.

CHAPTER IV

Results

Introduction

The results from the pilot study are described, followed by an analysis of the primary study data: description of the sample, the relationship between regular yoga practice and anxiety scores, influence of other stress management techniques, and a profile of adherence to yoga practice.

Pilot study

Comprising the pilot sample were 32 students from one yoga studio. Internal consistency of the STAI survey was confirmed for this group (Alpha = .88). Based on subject feedback, minor changes to the wording of the survey instructions were made for clarity.

Primary study

Sample description.

Thirty-one Iyengar yoga classes were approached, resulting in 153 of the 293 women in these classes volunteering for the study. Response rate was similar for the 11 weekday evening classes, the 8 classes given during normal work hours, and the 12 weekend classes. The 5 groups were Novice (NOV) with 0-4 weeks of yoga (n=16), and regular yoga practitioners of 1-6 months (R1-6, n=27), 7-12 months (R7-12, n=13), 13-24 months (R13-24, n=17), more than 24 months (R>24, n=35), and non-regular practitioners (NR, n=45). The R>24 group averaged 6.98 years of regular practice (SD=5.49)

Means and percentages showed negligible differences among groups for

age, race, education, and occupation. Sample age range was 21-72 with a mean of 40.9 years of age, and a gradual increase from NOV (mean = 38.7) to R>24 (mean = 43.2). Data on race showed 89.5% to be Caucasian. Seventy-five percent worked outside of the home with 39.5% of the sample being non-managerial professionals. Over 42% possessed a 4-year college degree, an additional 29.6% had a master's degree, and 6.6% held a doctorate. The sample was a highly educated, White, professional group.

Relationship between anxiety scores and yoga practice.

Internal consistency was again confirmed with the primary study data (Alpha = .93). Normality of distribution by group was acceptable. Although homogeneity of variance was borderline with a value of 2, the 1-way ANOVA was considered appropriate. There were no statistically significant differences among group mean trait anxiety scores ($p=.66$) (Appendix G). Eta^2 was .02 suggesting limited practical significance as well. Due to the small number of subjects per group, power was found to be less than .25 according to Myers' power chart (1979). Although groups R>24 and NR were not included in the ANOVA, they are included in Table 1 for descriptive purposes. The first 3 groups showed a tendency toward reduced anxiety scores as regular yoga practice adherence extended. Group R13-24 then interrupted this trend. The longest regularly practicing group (R>24) had the lowest mean anxiety score. Non regular practitioners (NR) scored as well as R7-12.

Table 1**STAI Means and Standard Deviations By Group**

Group	STAI Mean	SD	n
NOV	43.44	12.09	16
R1-6	40.70	11.42	27
R7-12	38.69	5.94	13
R13-24	41.00	8.61	17
R>24	36.97	6.68	35
NR	38.80	11.82	45

Normative data produced (Spielberger et al., 1970) by age group suggests that this sample may have been slightly more anxious than working women of the age groups studied in 1970 (See Table 2).

Table 2**STAI Normative Means and Standard Deviations for Working Women Compared With Sample Group Means**

Normative Data For Women				Sample Group Data			
Age	STAI	SD	n	Age	STAI	SD	n
Group	Mean			Group	Mean		
19-39	36.15	9.53	210	21-39	40.13	11.16	70
40-49	35.03	9.31	135	40-49	39.71	9.27	48
50-69	31.79	7.78	106	50-72	37.69	8.84	35

Group means of current yoga practice time per week (practice days per week multiplied by minutes per practice session) showed an increase along with progressive practice groups, although there is considerable variability within each group (Figure 3). This variability could have caused a blurring of sample group boundaries, making differences between groups difficult to detect. In analyzing this possible interaction between practice frequency and duration, no strong Pearson Product Moment Correlations between STAI score and total weekly yoga practice time were found for the population as a whole, or for any individual practice group. Groups R1-6, R13-24, and the NOV through R13-24 groups as a whole did show a moderate inverse relationship ($r = -.33$; $r = -.49$; $r = -.27$).

Figure 3: Weekly Yoga Practice Time By Group

Influence of other stress management techniques.

For each non-yoga stress management technique considered, there was no

obvious pattern or trend in weekly frequency, duration or total time of practice per week for the sample groups. For instance, no technique paralleled usage of any other; high and low usage seemed to occur randomly within and across each sample group. As was found for yoga practice, there was no strong correlation between any single technique's total weekly practice time with anxiety score for any practice group. For 18.1 % of the sample that utilized psychotherapy, this treatment had a moderate positive correlation for all but R>24 (NOV: $r = .5$; R1-6: $r = .43$; R7-12: $r = .49$; R13-24: $r = .35$; NR: $r = .38$). For the 72.5% of the sample that utilized aerobic exercise, groups NOV, R13-24, and NR had a moderate inverse relationship with anxiety score ($r = -.32, -.39, -.35$). Aerobic exercise was the second most utilized stress management activity, but no group averaged participation of more than 2.6 days per week. This is less than the minimum of three, twenty minute sessions per week necessary for either fitness or reduction of anxiety (Petruzzello, et al., 1991). The R>24 group was the only group that regularly practiced pranayama, with a mean of 2.38 (SD=2.76) days per week for an average of 12.29 minutes (SD=15.07) each day practiced. Since 62% of R>24 reported practicing pranayama at least once a week, as well as 77% using aerobic exercise that amount, these techniques may be contributing factors to their group having achieved the lowest mean anxiety scores of the groups surveyed.

Figure 4 depicts a self reported estimate of average time invested per week for each technique including yoga, by group. For each activity, average days practiced per week was multiplied by average typical practice duration, providing total time spent per week.

Figure 4: Weekly Stress Management Time By Group

The profile of yoga usage in this graph appears to be a mirror image of the graph of STAI scores by group (Figure 5), except for the more dramatic break at R13-24 on the STAI graph. Note also that there is a clear linear increase in total time dedicated to a combination of stress management activities as regular yoga practice continues across time. Group R>24 dedicated more yoga time, and more total stress management time, than any other group and also had the lowest mean anxiety score.

Figure 5: Mean STAI Scores By Group

Yoga practice profile.

As a whole, this population recorded *flexibility* as the most popular single reason why they initially began yoga (22.4%), and *general health* was ranked second with 17.1%. The comparison between reason for beginning yoga with reason for continuing yoga revealed that flexibility diminished to 13.1% while general health became a stronger first choice with 30%. Spirituality doubled in importance (6.5% to 15%) becoming the second most popular reason with the greatest change seen in the R7-12 (5.9% to 23.5%) and R>24 (11.4% to 25.7%) groups. Relaxation also doubled in importance and stress management increased slightly. Many subjects complained that choosing only one reason was very difficult since several choices applied equally.

Figure 6 illustrates each group's practice habits during the first 6 months they began practicing yoga, the 7th through 12th months they practiced yoga,

then the second year they practiced, regardless of when they became regular practitioners. A clear group pattern or profile of practice development is difficult to determine without knowing how long it took each subject to become a regular practitioner. However, practice habits formed in the first 6 months may indicate level of future participation. On average, those groups that established approximately a 3 hour per week practice minimum in their first 6 months of yoga (R13-24 and R>24) maintained at least that level of regularity. Those who began at a less regular pace, took longer to achieve a minimum regular practice as evidenced by the existence of the second two columns for R1-6, and the third column for R7-12. These averages however, could be misleading since there was considerable variability in practice habits within groups for all time periods. Standard deviations ranged from 42 to 196 and were typically over 100. These average times for participation may also be distorted by the survey's request for "typical" frequency and duration of practice. For instance, for those who practiced more often at home than in a 60 or 90 minute class, "typical" days multiplied by "typical" time could be underestimated.

Figure 6: Yoga Practice History By Group

Discussion

The data do not support the research hypothesis that trait anxiety is inversely related to regular yoga practice, unlike the results for a sample of regular runners (Nouri & Beer, 1989). Although a trend was evidenced, there was not enough power to detect significant differences. Also, the large variability in practice habits may have covered up any effects of time, and certainly influenced the composition of comparison groups. Group R1-6 for instance, included those who immediately became regular practitioners (at least 3 hours per week), as well as those who took classes once a week for possibly years before becoming regular. A subject practicing 4 times per week for 90 minutes would be grouped with one practicing twice a week for 90 minutes each. The surprisingly low STAI score for the NR group could be a result of many years of a less time consuming practice. Use of "typical" time spent per week may also have caused distortion in the analyses of

current and historical participation. While it may appear that continued practice may not be beneficial since R13-24 veered from the pattern in group anxiety scores, the overall pattern was a decrease in anxiety over time. The most likely reason for this discontinuity in the pattern is variability in practice time. This variability is a possible reason this study varied from prior yoga studies where yoga produced significant effects (Baker, 1979; Siek et al., 1986). Since those studies were conducted by either one yoga instructor (Baker, 1979) or at only one yoga studio (Siek et al., 1986), their subjects received a consistent practice philosophy and may therefore have been more uniform in their practice habits. Subjects for this study were drawn from 20 different instructors' classes, from 10 yoga studios in a 50 mile radius. It was likely that a mix of recommendations was made regarding a minimum number of classes per week and how often and how long to practice at home.

A drawback to this cross sectional study was that anxiety level before taking up yoga was not available for analysis. Anxiety scores may not have changed at all as a result of yoga practice, or conversely, the lowest STAI scoring group could have been the most anxious initially.

It was noted that the sample's anxiety scores were slightly above norms developed in 1970. We can only speculate how this sample would compare with more current norms and to norms for a high technology, metropolitan area.

Although some moderate correlations were found with anxiety scores, the usage profiles of psychotherapy and aerobic exercise suggested they were not a primary influence on anxiety. Based on guidelines from previous research (Lehrer & Woolfolk, 1984; Petruzzello et al., 1991), subjects did not utilize any other stress management technique at a regular enough level to have had a

significant effect. The increase in use of other techniques across successive groups however, may have contributed to a cumulative effect of stress management activities, as seen in the groups' tendency toward lower anxiety scores. The increased interest in meditation and pranayama in successive yoga practice groups is not surprising since these techniques are introduced within the context of yoga in the pursuit of knowledge and control of the mind/body connection.

Reasons for continuing yoga also reflected a tendency toward a holistic approach to health rather than using this activity for a more specific purpose such as flexibility. Motivators of general health, spirituality, increased fitness and stress management increased in importance, especially for the 2 longest practicing groups. Whether these motivations drove extended practice, or vice versa, it appears that if a regular yoga practice is established within the first 6 months of taking it up, the practice remains fairly steady, increases gradually, and perhaps awakens an interest in other stress management activity. Initial irregularity indicated difficulty in establishing a long term regular practice. No prior research had included data to analyze the makeup or habits of those who regularly practiced yoga. From a demographically homogenous group, that is, early middle aged, highly educated, professional women, this study indicated a large variability in practice habits and motivation of regular yoga practitioners. This variability makes change at specific practice time intervals difficult to detect and discourages generalizability.

CHAPTER V

Conclusion

Summary

The purpose of the study was to examine the relationship between trait anxiety level and regular yoga practice. Within a cross sectional design, a group of subjects new to yoga (n=16) were compared with three regularly practicing yoga groups with 1-6 months (n=27), 7-12 months (n=13) or 13-24 months (n=17) of a minimum regimen of 3 hours a week of yoga practice. The SPSS package was utilized to conduct a 1-way ANOVA, which found no significant differences among the groups' trait anxiety scores as measured by the State Trait Anxiety Inventory. Although the population was too small to provide sufficient power, a tendency in scores was observed in support of the hypothesis that regular yoga practice reduces trait anxiety. A primary goal of the selection of group boundaries was to minimize variation of practice habits among subjects across comparison groups. However, large variations in practice habits were encountered, possibly influencing the results.

Subjects surveyed who had practiced yoga regularly for over 24 months (n=35), or not regularly at all (n=45) were included in the analysis descriptively and assisted in developing a profile of yoga practice habits and motivations. Habits established in the first 6 months of yoga seemed to influence long term adherence. Also, as regular yoga practice continued over time, motivation moved toward a more holistic approach to health, and time allocated to stress management techniques in general increased.

Conclusions

Based on the data, the following conclusions can be made:

1. The regular practice of yoga did not significantly lower trait anxiety in a population of women in the San Francisco Bay area, although a pattern appeared in the hypothesized direction. All mean anxiety scores were in the normal range for this age group. Research on a larger population is necessary.
2. Trait anxiety was not related to the number of months of regular yoga practice, although a pattern indicated some decrease in anxiety on the continuum of practice months up to 2 years.
3. A cross sectional design did not allow for sufficient recording or control of practice habits, or original levels of trait anxiety which might have influenced the effect.
4. Yoga students were highly individual in their yoga practice habits regardless of the longevity of their involvement with yoga. Large variations occurred in number of days of practice per week, and time spent per practice session. However, total yoga time spent per week increased as regular practice continued.
5. Yoga students tended to increase their attention to the mind/body connection as regular practice continued. Motivations for continuing yoga became more whole body oriented, and time spent on other stress management techniques such as aerobics, pranayama, psychotherapy, and meditation also increased. Total time spent at stress management suggested a possible inverse relationship to anxiety level.

Recommendations

The following recommendations are based on the conclusions made:

1. Further research is necessary to more accurately analyze the effects of yoga. Following are four suggestions:
 - a) Conduct a longitudinal study using multiple beginning yoga groups in order to observe real changes in anxiety level and practice habits.
 - b) Utilize yoga students from both an Iyengar studio environment, and from a health club environment for comparison of the effect of teaching method and demographics. This would provide a larger cross section of the Bay Area population and therefore increase the generalizability of the results.
 - c) Collect STAI trait anxiety scores and yoga and other stress management practice habits at the beginning of the study and at 6 month intervals for 2 years. Practice patterns and the effect of yoga over time would be disclosed, as well as any possible influence of other techniques on anxiety.
 - d) Utilize mailed surveys to be completed at home in order to include a large number of subjects and to compensate for attrition over the 2 years.
 - e) Collect a daily log of practice frequency and duration for all stress management techniques to increase accuracy and avoid retrospective data.
2. Yoga teachers should emphasize the importance of establishing a minimum practice regimen of 3 hours per week to assist in long term adherence. Encouraging a home practice using a daily practice log

would support this goal. The log has been found to be an effective aid to adherence to a home exercise program (Juneau et al., 1987).

3. Yoga teachers should emphasize the complementary and possibly cumulative role of other stress management techniques such as aerobic exercise, pranayama and meditation to a yoga practice.

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Appendix A

Self-evaluation Questionnaire

Part I: DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *normally* feel, not necessarily how you feel at this moment, or right after doing yoga. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you **generally** feel during the day.

- | | | Almost
Never | Sometimes | Often | Almost
Always |
|-----|--|-----------------|-----------|-------|------------------|
| 1. | I feel pleasant..... | 1 | 2 | 3 | 4 |
| 2. | I feel nervous and restless | 1 | 2 | 3 | 4 |
| 3. | I feel satisfied with myself..... | 1 | 2 | 3 | 4 |
| 4. | I wish I could be as happy as others
seem to be | 1 | 2 | 3 | 4 |
| 5. | I feel like a failure | 1 | 2 | 3 | 4 |
| 6. | I feel rested | 1 | 2 | 3 | 4 |
| 7. | I am "calm, cool, and collected"..... | 1 | 2 | 3 | 4 |
| 8. | I feel that difficulties are piling up
so that I cannot overcome them | 1 | 2 | 3 | 4 |
| 9. | I worry too much over something
that really doesn't matter..... | 1 | 2 | 3 | 4 |
| 10. | I am happy..... | 1 | 2 | 3 | 4 |
| 11. | I have disturbing thoughts..... | 1 | 2 | 3 | 4 |

12. I lack self-confidence.....1234
13. I feel secure1234
14. I make decisions easily1234
15. I feel inadequate.....1234
16. I am content.....1234
17. Some unimportant thought runs
through my mind and bothers me1234
18. I take disappointments so keenly that
I can't put them out of my mind.....1234
19. I am a steady person.....1234
20. I get in a state of tension or turmoil
as I think over my recent concerns
and interests.....1234

Appendix B

Demographic Data

Part I - *In order to obtain a profile of participants, we would like the following personal information. All responses will be kept strictly confidential along with other study information you provide.*

Please complete all items even if the answer is zero. For time estimates, provide one number, not a range.

1. _____ Age
2. Race. Select the closest ONE:
 _____ Black _____ Caucasian _____ Hispanic _____ Asian
 _____ Indian _____ Native American _____ Other
3. Education level. Check the highest completed:
 _____ High school _____ 2-yr college _____ Trade school
 _____ 4-yr college degree _____ Masters degree _____ Doctorate degree
4. Select the ONE occupation type closest to what you do:
 _____ Homemaking _____ Clerical _____ Administrative
 _____ Managerial _____ Industrial _____ Professional (non-manager)
 _____ Sales _____ Service _____ Other
5. Non-yoga activities: For each of the following activities outside of your yoga practice, circle the *closest* number of days per week *typically* performed *over the past month* (even if it is zero), and provide the *typical* number of minutes (not a range) done each day that you participated in them:

<u>Activity</u>	<u>Practice Day Data</u>
a) aerobic exercise	Days per week: 0 1 2 3 4 5 6 7
b)	Typical minutes per practice day: _____
c) meditation	Days per week: 0 1 2 3 4 5 6 7
d)	Typical minutes per practice day: _____
e) biofeedback	Days per week: 0 1 2 3 4 5 6 7
f)	Typical minutes per practice day: _____
g) psychotherapy	Days per week: 0 1 2 3 4 5 6 7
h)	Typical minutes per practice day: _____
i) pranayama	Days per week: 0 1 2 3 4 5 6 7
j) (breathing exercises)	Typical minutes per practice day: _____

Part II - *The next questions concern the history of your yoga practice frequency at different periods of time from when you first began practicing regularly. For this study, practicing regularly is both:*

- at least two practices every week (classes *do* count)
- a week of practice (including classes) totals at least 3 hours.

1. Current practice:

- a) Is this your first month of yoga, ever? _____ Yes _____ No
- b) Do you now practice yoga *regularly* by the definition above?
_____ Yes _____ No
- c) If you do, for how many months have you practiced regularly up to the present with little or no break?: _____ Months *or* _____ Years
- d) For the past month, circle the number of days per week you *typically* practiced yoga (at home and at class), and provide the *typical* number

of minutes (not a range) done each day that you practiced:

Days per week: 0 1 2 3 4 5 6 7

Typical minutes per practice day: _____

2. Your yoga practice history: From when you first began yoga, circle the closest number of days per week *typically* practiced (includes classes), and the *typical* number of minutes practiced (not a range) for each time frame of months indicated (even if it is zero).

Historical practice period

Practice Data

a) Your 1st 6 months:	Days per week: 0 1 2 3 4 5 6 7
b)	Typical minutes per practice day: _____
c) months 7-12 :	Days per week: 0 1 2 3 4 5 6 7
d)	Typical minutes per practice day: _____
e) months 13-24:	Days per week: 0 1 2 3 4 5 6 7
f)	Typical minutes per practice day: _____

3. Mark only **ONE** (the most important) reason you *initially began* practicing yoga:

_____ Not clear	_____ Flexibility	_____ Spirituality
_____ General health	_____ Relaxation	_____ Rehabilitation
_____ Increase fitness	_____ Stress management	_____ Self confidence
_____ Sociability	_____ Dr. recommendation	
_____ Chiropractor recommendation	_____ Minor aches and pains	

4. Mark only **ONE** (the most important) reason you *continue* practicing yoga:

☐ Not clear ☐ Flexibility ☐ Spirituality
☐ General health ☐ Relaxation ☐ Rehabilitation
☐ Increase fitness ☐ Stress management ☐ Self confidence
☐ Sociability ☐ Dr. recommendation
☐ Chiropractor recommendation ☐ Minor aches and pains

Appendix C
Introductory letter

September 15, 1994

Yoga Instructor Name
Street Address
City, CA 94618

Dear Beth,

I enjoyed speaking with you today. As I mentioned, I am a graduate student conducting research on yoga. This research is under the direction of Dr. Bethany Shifflett at San Jose State University. Through this research we are hoping to learn more about the long term mental and physical health effects of yoga. As a yoga instructor you are probably convinced that yoga is beneficial to health. But scientific research such as mine provides an effective and influential method of reaching people who may be currently unfamiliar with yoga. Such exposure to the benefits of yoga may attract more individuals to yoga, and may influence doctors, psychotherapists, and others in the health care profession to recommend therapeutic and preventative yoga based health programs for their clients.

My research specifically addresses the effect of regular yoga practice on anxiety level. By administering two short surveys, I will analyze the relationship between anxiety level and the number of months of yoga practice. My hypothesis is that anxiety level decreases as the compliance to a regular practice program continues. I am additionally gathering information about the historical practice habits of these subjects to find practice patterns, and possibly to develop a profile of the yoga practitioner. The results of the

study will help health program consultants and yoga instructors in understanding yoga students, in presenting the benefits of a long term yoga program, and will help in recommending practice guidelines. I have included a copy of the survey in this letter for your review. It takes approximately 10 minutes to complete the information. The forms are anonymous and non-threatening. The method of administration and the content of the materials have been approved by San Jose State University. Results of the research will be made available to any participants who request them.

As with all research, finding a sufficient number of subjects is difficult. Since I am looking for subjects who are yoga novices as well as those experienced in yoga, your classes could provide a sample of that population. I would like your support in allowing me to ask for volunteers at the conclusion of various classes to complete the surveys. When there is a class following the one to be surveyed, we will either use any available adjacent space, or go outside if necessary. I will mention that participation is completely voluntary, and that neither the studio nor you are making this request of them as students at the studio. I respect the fact that many students will not have the time or possibly the inclination to participate, but it has so far been my experience that students are interested in this research, and about 40-50% typically volunteer. Since some students have advanced degrees themselves, I suspect they are also empathetic to the search for subjects.

I began my yoga practice for rehabilitation purposes after an automobile accident 5 years ago. My interest in stress management began

when I was teaching yoga at Oracle Corporation, a hi-tech, high stress environment. For the past 2 years I have been studying with Ramanand Patel at the Yoga Fitness studio in San Jose. This research is one way in which I might introduce yoga to more people who might benefit from its multifaceted character. Your assistance in providing access to these potential volunteers would be greatly appreciated.

There are several practical benefits of this research to the community. With so much emphasis on development of preventative, holistic health programs, health professionals are looking for information on the selection of activities, practice programs guidelines, and the knowledge of the effect these programs might have over time. Publication of this research would further the exposure of yoga as a viable stress management technique. If this study indicates that anxiety level does decrease the longer you regularly practice yoga, it will encourage individuals in continuing and possibly expanding their current level of practice. Participating yoga studios will be identified to assist health care professionals in implementing programs for their clients.

I appreciate your attention to this, your help is very important. I will phone you Sunday evening to discuss any questions you might have. If this turns out to be an inconvenient time, please contact me at your convenience at 415/948-3805.

Namaste,

Jeanne Romano

Appendix D

Verbal Survey Instructions

As part of a research project at San Jose State University, I am asking for volunteers to participate in an anonymous study on women and yoga. Since I am seeking to examine all levels of yoga experience including novice, no current or prior experience is necessary. We are hoping to learn about the long term mental and physical health effects of yoga. The results of this study will be available to participants. Based on information gathered, these results may assist you in your own exercise program.

Your assistance would consist of completing a short information sheet and a personality trait survey, and signing a consent form. The total time commitment will be approximately 10 minutes. Anyone who is willing to assist in this research, please remain to complete these short surveys. Your participation is very important, and we appreciate your time.

To the remaining volunteers:

Please complete all items on the two surveys even if the answer is zero, and sign the informed consent form. Please read the instructions carefully. Any questions? Thank you again for assisting in this important research.

Appendix E
Informed Consent Form - Yoga Students

As part of a research project at San Jose State University, you are invited to participate in a study on individual reactions to exercise, but specific experience is NOT necessary. We are hoping to learn about the long term mental and physical health effects of exercise. A summary of the results of this study will be available to participants. Based on information gathered, these results may assist you in your own exercise program.

We are looking for female volunteers to complete a short information sheet and a personality survey. The *total* time commitment will be approximately 10 minutes. If you have any concerns or questions about the program at any time, please contact the researcher Jeanne Romano at 415/948-3805.

This study is part of a graduate program at San Jose State University. If you have any complaints about the procedure you may present them to Jim Bryant, Department Chair of Human Performance at SJSU at 408/924-3010. For questions about research subjects' rights, contact Serena Stanford (Associate Academic Vice President for Graduate Studies and Research) at 408/924-2480.

Your participation in this study is completely voluntary. You may refuse to participate or withdraw at any time without prejudice to your relations with the studio, or with San Jose State University. The data generated may be used for scientific purposes including publication and presentation at professional meetings. Individual names will *not* be recorded or revealed.

I have read and understand the procedure and am willing to participate in the research. I understand that I can withdraw any time.

Signature: _____

Date: _____

Print name: _____

Investigator's signature: _____

Date: _____

Appendix F

Informed Consent Form - Yoga Instructors

As part of a research project at San Jose State University, your students are invited to participate in a study on individual reactions to exercise. We are hoping to learn about the long term mental and physical health effects of yoga. A summary of the results of this study will be available to participants and instructors. Based on information gathered, these results may give you greater insight into yoga practitioners as a group.

We are looking for female volunteers from your classes to complete a short information sheet and a personality survey. Their *total* time commitment will be approximately 10 minutes. If you have any concerns or questions about the program at any time, please contact the researcher Jeanne Romano at 415/948-3805.

This study is part of a graduate program at San Jose State University. If you have any complaints about the procedure you may present them to Jim Bryant, Department Chair of Human Performance at SJSU at 408/924-3010. For questions about research subjects' rights, contact Serena Stanford (Associate Academic Vice President for Graduate Studies and Research) at 408/924-2480.

Your and your students' participation in this study are completely voluntary. You may refuse to participate or withdraw at any time without prejudice to your relations with the yoga studio, or with San Jose State University. The data generated may be used for scientific purposes including publication and presentation at professional meetings. Individual names will *not* be recorded or revealed.

I have read and understand the procedure and am willing to allow the

researcher access to my classes to ask for volunteers for this research. I understand that I, or they, can withdraw any time.

Signature: _____ Date: _____

Print name: _____

Investigator's signature: _____ Date: _____

Appendix G
Analysis of Variance

STAI Anxiety Scores For Novice and Regular Yoga Practice Groups

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Probability
Betw Groups	3	166.6499	55.5500	.5328	.6613
Within Grps	69	7194.3364	104.2657		
Total	72	7360.9863			

Note. $\text{Eta}^2 = .0226$

Appendix H

SPSS Files

***FILE YOGA.DEF - SPSS DEFINITION FILE.**

Data list file = 'b:yoga.dat'

/Id 1-3 versn 4 s1 5 s2 6 s3 7 s4 8 s5 9 s6 10 s7 11 s8 12 s9 13 s10 14 s11 15

s12 16 s13 17 s14 18 s15 19 s16 20 s17 21 s18 22 s19 23 s20 24

Age 26-27 Race 28 Educ 29 Occup 30-31

AeroF 32 AeroM 33-35 MedF 36 MedM 37-39 BioF 40 BioM 41-43 PsyF 44

PsyM 45-47

PranF 48 PranM 49-51

Novice 53 Reg 54 Regmos 55-57 Regfreq 58 Regdur 59-61 Group 62

PracM1F 63 PracM1M 64-66 PracM7F 67 PracM7M 68-70 PracM13F 71

PracM13M 72-74

WhyB 75-76 WhyC 77-78 MySTAI 79-80.

Variable labels Id 'ID number'

Age 'Age'

Race 'Race'

Educ 'Education'

Occup 'Occupation'

AeroF 'Aerobic days per week'

AeroM 'Aerobic minutes per day'

MedF 'Meditation days per week'

MedM 'Meditation minutes per pay '

BioF 'Biofeedback days per week'

BioM 'Biofeedback minutes per day'

PsyF 'Psychotherapy days per week'
 PsyM 'Psychotherapy minutes per day'
 Regfreq 'Yoga days per week this month'
 Regdur 'Yoga minutes per day this month'
 PranF 'Pranayama days per week'
 PranM 'Pranayama minutes per day'
 Reg 'Regular yoga?'
 Novice 'Novice'
 Regmos 'Months of reg yoga practice'
 Group 'Practice group'
 PracM1F '1st 6 months practice days per week'
 PracM1M '1st 6 months minutes per day'
 PracM7F 'months 7-12 practice days per week'
 PracM7M 'months 7-12 minutes per day'
 PracM13F 'months 13-24 practice days per week'
 PracM13M 'months 13-24 minutes per day'
 WhyB 'Reason for beginning yoga'
 WhyC 'Reason for continuing yoga'
 MySTAI 'STAI score'.

Value labels

/Race 1 'Black' 2 'Caucasian' 3 'Hispanic' 4 'Asian' 5 'Indian'
 6 'Native American' 7 'other'
 /Reg 0 'No' 1 'Yes'
 /Novice 0 'No' 1 'Novice'
 /Group 0 'less than 1 month' 1 '5wk-6month' 2 '7-12 months' 3 '13-24 months'

4 '>24 months' 5 'non regular'

/WhyB 1 'not clear' 2 'flexibility' 3 'spirituality' 4 'general health'

5 'relaxation' 6 'rehabilitation' 7 'increase fitness' 8 'stress management'

9 'self confidence' 10 'sociability' 11 'Dr. recommendation'

12 'chiropractor recommendation' 13 'other' 14 'multiple ans'

/WhyC 1 'not clear' 2 'flexibility' 3 'spirituality' 4 'general health'

5 'relaxation' 6 'rehabilitation' 7 'increase fitness' 8 'stress management'

9 'self confidence' 10 'sociability' 11 'Dr. recommendation'

12 'chiropractor recommendation' 13 'other' 14 'multiple ans'.

Missing value s1 to s20 Race Educ AeroF MedF BioF PsyF PranF Novice Reg
 Regfreq PracM1F PracM7F PracM13F (9)

/Age Occup WhyB WhyC TotSTAI(99)

/AeroM MedM BioM PsyM PranM Regmos Regdur PracM1M PracM7M
 PracM13M (999).

***COMPUTE TYPICAL HOUR PER WEEK FOR EACH ACTIVITY.**

compute Yogaweek = (Regfreq * Regdur).

compute Aeroweek = (AeroF * AeroM).

compute Psyweek = (PsyF * PsyM).

compute Medweek = (MedF * MedM).

compute Bioweek = (BioF * BioM).

compute Pranweek = (PranF * PranM).

compute TotSM = (Yogaweek + Aeroweek + Medweek + Bioweek + Psyweek
 + Pranweek).

compute Tothrs = TotSM/60.

compute M1week = (PracM1F * PracM1M).

compute M7week = (PracM7F * PracM7M).

compute M13week = (PracM13F * PracM13M).

List variables = Id to WhyC TotSTAI /cases = 2.

List variables = TotSTAI Yogaweek Aeroweek Medweek Bioweek Psyweek
Pranweek TotSM Tothrs.

List variables Id M1week M7week M13week.

Frequencies variables = s1 to WhyC.

save outfile = 'b:yoga.stm'.

***FILE YOGA.PGM - SPSS PROGRAM FILE.**

get file 'b:yoga.stm'.

***MEANS AND SD FOR AGE AND TOTAL ANXIETY SCORE BY GROUP.**

means tables = age by group.

means tables = TotSTAI by group.

*** CROSSTABULATIONS FOR EDUCATION, RACE, AND OCCUPATION
BY GROUP.**

crosstabs tables = Educ by Group

/cells = row col count.

crosstabs tables = Race by Group

/cells = row col count.

crosstabs tables = Occup by Group

/cells = row col count.

*** CHECKING ASSUMPTIONS FOR ANOVA; HOMO. OF VAR AND
NORMALITY.**

temporary.

select if (Group=0).

freq var = TotSTAI

/format = notable /hist

/stats = stdev.

temporary.

select if (Group=1).

freq var = TotSTAI

/format = notable /hist

/stats = stdev.

temporary.

select if (Group=2).

freq var = TotSTAI

/format = notable /hist

/stats = stdev.

temporary.

select if (Group=3).

freq var = TotSTAI

/format = notable /hist

/stats = stdev.

*** RELIABILITY (INTERNAL CONSISTENCY) CHECKING.**

reliability variables = s1 to s20

/scale (scale1) s1 to s20.

*** ONE-WAY ANOVA.**

oneway /var = TotSTAI by Group(0,3) /ranges=scheffe.

***PRACTICE PROFILES FOR REGULAR YOGA PRACTITIONERS.**

* First 6 months across groups.

means tables = PracM1F by Group.

means tables = PracM1M by Group.

* Months 7-12 across groups.

means tables = PracM7F by Group.

means tables = PracM7M by Group.

* Months 13-24 across groups.

means tables = PracM13F by Group.

means tables = PracM13M by Group.

* POSSIBLE INFLUENCES OF OTHER PRACTICES.

means tables = AeroF by Group.

means tables = AeroM by Group.

means tables = BioF by Group.

means tables = BioM by Group.

means tables = PsyF by Group.

means tables = PsyM by Group.

means tables = PranF by Group.

means tables = PranM by Group.

means tables = MedF by Group.

means tables = MedM by Group.

means tables = Regdur by Group.

means tables = Regfreq by Group.

means tables = Regmos by Group.

*OTHER PRACTICES TOTAL WEEKLY TIME BY GROUP.

means tables = Yogaweek by Group.

means tables = Aeroweek by Group.

means tables = Medweek by Group.

means tables = Psyweek by Group.

means tables = Bioweeek by Group.

means tables = Pranweek by Group.

means tables = TotSM by Group.

*** FREQUENCY DISTRIBUTION FOR WHY BEGINNING AND
CONTINUING YOGA.**

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 0).

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 1).

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 2).

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 3).

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 4).

frequencies variables WhyB to WhyC.

temporary.

select if (Group = 5).

frequencies variables WhyB to WhyC.

***PRACTICE PROFILES FOR REGULAR YOGA PRACTITIONERS.**

*** First 6 months across groups.**

means tables = PracM1F by Group.

means tables = PracM1M by Group.

means tables = M1week by Group.

*** Months 7-12 across groups.**

means tables = PracM7F by Group.

means tables = PracM7M by Group.

means tables = M7week by Group.

*** Months 13-24 across groups.**

means tables = PracM13F by Group.

means tables = PracM13M by Group.

means tables = M13week by Group.

*** CORRELATION BETWEEN YOGAWEEK AND ANXIETY SCORE -ALL.**

correlate Yogaweek with TotSTAI.

*** CORR BETWEEN WEEKLY YOGA PRACTICE AND ANXIETY SCORE BY GROUP.**

temporary.

select if (Group=0).

correlate Yogaweek with TotSTAI.

temporary.

select if (Group=1).

correlate Yogaweek with TotSTAI.

temporary.

select if (Group=2).

correlate Yogaweek with TotSTAI.

temporary.

select if (Group=3).

correlate Yogaweek with TotSTAI.

temporary.

select if (Group=4).

correlate Yogaweek with TotSTAI.

temporary.

select if (Group=5).

correlate Yogaweek with TotSTAI.

*** CORRELATION BETWEEN AEROWEEK AND ANXIETY SCORE BY GROUP.**

temporary.

select if (Group=0).

correlate Aeroweek with TotSTAI.

temporary.

select if (Group=1).

correlate Aeroweek with TotSTAI.

temporary.

select if (Group=2).

correlate Aeroweek with TotSTAI.

temporary.

select if (Group=3).

correlate Aeroweek with TotSTAI.

temporary.

select if (Group=4).

correlate Aeroweek with TotSTAI.

temporary.

select if (Group=5).

correlate Aeroweek with TotSTAI.

*** CORRELATION BETWEEN MEDWEEK AND ANXIETY SCORE BY GROUP.**

temporary.

select if (Group=0).

correlate Medweek with TotSTAI.

temporary.

select if (Group=1).

correlate Medweek with TotSTAI.

temporary.

select if (Group=2).

correlate Medweek with TotSTAI.

temporary.

select if (Group=3).

correlate Medweek with TotSTAI.

temporary.

select if (Group=4).

correlate Medweek with TotSTAI.

temporary.

select if (Group=5).

correlate Medweek with TotSTAI.

*** CORRELATION BETWEEN BOWEEK AND ANXIETY SCORE BY GROUP .**

temporary.

select if (Group=0).

correlate Bioweeek with TotSTAI.

temporary.

select if (Group=1).

correlate Bioweeek with TotSTAI.

temporary.

select if (Group=2).

correlate Bioweeek with TotSTAI.

temporary.

select if (Group=3).

correlate Bioweeek with TotSTAI.

temporary.

select if (Group=4).

correlate Bioweeek with TotSTAI.

temporary.

select if (Group=5).

correlate Bioweeek with TotSTAI.

*** CORRELATION BETWEEN PRANWEEK AND ANXIETY SCORE BY
GROUP .**

temporary.

select if (Group=0).

correlate Pranweek with TotSTAI.

temporary.

select if (Group=1).

correlate Pranweek with TotSTAI.

temporary.

select if (Group=2).

correlate Pranweek with TotSTAI.

temporary.

select if (Group=3).

correlate Pranweek with TotSTAI.

temporary.

select if (Group=4).

correlate Pranweek with TotSTAI.

temporary.

select if (Group=5).

correlate Pranweek with TotSTAI.

*** CORRELATION BETWEEN PSYWEEK AND ANXIETY SCORE BY GROUP.**

temporary.

select if (Group=0).

correlate Psyweek with TotSTAI.

temporary.

select if (Group=1).

correlate Psyweek with TotSTAI.

temporary.

select if (Group=2).

correlate Psyweek with TotSTAI.

temporary.

select if (Group=3).

correlate Psyweek with TotSTAI.

temporary.

select if (Group=4).

correlate Psyweek with TotSTAI.

temporary.

select if (Group=5).

correlate Psyweek with TotSTAI.

Appendix I
Prior Research Questions On
Reasons For Doing Yoga

1. The 3 most influential reasons I began yoga initially: (Please mark)

☐ Not clear	☐ Flexibility	☐ Spirituality
☐ General Health	☐ Lose Weight	☐ Stress Management
☐ Relaxation	☐ Sociability	☐ Increase Fitness
☐ Self Confidence	☐ Rehabilitation	☐ Other

2. The 3 most influential reasons I continue to practice yoga : (Please mark)

☐ Not clear	☐ Flexibility	☐ Spirituality
☐ General Health	☐ Lose Weight	☐ Stress Management
☐ Relaxation	☐ Sociability	☐ Increase Fitness
☐ Self Confidence	☐ Rehabilitation	☐ Other

Iyengar Yoga Institute of San Francisco

August 24, 1994

To whom it may concern:

Jeanne Romano has our permission to use images from the Yoga Flash Card series as illustration for her Masters Degree thesis without payment of royalties. We would like to have credit for the illustrations in the thesis. We understand that this thesis could at some point be published.

Yours truly,

Natasha Sevilla

Natasha Sevilla
Director

2404 - 27th Avenue, San Francisco, California 94116 (415) 753-0909

KENTRO

Body Balance

August 22, 1994

To whom it may concern:

Jannet Romano has permission to use excerpts from The Runners Yoga Book without the payment of royalties. This permission is given only for the thesis being worked on the summer of 1994.

Jean O'Connell
author