YOGA AS AN INTERVENTION FOR STRESS REDUCTION AND ENHANCED
WELLBEING IN AFRICAN AMERICAN ATHLETES

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree

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ABSTRACT

Yoga as an Intervention for Stress Reduction and Enhanced Wellbeing in African American Athletes

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This study explored the preventive impact of a brief Hatha yoga program on stress-reduction and enhanced wellbeing in a sample of healthy African American college athletes. African Americans suffer higher rates of hypertension and sudden cardiac death syndrome, both linked to stress. Study design was single case, with six replications, utilizing comparison of pre- and post-intervention scores on physiological and psychological indicators of distress and wellbeing. Findings were inconsistent across participants and measures, though generally included beneficial increases in positive affect (i.e., $C = 0.567, Z = 2.071, p < 0.05$) and perceived physical health (i.e., $C = 0.489, Z = 1.721, p < 0.05$). Increased fatigue over the course of the semester may have confounded results. Given the brevity and cost-effectiveness of the intervention, limited positive results suggest more intensive studies are warranted.

(146 pages)
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Jennifer Fallon
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IN RECENT YEARS, YOGA PRACTITIONERS IN THE U.S. HAVE DOUBLED IN NUMBER, REACHING 15 MILLION, MAKING IT THREE TIMES AS POPULAR AS SNOWBOARDING (BEASON, 2004; CLOTHER, 2004). WHILE THERE ARE MANY BENEFITS ASSOCIATED WITH YOGA, THERE IS INDICATION THAT SOME PEOPLE SEEK YOGA PRACTICE SPECIFICALLY TO REDUCE STRESS (DAVIDSON ET AL., 2003). A QUALITATIVE STUDY INVESTIGATING THERAPEUTIC PROCESSES IN A YOGIC ASHRAM (INTENTIONAL LIVING COMMUNITY) NOTED THAT RESIDENTS' ANSWERS TO WHY THEY HAD CHOSEN TO LIVE THERE "ALWAYS INCLUDED SOME STRESS-RELATED PROBLEMS THEY HOPED TO RESOLVE BY BEING THERE" (WILSON, 1985, P. 253). YOGA HAS A CENTRAL AIM TO CALM BOTH MIND AND BODY, THEREBY PROMOTING
better overall functioning (Watts, 2000). This emphasis on both psychological and physiological systems may lead yoga to be particularly effective in the reduction of stress. For example, pranayama, breathing exercises, may interrupt both negative thought patterns and the fight/flight response of the sympathetic nervous system (Haiken, 2005). Additionally, because yoga is very accessible, cost-effective, and popular (nonstigma), if measurable, clinically significant reductions in stress symptoms and outcomes are observed as a result of yoga practice, this would be a major contribution to stress-reduction and disease prevention.

There is some empirical support for yoga’s potential to calm the body and mind (Arpita, 1990; Pandya, Vyas, & Vyas, 1999; Watts, 2000). Various studies have related the practice of yoga to reductions in pain symptoms (Raub, 2002), depression (Miller, Fletcher, & Kabat-Zinn, 1995), and symptoms of coronary heart disease (Ornish, 1992). However, most of these studies have focused on alleviating severe symptoms of advanced disease states through lengthy interventions (e.g., one year or more). Only one study has explored a preventative and brief application of yoga: Waelde, Thompson, and Gallagher-Thompson (2004) found a yoga intervention significantly reduced reported stress levels among healthy Latina dementia caregivers.

However, the literature is not conclusive because many studies have limitations such as failure to describe the yoga intervention, absence of baseline/initial evaluations, and exclusive reliance on self-report measures. Understanding study outcomes is further complicated by the wide variety of components comprising these interventions (e.g., breathing exercises, mantras, postures, chanting). Similarly, the wide range of symptoms addressed and the corresponding range of outcome measures used further complicate
drawing conclusions across studies. Finally, drawing conclusions about the efficacy of yoga interventions is particularly hindered by poor reporting of data, such as omission of basic descriptive information (e.g., means, standard deviations) and results of statistical significance testing. Therefore, although there is preliminary support, additional research is needed to clarify the magnitude of the impact of yoga interventions and the necessary active ingredients for these interventions to prove efficacious (Arpita, 1990; Pandya et al., 1999; Raub, 2002; Watts, 2000).

High levels of stress have been linked to serious illnesses, including increased risk of cardiovascular disease, which is actually the leading cause of death in the United States for both men and women (American Heart Association, 2007a). African Americans suffer disproportionately high fatality rates from hypertension and cardiovascular disease (CVD; Nakamura, 1999). Hypertension, high blood pressure (BP), is one of four major risk factors for CVD and also a disease often requiring medication and lifestyle changes. Another major risk factor for CVD is inactivity, and approximately 50% of African Americans report a sedentary lifestyle (American Heart Association, 2007b); in a recent survey of over 1,000 African Americans, mean frequency of weekly aerobic exercise of moderate intensity was 1 to 2 times per week (Shive et al., 2006). Essential hypertension, or hypertension of unknown etiology, is the common type experienced by African Americans, and chronic stress has been repeatedly hypothesized as a contributor (Kim, Han, Hill, Rose, & Roary, 2003). African Americans are thus at increased risk for stress-related CVD.

While lack of physical activity is a commonly considered risk factor for CVD, African American athletes (particularly males) are also at increased risk for deadly
cardiovascular incidents, a phenomenon known as sudden cardiac death (SCD; Maron, 1998). SCD in athletes is often linked generally to arrhythmias, and specifically to hypertrophic cardiomyopathy (HCM), which has also been linked to psychological stress and emotional arousal (e.g., fear, anger; Tofler, 1998). Tofler explains stress may operate by both increasing physiological responses to situations/stressors and negatively affecting behavioral responses (e.g., failing to withdraw from activity when heart rate is dramatically elevated—or failing to notice the elevation itself). Thus, stress reduction may be an important consideration for both athletic and sedentary members of the African American population in the prevention of cardiovascular disease.

Compared to conventional psychological and medical treatments for stress-reduction and hypertension, yoga may have greater appeal to African Americans. Historical inequalities and mistreatment by medical practitioners, limited accessibility to medical facilities, lower likelihood of having health insurance, and cultural barriers all impede the effectiveness of conventional approaches to stress-reduction and treatments for hypertension (Kim et al., 2003) with African Americans. These factors also complicate early identification of physical conditions increasing risk for SCD in African American athletes (Maron, 1998). In contrast to the aforementioned treatments, yoga may be delivered inexpensively in a variety of settings, including urban community centers (International Association of Black Yoga Teachers, 2002). Additionally, yoga's somatic and emotional integration, holistic concepts of healing, and spiritual foundations parallel some traditional African healing approaches (Bynum, 1999). Thus, yoga may represent a culturally congruent treatment for stress-reduction for African Americans. There are no known studies addressing the potential effects of yoga for African
Americans. The present study begins to bridge that gap by assessing the effectiveness of yoga in reducing symptoms of stress and enhancing wellbeing in an African American college sample, and further addresses stress reduction among athletes by utilizing a subgroup, male college football players. The purpose of this study was to evaluate the impact of a brief yoga program on psychological and physiological indicators of distress and wellbeing in a sample of African American male college student athletes: psychological indicators include perceived stress, general mental and physical health perceptions, positive and negative affect, and wellbeing; physiological indicators include systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR).
CHAPTER II
LITERATURE REVIEW

The purpose of this section of the paper is three-fold. The first part addresses the significance of stress related disorders, particularly hypertension rates among African American and sudden cardiac death syndrome. The second part presents a link between yoga and psychological treatments, highlighting similarities and borrowing from the strong empirical support found in psychological research for specific interventions. The third portion is a review of existing literature on the benefits of yoga practice on symptoms of stress to determine the state of the field and make recommendations for future research directions.

Stress-Related Cardiovascular Disease and African Americans

Significance of Stress and Stress-Related Disorders

Stress, as defined by the American Heritage Dictionary (1992), is “a mentally or emotionally disruptive or upsetting condition occurring in response to adverse external influences and capable of affecting physical health, usually characterized by increased heart rate, a rise in BP, muscular tension, irritability, and depression” (p. 1778). Lazarus (1982) defined stress simply as “demands that tax or exceed our resources” (p. 34). Though some might argue about the internal versus external quality of the trigger, in either definition, the important concept is the experience of an undesirable state in response to some load (Lazarus). Selye’s (1974) physiological model of the General Adaptation Syndrome describes three stages of nonspecific response to any stressor:
alarm, resistance, and exhaustion. More recently, others have argued that types of stressors may be differentiated (e.g., threat vs. challenge), and in doing so, have emphasized the mediating roles of appraisal and coping responses (Lazarus). Thus, there are effects that a given stressful situation has on an organism, and there are effects the organism brings to bear on the evaluation of a situation as stressful.

The experience of stress is multidimensional. Physical and emotional wellbeing are affected, and studies suggest that under chronic stress, cognitive abilities may also become impaired (Sapolsky, 1998). When these various domains are affected, the impact of a stressor may be multiplied exponentially. For example, if one begins smoking to cope with a perceived threat of job loss, one's physical health may suffer, leading potentially to additional stressors such as illness, unemployment, self-esteem loss, and interpersonal difficulties. As this scenario suggests, appraisal of the situation and the relevant coping skills deemed available are key factors in determining one's experience of a given stressor.

According to conventional wisdom, unhealthy behaviors tend to increase in high-stress periods. However, actual responses to stress are apt to vary considerably, again given the current appraisal and coping skills of individuals. In a recent study with undergraduates, Griffin and colleagues found unhealthy behaviors did not actually increase in high stress periods, while positive healthy behaviors did increase when stress levels dropped (Griffin, Friend, Eitel, & Lobel, 1993). Thus, a rebound effect may occur after high demand periods, which suggests that determinants of positive health practices may differ from those of negative health practices (Griffin et al.).
Research with college-age samples indicates that although symptoms of stress may vary, students generally report common symptoms (Sapolsky, 1998). These often include general irritability, unstable emotions, inability to concentrate, easy fatigability, emotional tenseness, and loss of appetite (Heilburn & Chefitz, 1984). Both depression and anxiety are “inextricably linked” to stress (Sapolsky, p. 33). And self-efficacy, confidence in one’s ability to take on tasks successfully, is an important factor in one’s perception of situations as stressful or not (Nakamura, 1999). Heilburn and Chefitz reported female students in their sample were more susceptible to psychosomatic symptoms, physical illness, psychological disorders, and anxiety and report greater depressive mood symptoms than were male students. This finding may reflect differences in perceived control reported by college men and women. In one study of undergraduates, women rated stressful situations as more unpleasant than men did, while men reported higher levels of perceived control and viewed stressful events as challenges rather than threats (Stilger, Etzel, & Lantz, 2001).

**Hypertension and Stress**

Essential hypertension is a frequent and serious condition associated with stress (Sapolsky, 1998). Some estimate it affects as many as 20% of adults between the ages of 25 and 74 (American Heart Association, 2000). Contrary to prior data, an analysis of National Health and Nutrition Examination Survey (NHANES) data from 1988 to 2000 showed the prevalence of hypertension is increasing (Hajjar & Kotchen, 2003). Recent figures show an increase of 4% in rates of hypertension for African American men ages 20 -74 between 1988-94 and 2001-2004 (Centers for Disease Control, 2006). Because
individuals are often asymptomatic until the condition is quite advanced, it is sometimes called 'a silent killer' (Cooper et al., 1997). Hypothesized factors for essential hypertension include psychological-emotional factors, such as stress and anger, and socioenvironmental factors, such as urban living and poverty in which increased levels of psychological distress have been observed (Kim et al., 2003). Chronic stress has also been repeatedly linked to development of atherosclerosis, another possible factor in the development of hypertension (Sapolsky).

Numerous severe health outcomes are linked to hypertension, including heart disease and kidney failure (American Heart Association, 2007c). According to Cooper and colleagues, hypertension is implicated in 500,000 deaths annually. However, the exact mechanisms involved in hypertension are not well understood. As Cooper and colleagues noted, “physiologists have not yet uncovered every detail of how the body regulates BP” (p. 22). Thus, at this point, the key prognostic indicator of early states of hypertension in young patients with mild to moderate disease is daily BP readings in normal settings (Perloff, Sokolow, & Cowan, 1983).

Hypertension is difficult to control and there are low rates of success in controlling hypertension with medication alone. In the latest NHANES survey, of those with BP measured at or greater than 140/90 mm Hg or using antihypertensive medication, only 58% were receiving treatment and only 31% of those had their hypertension under control (Hajjar & Kotchen, 2003). Similar low rates of success in treating hypertension with medication alone have been reflected in other studies, such as the Framingham data from 1990 to 1995 (Hajjar & Kotchen).
African Americans and hypertension. Compared to European Americans and Latinos, African Americans are at particular risk for developing hypertension and related conditions, such as heart disease and kidney failure. African Americans also have mortality rates from myocardial infarction higher than those of the general population (Kaplan, 1994). Prevalence estimates place the risk of developing hypertension at 34% compared with 29%, and 21%, in White and Latino populations, respectively (Hajjar & Kotchen, 2003). According to Kaplan, “about a third of the excess mortality of US blacks over non-blacks can be explained by their greater burden of hypertension... and another third by their lower socioeconomic status” (p. 452).

African Americans are overrepresented among the poor (U.S. Census, 2003) and poverty is a significant predictor for hypertension (Cooper et al., 1997). However, economic disadvantage does not seem to wholly explain the higher incidence of hypertension (HTN) in African Americans, given that the prevalence of HTN for African Americans is higher than that of any other group (Hajjar & Kotchen, 2003; Peters, 2004). Indeed socially disadvantaged Latinos, Asian Americans, and Native Americans have a prevalence of HTN similar to or even lower than that of Whites (Kaplan, 1994; Peters). Experts estimate as many as 35% of African Americans may have hypertension, and the disease may be responsible for 20% of deaths among African Americans in the U.S., compared to 10% of deaths among European Americans (Cooper et al.).

Initial explanations for the disproportionate percentage of African Americans affected by hypertension focused on race-based genetic factors (Cooper et al., 1997). However, when examined closely, the picture is far from clear. Rates of hypertension found in rural West Africa are actually some of the lowest in the world, suggesting that
the etiology of hypertension cannot be solely genetic (Cooper et al.). Instead, a stress-diathesis model may provide a more accurate explanation. For example in Jamaica, which is considered “an emerging industrial economy,” life expectancy for Jamaican blacks is generally 6 years longer than that of African Americans due to lower rates of cardiovascular disease and cancer (Cooper et al.). This longer life expectancy exists despite very high rates of poverty in Jamaica, suggesting that socioeconomic disadvantage and genetic predisposition do not completely explain the differences in disease rates. As Dressler (1996) noted, the disadvantage (and genetic predisposition) set “the context within which specific social, psychological, and behavioral factors, operating within and between individuals...are the proximate causes of high BP” (p. 80).

Attention to dietary differences has shown a similar pattern of increased risk for African Americans compared to blacks throughout the world. As one moves from less to more industrialized societies, average body mass index (BMI) and salt intake increase, (e.g., from Nigeria to Jamaica to U.S.; Cooper et al., 1997). Correspondingly, angiotensinogen levels in the blood have also been found to increase in individuals from Nigeria to Jamaica to U.S. An individual’s circulating level of angiotensinogen is correlated with body fat (Cooper et al.). Angiotensinogen level is significant because it leads to Angiotensinogen II, which prompts constricting of blood vessels, leading to increases in BP. According to Cooper and colleagues, this relationship leads to the conclusion that “being overweight, and the associated lack of exercise and poor diet, explains between 40 and 50 percent of the increased risk for hypertension that African Americans face compared with Nigerians” (Cooper, Rotimi, & Ward, 1999, p. 22). The
remaining difference may be due to increased levels of psychological stress, and particular types of stress, as Cooper and colleagues (1999) suggested:

Blacks in N. America and Europe face a unique kind of stress – racial discrimination ... blacks in certain parts of the Caribbean, including Trinidad, Cuba, and rural Puerto Rico, have average BPs that are nearly the same as those of other racial groups. Although this is no more than conjecture, perhaps the relationships among races in those societies impose fewer insults on the cardiovascular system than those in the continental U.S. do. (p. 22)

Several researchers, including Chief Executive Officer and Executive Vice President of the American Psychological Association Norman B. Anderson, proposed a biopsychosocial model that incorporates the experience of racism as one factor that leads to negative health outcomes, including cardiovascular disease (Clark, Anderson, Clark, & Williams, 1999). The foundation of the model is built on the general stress coping model proposed by Lazarus and Folkman (1984), and is based on the central tenet that "perception of an environmental stimulus as racist results in exaggerated psychological and physiological stress responses...influenced by constitutional factors, sociodemographic factors, psychological and behavioral factors, and coping responses" (Clark et al., p. 806). An important aspect of this model is that there are differences in perception of stressors, in differential rates of exposure to racism (as well as to stressors more generally) and differences in coping responses. Recognition of these differences can help account for the wide within-group variability in health outcomes among African Americans (Clark et al.). Recognition of these differences in perception, exposure, and response may also facilitate better understanding of the dynamics involved in the development of disease-states, and in tailoring interventions to individual needs.
The relationship between racism and BP in African Americans is complex, as seen in a recent study. Surprisingly a high prevalence of perceived racism was not associated with higher BP (Peters, 2004). Instead, in this study, the relationship between racism and BP was moderated by age, with older participants (40 years or older) reporting experiencing more distress from racism, more anger suppression, higher BP, and the lowest level of perceived racism, leading the author to consider “internalized oppression” as an explanation (Peters). Another explanation may lie in the observation made by Boutain and Cooke (2001), that racism is generally researched and perceived of as an individual act, while “the institutional forms of racism that sustain those individual acts and have the most profound impact on the lives of people, go unnoticed and unexplored” (p. 798). Steptoe and colleagues made a similar observation in a study with white middle class Americans, noting that “in lower-status groups, recurrent high effort resulting from overcommitment is unlikely to be met by appropriate rewards. This state of social reward deficiency may trigger sustained autonomic arousal” (Steptoe, Siegrist, Kirschbaum, & Marmot, 2004, p. 328).

Experts note that hypertension currently accounts for approximately 7% of all deaths worldwide and warn this figure will likely increase as societies continue to adopt the habits and lifestyle of industrial nations (Cooper et al., 1997; NIH, 2003). As noted by a leading researcher, “uncontrolled high BP is a public health dilemma that requires an urgent global and national response” (Medical News Today, 2007). White, Schulman, McCabe, and Dey (1989) noted, “if antihypertensive therapy were entirely harmless and inexpensive, treating all persons with even minimal elevation of diastolic or systolic BP (DBP, SBP, respectively) might be justified, if it were not for the psychological impact of...
making asymptomatic persons into patients” (p. 27). Additionally, a recent NIH report concluded lifestyle modifications were particularly important, since “the prevalence, severity, and impact of hypertension are increased in African Americans, who also demonstrate somewhat reduced BP responses to monotherapy (drug)” (p.17, NIH, 2003).

*African American athletes, Sudden Cardiac Death (SCD), and stress.* African American male athletes appear to experience SCD at increased rates, presenting a subpopulation who may particularly benefit from stress reduction. Hypertrophic cardiomyopathy (HCM) has been identified as the most common cardiovascular abnormality among causes of SCD in young athletes (Maron, 1998) with left ventricular hypertrophy (LVH) its most common expression. LVH is a thickening of the myocardium (heart muscle) of the left ventricle; this may be congenital in some cases, while in others develops in response to chronic high BP (MayoClinic.com, 2006). There are some normal cardiovascular adaptations evident in many elite athletes, such as increased left ventricular end-diastolic cavity dimension, which can complicate differential diagnosis; however, HCM is usually diagnosed by identification of its most striking feature, asymmetric thickening of the left ventricular associated with a nondilated cavity and absence of other diseases potentially responsible (Maron). The condition is particularly challenging to treat since its first symptom among young people is often sudden death, caused by severely abnormal heart arrhythmias (MedlinePlus, 2007). HCM is a major cause of death in young seemingly healthy athletes, with almost half of these deaths occurring during or immediately following some type of intense physical activity (MedlinePlus).
In a review of several studies investigating SCD in athletes, excluding cases due to drug use, Williams (1998) noted the frequency of SCD among young athletes is approximately 10%, with the incidence of HCM within this as 2-5%. He also noted males far outnumber females in cases of SCD and HCM, possibly due to hormonal factors which seem to limit increases in both left ventricular wall thickness and left ventricular cavity dimension experienced by elite female athletes (Williams). There is also evidence the incidence of HCM-related SCD is substantially more common among African American male athletes (48%) than among whites (24%) Maron. Williams concluded that the primary precursors of SCD in young athletes (i.e., HCM, anomalous coronary artery disease, and aortic rupture) occur more commonly among African Americans leading to a disproportionate impact of SCD on young African American male athletes.

As noted by Tofler (1998), the presence of HCM alone does not usually lead to SCD; instead it is the combination of several component causes that produces SCD. These combinations vary by individual, but may include HCM (or some other cardiovascular abnormality), plus potentially manageable factors such as hypertension or elevated cholesterol (Tofler). The list of potentially manageable factors or component causes may include emotional stress, such as fear or anger, and mental stress, such as financial consequences of poor performance (Tofler). Maron (1998) noted, “the stress of intense athletic training and competition (as well as associated alterations in blood volume, hydration, and electrolytes) probably increases the risk of sudden cardiac death in highly trained competitive athletes as compared to nonathletes with this disease” (p. 306). Thus stress-reduction interventions could be of particular value to younger African American male athletes.
Summary: Stress-Related Cardiovascular Conditions and African Americans

This literature review has presented the significance of two particular stress-related cardiovascular conditions, hypertension and SCD, for which African Americans are at increased risk. Reducing the overall experience of stress, increasing coping skills, and facilitating recovery from stressors could interrupt prolonged stress responses, and thereby slow the development of hypertension and perhaps lessen the incidence of SCD. As Dressler (1996) concluded, “the significant effects of social and psychological variables on BP in the African American community also suggest that additional effort be devoted to studying and using various behavioral interventions such as biofeedback or relaxation training” (p. 81). Like relaxation and biofeedback, yoga is noninvasive and devoid of negative side effects. As such, yoga may offer a means of addressing social and psychological variables affecting BP and cardiovascular disease in both at risk individuals and the community at large in an affordable, nonstigmatized context.

Yoga and Psychology

Yoga is an ancient Indian spiritual philosophy. It is defined in various ways depending on the yogic tradition. The dictionary defines yoga as “a Hindu theistic philosophy teaching the suppression of all activity of body, mind, and will in order that the self may realize its distinction from them and attain liberation,” and “a system of exercises for attaining bodily or mental control and well-being” (Merriam Webster, 2007). Most of yoga taught in the U.S. is Hatha yoga, meaning the path of study emphasizes knowledge through the body, rather than through devotional acts or intellect.
Within the Hatha yoga, numerous schools have developed, each following the teachings of a particular yogi, (e.g., Iyengar or Bikram). Though these schools have slightly different teachings, they are all united in their fundamental goal, to unite mind and body. In fact, the word yoga is Sanskrit for “yoke” or “union” (Kabat-Zinn, 1994a). This is generally achieved through some combination of physical poses, breathing practices, meditation, and ethical living.

There are several elements of yoga that are similar to components of familiar psychological theories or practices. Because both yoga (along with other eastern meditative practices) and psychology are concerned with optimal human functioning, the overlap itself is not surprising; but the similarity in structure, particularly as compared to cognitive behavioral therapies (CBT), is striking. As noted by colleagues of the Dalai Lama in a collaborative effort with western scientists, “Buddhists and psychologists alike believe that emotions strongly influence people’s thoughts, words, and actions” (Ekman, Davidson, Ricard, & Wallace, 2005).

The similarity in yogic and psychological approaches is particularly evident in more recently developed psychological treatments, such as Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999), and Mindfulness Based Stress Reduction (Kabat-Zinn, 1994b). In a recent review of the application of Kabat-Zinn’s MBSR approach to clinical practice, Salmon and colleagues note similarities in the fundamental tenets of meditation and western pragmatism: both philosophies emphasize the interdependence of behavior/action, emotion, cognition, and memory (Salmon et al., 2004). The meditative state cultivated in both moving meditations of yoga postures (asanas) and in seated meditation, has been described by psychologists as “global
desensitization" (Goleman, 1990) and "nonreinforced exposure to extinguish fear and avoidance" (Linehan, 1994). The goal of such meditative states is to learn "to observe internal and external events without necessarily trying to terminate them when painful or prolong them when pleasant" (Linehan, p. 77).

A focus on present-moment awareness is important to both yoga and CBT. In the latter, it is the awareness of one's illogical thinking errors or negative self-statements that allows for altering thoughts/beliefs, and this awareness is facilitated by the therapist's calling attention to these negative cognitions as they arise in session (Goleman & Schwartz, 1976). In yoga, it is the practice of the postures, whether moving or stationary, that "serves as a vehicle to practice moment-by-moment awareness" (Salmon et al., 2004). Mirroring the goals of CBT for deeply engrained emotional patterns, developing present moment awareness in yoga and meditative practices "results not only in shifts in fleeting emotions but also lead to changes in one's moods and eventually even changes in one's temperament" (Kabat-Zinn, 1994b).

In addition, both yoga and meditation practices are intended to ideally be practiced daily, or at least frequently. This practice is congruent with CBT practice and theory. Most, if not all, manualized CBT interventions include homework, encouraging practice of learned skills and stimulating generalization to other contexts and settings (Salmon et al., 2004). This "high-demand" characteristic is also similar to CBT interventions, in that regardless of how one is feeling, frequent use of the skills being learned (e.g., interrupt catastrophizing or clear the mind) is deemed necessary for observable, measurable change in behavior (Salmon et al.).
Like psychotherapy, yoga may have an advantage over medical interventions in securing long-term effects (Watts, 2000). Though drug treatments may be more effective initially, those who receive psychotherapy are less likely to relapse, arguably because they have learned helpful skills, such as how to counter depressive ruminations (Teasdale, Segal, & Williams, 1995). Similar acquisition of valuable skills may be learned through yogic practice, and yoga may actually serve a preventive purpose by promoting a healthy lifestyle (Varma, 2002).

As an intervention, Hatha yoga may have several practical advantages to traditional psychotherapeutic interventions. Hatha yoga is relatively low-cost and non-invasive. Classes typically range in price from $5 to $20 dollars per session, depending on where they are offered. Hatha yoga may be easily taught in mixed-level group settings, facilitating delivery and affordability as compared to both pharmacological and psychotherapeutic treatments. As with other non-pharmacological treatments, Hatha yoga has few if any dangerous side effects for most people. In addition, Hatha yoga is extremely portable, meaning it can easily be practiced where space is limited and does not require substantial, if any, equipment. Some teachings, particularly breathing techniques may be practiced anywhere, facilitating over-learning some skills and application. Over-learning is essential to lasting behavior change (Driskell, Willis, & Copper, 1992).

In sum, yoga and CBT seem to share several commonalities, including both goals and approaches. For both, facilitating optimal human functioning is the grand goal. Both yoga and CBT pursue this goal through similar approaches, based on recognition of the interdependence of cognitions and behavior, and cultivation of a present moment focus.
Also, both yoga and CBT approaches utilize desensitization and strongly emphasize over-learning through consistent practice of skills. Contrary to perceptions of yoga as "exotic," it actually has much in common with effective and popular western psychotherapeutic interventions, such as CBT, which are often used for stress reduction (Michalsen et al., 2005).

Evidence of Yoga's Effectiveness in Stress Reduction

Research on yoga as intervention is in its infancy. Studies that investigate the applicability of yoga as an intervention for various stress-related conditions have been researched using primarily small sample sizes or even case studies. State-of-the-literature reviews addressing multiple studies for a given stress-related condition are currently limited to musculoskeletal and cardiovascular diseases. Further most studies found in the course of this research seem to be conducted in the U.S. Although research has taken place in India, many of these studies are limited, of questionable quality, and difficult to access (Raub, 2002). The current search sought state-of-the-literature reviews as well as single studies to better understand the current scientific knowledge regarding yoga as a stress-reduction intervention. Additionally, some of the most robust findings come from comprehensive interventions in which yoga was a key part; these are reviewed first.

Yoga in Comprehensive Wellbeing Interventions

Recent evidence of yoga's potential to reduce stress and improve wellbeing is found in several well-publicized American studies in which yoga was part of comprehensive intervention programs. These programs generally have been applied to
clinical populations, whether of psychological or physical disorders, and have been replicated. These studies are some of the strongest studies in this area of study, usually based on random assignment, multiple means of assessment, and long-term follow-up.

In a ground-breaking study, Ornish and colleagues showed it was possible to reverse the evidence of coronary heart disease through a comprehensive lifestyle intervention including smoking cessation, diet changes, group stress management training, and yoga (Ornish et al., 1990). Over a 1-year period, individuals in the intervention showed a regression of severe coronary atherosclerosis, while those in the care-as-usual group showed progression, meaning an increase in the average percentage diameter of lesions blocking arteries (Ornish et al., 1998). Particularly noteworthy is the additional regression participants showed in a 5-year follow-up (Ornish, 1992).

A similar multidimensional approach utilized by Kabat-Zinn, of the University of Massachusetts Medical Center, combines Hatha yoga with mindfulness meditation to treat a variety of conditions including anxiety and chronic pain disorders. This approach, MBSR, is presented in a highly structured 8-week program involving one class per week and 45 minutes of home meditation practice 6 days per week. There is also a full day silent meditation retreat at the end of the sixth week. In one of several studies using this approach, statistically significant reductions in symptoms of anxiety and depression were reported for 22 patients who met criteria for DSM-III-R anxiety disorders (Miller et al., 1995). MBSR has also been used with professional athletes to improve concentration, performance, and recovery (Davidson et al., 2003).

The 8-week MBSR course has also been researched in relation to alterations in brain and immune functioning in healthy participants (Davidson et al., 2003).
Researchers found meditators had significant increases in left-side anterior activation, a pattern associated with positive affect (Davidson et al.). Researchers also found that in the meditators, the magnitude of increase in left-side anterior activity predicted the magnitude of antibody titer rise in response to an administered influenza vaccine, indicating a direct relationship to immune system functioning (Davidson et al.). This study is particularly interesting since it demonstrates the beneficial changes in underlying biological processes that may be associated with relatively brief yoga and meditation experience. It should be noted that while meditation is generally considered an important component of Hatha yoga (Watts, 2000), many programs utilize only brief seated meditation periods (e.g., 10 minutes), focusing instead on the “moving meditation” of the postures (Wilson, 1985) in contrast to the 45 minutes of meditation used in MBSR.

**Review Articles**

State-of-the-literature reviews were sought as they are considered to provide strong evidence for scientific findings (Rosenthal & DiMatteo, 2001). The search focused on the effects of yoga on either psychological or physiological stress-related symptoms were located through searches for the term “yoga” in online databases (i.e., EBSCO Host, MEDLINE, PSYCLIT, and Social Science Abstracts). Additional searches were conducted in two websites, *Yoga Journal* and *The International Association of Yoga Therapists*. Five articles were located.

Raub (2002) summarizes 64 research studies that cover several conditions under the broad label “musculoskeletal and cardiopulmonary diseases.” He found that there is general support for yoga as a beneficial intervention for improved wellbeing, and some
indication of specific benefits with certain ailments. Raub concludes yoga is effective for stress reduction, and thereby useful in dealing with several stress-related conditions. However, he also calls for more research, as current studies do not clearly enough describe interventions or subject variables.

In an earlier review, Arpita (1990) summarized results on both physiological and psychological stress-related symptoms. As in the Raub (2002) review, Arpita concluded there are positive benefits associated with yogic practice. Arpita (1990) provided useful tables of study characteristics that may be related to outcomes, such as length of intervention, frequency of practice, and specific yogic components. This leads to the conclusion that studies using interventions based on regular practice (two or more times per week) and of at least 4 weeks in length show either physiological or psychological benefits (Arpita). However, he also calls for future researchers to clearly describe their interventions (i.e., reporting specific practices included such as pranayama). This review manages to overcome the problem of access to Indian journals and is unique in identifying important study characteristics that could weaken or strengthen findings, such as whether studies were conducted by the same researcher, or were dissertation projects.

In a theoretical review Watts (2000) outlined directions for future research, and like Arpita (1990), called for more thorough description of interventions in applied research. He concluded that the “most plausible current hypothesis is yoga has valuable effects, but (it) does not have any unique value” (p. 73). Watts stressed that future research should attempt to differentiate yoga postures from other “self-relaxation” techniques with which it is often combined, such as meditation and relaxation. For those who raise philosophical objections to removing meditation and relaxation from the
practice of yoga even for the purpose of research, he suggested using a component-analysis approach to facilitate better understanding of the contributions of each component. While Watts' promoted research to evaluate the unique effects of yogic postures, he also argued that even without unique effects, yoga may still be useful. In this regard, Watts emphasized yoga's relative safety, and suggested research on the magnitude and duration of yoga's effects, particularly across various individuals.

Two final reviews also concluded yoga is useful and call for further investigation (Luskin et al., 1998; Pandya et al., 1999). Luskin and colleagues noted that yoga seems to have benefit not only in addressing disease conditions and the stress that can amplify symptoms, but also in moving healthy individuals towards achieving optimal health. In their review of benefits associated with yoga practice, Pandya and colleagues (1999) concluded yoga is particularly effective because it can alleviate physiological symptoms of stress in several systems simultaneously, for example, cardiovascular, muscular, neurological, while also alleviating mental and emotional stress.

Overall, these state-of-the-literature reviews show consensus regarding yoga's positive effects on stress-related symptoms and the need for further research. The reviews have important limitations. For example, while Raub (2002) published a review with a strong sample of studies, and provided clear information on selection methods and criteria, the manner by which he arrives at his final conclusion is less clear as there is little numerical data reported (e.g., effect sizes) and study results are not systematically compared. Arpita (1990) described inclusion criteria clearly (e.g., empirical), but not the data collection methods. Arpita provided some effect sizes (as percentage improved) and uses a simple vote-counting method to summarize the findings (i.e., counting the number
of studies that did or did not show positive effect). These limitations are likely a function of the data available (e.g., the lack of numerical data available in published studies) and/or the difficulty of summarizing across various outcomes (e.g., depression measure, anxiety scale, study-specific multidimensional scales). These suggest that more research is needed and reporting in future studies should include information to allow for future state-of-the-literature comparisons.

Despite the limitations acknowledged, the conclusions of these reviews should be considered in a larger context. Importantly, the conditions upon which yoga appears to have some positive impact are both serious and prevalent: cardiovascular disease, for example, is the leading cause of death in the United States (American Heart Association, 2007c). Several of these reviews have significantly contributed to the literature by identifying future lines of research and important study characteristics, such as intervention length. However, a more empirical and quantitative consideration of existing primary studies focused on psychological symptoms (as the main emphasis of the proposed project) seems appropriate, particularly in the identification of additional study characteristics, intervention components, and outcome assessments important to the design of future studies.

Single Studies: Yoga as Primary Intervention

Studies were located through searches for the term "yoga" in online databases (i.e., EBSCO Host, MEDLINE, PSYCLIT, and Social Science Abstracts). Although searches often generated a high number of responses, many of these proved to be articles discussing the potential of yoga rather than studies providing empirical evidence. Also,
many early studies were focused on the extraordinary feats of extremely accomplished yogis, rather than the application of interventions with beginning practitioners. In total, twelve empirical studies employing Hatha yoga for the reduction of both physiological and psychological symptoms of stress were located (MBSR is a multidimensional intervention, so studies using that approach are addressed separately; see prior section). Effects on both physiological and psychological symptoms were reviewed. However, physiological indicators/measures varied from study to study, (e.g., systolic BP, salivary cortisol, galvanic skin response) making systematic comparison across studies impossible. Psychological indicators/measures were more consistent across studies (e.g., different measures of depression or anxiety); therefore the conclusions below are based on the systematic review of the impact on psychological variables.

The strongest studies reviewed have both some apparent similarities, such as intervention components, and some substantial differences, such as sample characteristics. Characteristics similar across studies include: intervention components (postures, breathing techniques, meditation); regular practice (through at least biweekly sessions, and emphasis on frequent home practice); and session length (1 to 1½ hr.). Based on this review of empirical studies utilizing a yogic intervention for the reduction of psychological symptoms of stress, clinically significant benefits may be associated with interventions with the following characteristics: (a) Instruction and practice of poses, breath techniques, and meditation (Sherman, Cherkin, Erro, Miglioretti, & Deyo, 2005; Waelde et al., 2004); (b) 6 weeks or longer (Holmer, Gevirtz, Spria, & Greenberg, 2004; Waelde et al.); (c) Sessions are at least biweekly, and 1 to 1½ hrs. in length (McCaffrey, Riiknui, Hatthakit, & Kasetsomboon, 2005; Yogendra et al., 2004); and (d)
Home practice is emphasized, and tools for this are provided (Holmer et al., 2004; Shaffer, LaSalvia, & Stein, 1997).

Major differences in studies include intervention length and participant characteristics. Two studies considered effectiveness of a single session (Berger & Owen, 1992; Netz & Lidor, 2003), and another was only 10 days (Bera & Rajakpurkar, 1993). However, of those showing medium size effects, a minimum intervention length of 6 weeks was employed (Holmer et al., 2004; Waelde et al., 2004; West, Otte, Geher, Johnson, & Mohr, 2004; Yogendra et al., 2004). The studies conducted in the U.S. were generally substantially shorter than those conducted in East Asian countries (e.g., 6 to 8 weeks vs. 6 months to 1 year; Yogendra et al.). Differences in participant characteristics reflect target populations, and countries in which research was conducted. For example, one study was designed as an intervention specifically for those caring for a loved one with dementia (Holmer et al.). Participants in this study tended to be older, ranging in age from 39 to 69 years, as compared to those in other studies, which generally covered a broad age range, from approximately 18 to 65 years (West et al.; Yogendra et al., 2004). Differences in initial levels of health and wellbeing across studies, making conclusions difficult: some utilized healthy college students while others utilized adults with cancer diagnoses and those with substance addictions reflecting both preventive and clinical uses (Cohen, Warneke, Fouladi, Rodriguez, & Chaoul-Reich, 2004; Shaffer et al., 2007; West et al., 2004).

The studies reviewed utilized various stress-related psychological symptoms and measurement scales as outcomes, but similar results were seen across symptoms and scales. In the reduction of depressive symptoms, two studies, Waelde and colleagues
(2004) and Holmer and colleagues (2004), showed medium effect sizes (.28-.53) per Cohen's effect size designations (Stevens, 1999). Statistically significant reductions in anxiety symptoms were also achieved in these studies. These effect sizes are comparable to those seen with psychological interventions for stress reduction: for example, exercise interventions for depression have resulted in 42% reduction in symptoms and studies of cognitive behavioral therapy for depression have shown 36% to 60% reductions in depressive symptoms (Bijlani et al., 2005; Sherman et al., 2005). Other studies showed less powerful effects (McCaffrey et al., 2005), though as one author noted, "the reduction in the risk factors investigated is modest but significant because it was achieved in a very short time by a very simple and inexpensive intervention" (Sherman et al., p. 271).

**Recommendations and Conclusions**

Overall, the available literature reflects that yoga as an intervention for stress reduction has the potential to reduce psychological and physiological stress (Holmer et al., 2004; McCaffrey et al., 2005; Shaffer et al., 1997; Waelde et al., 2004; West et al., 2004). This seems to be achieved through cultivating greater awareness of physiological conditions such as posture and breath, and psychological conditions such as mental states and emotions (Iyengar, 1988). Awareness does not require changing thoughts; rather spaciousness is developed around them, allowing behaviors and subsequent emotions to be chosen rather than automatic.

**Recommendations for future research.** Research is needed to better understand the mechanisms involved in yoga's effects, how yoga may applied to disease prevention and treatment with different clinical populations, factors involved in the acquisition of
skills, and most effective types of yoga or components of practice. The recommendations for methodology discussed below would help clarify these issues of the therapeutic application of yoga.

First, as noted by several authors (Arpita, 1990; Raub, 2002), studies should be more rigorously controlled. A beginning point for this would be to include initial or baseline assessments of participants on the outcome measures used. An even stronger design would include a control or comparison treatment group. Second, studies should specifically describe the intervention used: this will help researchers and reviewers, will permit replication attempts, and may also result in more consistent administration of the intervention within studies. Third, better overall description is needed. This includes participant characteristics, intervention characteristics, and presentation of results would ideally involve some quantifiable data. Fourth, future research should incorporate multiple forms of assessment, such as self-report and observation. This will strengthen findings, and could also indicate whether yoga is equally effective in perceived and actual symptoms reduction (e.g., subjective report of anxiety level compared to observed number of panic attacks). Fifth, because yoga is a mind and body intervention, studies should utilize both psychological and physiological measures, such as self-reported anger level and BP ratings; this approach would also address a unique potential strength of yoga interventions, impact on both the physiological and psychological domains. However, in order to draw conclusions regarding impact on physiological and psychological domains, consistent use of measures across studies is needed; as earlier mentioned, the vast array of different variables used prevented comparison of physiological effects across studies. Sixth, future studies could incorporate measurement
of the aforementioned characteristics associated with reduction of psychological symptoms. Seventh, future studies should aim to assess whether yoga interventions seem equally effective across various ethnic/cultural groups; cultural differences such as holistic vs. dualistic mind-body philosophies suggest that some groups may find yoga more conceptually accessible and therefore have greater potential for benefits (McCaffrey et al., 2005). Finally, assessment of type of stressor experienced, rather than simply symptoms as outcomes, may also help clarify yoga’s potential utility as a stress-reduction intervention.

Conclusions. At this point there is substantial evidence to support the assertion that regular practice of yoga may be beneficial for stress reduction, and emotional and physical wellbeing. This review of the literature has presented the similarities between yoga and psychological treatments that have robust empirical support, borrowing from the strength of the psychological studies in supporting yoga practice as a potentially useful intervention. In addition, yoga has been a central component of comprehensive interventions with important and replicated effects. A number of individual studies have shown notable effects associated with a variety of yogic interventions. Meta-analytic reviews have concluded yoga practice does have beneficial effects, while calling for more research to elucidate both effects and relevant intervention characteristics. As explained by master yoga teacher, Iyengar (1988), “Yoga is an integrated system of physiological, psychological, and philosophical practices that treat the imbalances and maintain the overall well being of the whole person--mind, body, and spirit” (p. 21). In contrast to Descartes’ dualistic separation of mind and body, the yoga tradition presumes a unity of mind and body, and the significance of cognitions and emotions to our
physiological realities. Similarly, physiological conditions are understood to be significant to our mental and emotional wellbeing. Because there is no distinction between mind and body in yoga, the “undoing” of negative cognitions or emotions may occur through physically purifying postures, leading to both physical and psychological healing. As Arpita (1990) explained:

the yoga tradition posits that the body reflects the cognitive/emotional pattern that the individual holds. Tensions and pains are seen as blocks in the energy flow that represents stored emotional material, defenses, or armoring. Chronic postural stances, tensions, and inflexibility express the correlating mental/emotional stance or tightness that underlies them. Bringing awareness to areas of tightness or weakness is a major goal of Hatha yoga because easing these helps to stretch and flex not only the body, but also the personality. (p. 33)

Research Questions

Yoga, as an active mind-body discipline intentionally targeting both physiological and psychological domains, may be particularly effective in stress-reduction. Several reviewers have concluded Hatha yoga was positively correlated with reductions in stress-related symptoms based on their descriptive reviews of primary research (Arpita, 1990; Pandya et al., 1999; Raub, 2002; Watts, 2000). Also, a small body of primary research supports yoga’s benefits for a range of physiological and psychological stress-related symptoms (Miller et al., 1995, Waelde et al., 2004).

Given there is both theoretical and limited empirical support for the potential of Hatha yoga to positively impact stress-related symptoms and the serious health costs of chronic stress, such as hypertension and CVD, further research into this holistic, noninvasive, and cost-effective intervention is warranted. This is particularly the case as
yoga continues to increase in popularity. Future research should incorporate studies in diverse samples. This study aimed to do this by focusing on the potential of yoga to reduce reported stress and improve wellbeing in African American athletes who are at increased risk for both hypertension and SCD.

Specific research questions addressed in the present study were the following:

Research Question 1: In a sample of African American male athletes, what is the relationship between participation in a brief yoga intervention and perceived stress level?

Research Question 2: In a sample of African American male athletes, what is the relationship between participation in a brief yoga intervention and perceived psychological symptoms of stress, particularly negative affect?

Research Question 3: In a sample of African American male athletes, what is the relationship between participation in a brief yoga intervention and physiological symptoms of stress, specifically systolic and diastolic blood pressure (BP)?

Research Question 4: In a sample of African American male athletes, what is the relationship between participation in a brief yoga intervention and perceived wellbeing?
CHAPTER III
METHODS

This section will describe the study design, participants, and measures used in this research. In addition, treatment procedures are described in detail, including the philosophy behind the intervention, the class format, and content matters such as breathing techniques and poses.

Design

The present study utilized a single-subject AB design with replication. This design was the most appropriate for an exploratory, time-intensive intervention study such as this one. Additionally, the number of athletic African Americans in the local community was low, rendering a single-subject design the most feasible to answer the questions posed, given local demographics; per the most recent census data, African Americans represent .6% of the Logan city population and .8% of the Cache County population (U.S. Census, 2000). Single-subject methodology emphasizes the experiences of each individual (Sidman, 1960). In a single-subject with replication design, a baseline is established for each individual, through repeated preintervention assessment; then the intervention is introduced, and assessment continues through the intervention. Intervention levels for a given individual are compared to his/her baseline levels. Because individuals begin the intervention at different points in time, external factors that may threaten the study’s internal validity may have less impact on interpretations of final result. Of particular relevance in this study is the increase in stress that may be
experienced by students over the course of the semester due to increased academic demands (Stilger et al., 2001).

Though single-subject designs inherently have limited external validity, the multiple replications allow for some comparisons across individuals. And there are additional advantages to this design for this type of study. As opposed to ABAB designs, "once the intervention is presented, it need not be withdrawn or altered to reverse behavior to or near baseline levels" (Kazdin, 1982, p. 46), in the single-subject with replication design. Therefore, this is a logical approach for an intervention such as psychotherapy or exercise in which effects are presumed to be cumulative and relatively long lasting, and would not easily (or possibly ethically) be withdrawn. An additional benefit of the single-subject with replication design for this study is that it allowed the intervention to be delivered at a group level, supporting generalization as it is consistent with general/common applications of yoga and permits advantages such as low cost of implementation. The original proposed data collection scheme is presented in Table 1.

Participants

Seven African American male student athletes were recruited from the Utah State University (USU) football team for participation in the study. This athletic team was targeted for recruitment for its comparatively high rate of African American students. This figure represents almost 10% of those recognized as African American undergraduate or graduate students by the USU Registrar (N = 72; USU 2005), and almost 50% of those approached for participation (15 students). The research questions, study design, and proposed measures and intervention were presented to USU football
Table 1

Single-subject Time Series Design, 6-week Yoga Intervention with Six Replications (Ss)

Proposed Data Collection Scheme

<table>
<thead>
<tr>
<th>Week</th>
<th>Ss 1 and 2</th>
<th>Ss 3 and 4</th>
<th>Ss 5 and 6</th>
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<td>1</td>
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<td>Pre2</td>
<td>Pre1</td>
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<td>3</td>
<td>Pre3</td>
<td>Pre2</td>
<td>Pre1</td>
</tr>
<tr>
<td>4</td>
<td>Int1</td>
<td>Pre3</td>
<td>Pre2</td>
</tr>
<tr>
<td>5</td>
<td>Int2</td>
<td>Int1</td>
<td>Pre3</td>
</tr>
<tr>
<td>6</td>
<td>Int3</td>
<td>Int2</td>
<td>Int1</td>
</tr>
<tr>
<td>7</td>
<td>Int4</td>
<td>Int3</td>
<td>Int2</td>
</tr>
<tr>
<td>8</td>
<td>Int5</td>
<td>Int4</td>
<td>Int3</td>
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<tr>
<td>9</td>
<td>Int6</td>
<td>Int5</td>
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<td>10</td>
<td>Post</td>
<td>Int6</td>
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<td>Post</td>
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<td>12</td>
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<td>Post</td>
</tr>
</tbody>
</table>

staff, including Brian Evans, Ed D., academic representative, and Head Coach Brent Guy.

Coach Guy approved recruitment of potential participants through the team, after which Dr. Evans presented the study to first- and second-year African American male student athletes. For incentive and in lieu of monetary compensation for participation, volunteers were offered 1 physical education credit (Pass/Fail), if they completed yoga classes and measurement sessions.

Nine potential participants contacted the researcher to express interest, and individual appointments were scheduled to obtain informed consent, contact information, and a screening questionnaire. Seven of these volunteers attended preliminary assessment sessions, where they were presented with detailed description of the study and reminded
of the right to withdraw at any time, in accordance with standards set by the USU Institutional Review Board. After signing the consent form (Appendix A) and giving current contact information, each volunteer was asked to complete a preliminary demographic sheet inquiring about age, ethnicity, health status (e.g., life-threatening conditions, serious injury), and current activity level (Appendix B). A volunteer meeting the requirements (e.g., self-identified African American, no life-threatening health conditions) was assigned the next available position in the single subject with replication design (see Table 1) and initial baseline measurements were collected. All volunteers had passed football team screens and were actively participating in team workouts and training; no rejections were made on the basis of health conditions. After completing baseline measurement sessions, participants were invited to begin the intervention by attending the yoga classes.

Measures

The following measures were given at all weekly measurement sessions by two research assistants under supervision, including spot checks, of the primary researcher. The research assistants were undergraduate students in the USU Psychology Department. One was male, two were female; all were between 20 and 25 years of age, juniors or seniors in college, and White American.

*Short-Form Health Survey, version 2 (SF-36, v. 2), Acute Form*

The SF-36, v. 2 Acute Form (Ware, Kosinski, & Dewey, 2000; Ware, Snow, Kosinski, & Gandek, 1993) was used to assess health-related quality of life over the past
week. The SF-36, v. 2, Acute Form, yields two summary scores, mental component summary (MCS) and physical component summary (PCS), based on eight subscales: social functioning (SF), role functioning related to emotional health (RE), mental health (MH), vitality (V), physical functioning (PF), role functioning related to physical health (RP), bodily pain (BP), and general health (GH). Three scales (PF, RP, BP) correlate most highly with the physical component and contribute most to the scoring of the PCS measure (Ware et al., 1993). The mental component correlates most highly with the MH, RE, and SF scales, which also contribute most to the scoring of the MCS measure. Three of the scales (VT, GH, and SF) have noteworthy correlations with both components (Ware et al.). Considerable evidence was found for the reliability of the SF-36, v. 2, Acute Form, (Cronbach's alpha greater than .85, reliability coefficient greater than .75 for all dimensions except social functioning), and for construct validity (Brazier et al., 1992). Confidence intervals around individual scores are much smaller for the two summary measures than for the eight scales (± 6-7 points vs. ± 13-32 points, respectively), indicating more precise estimates of actual scores and so permits greater accuracy in interpretation. Additionally, psychometrically based standards have been established for SF-36 scores used to classify changes (better, same or worse) in PCS and MCS scores (NCQA, 2002; Ware et al.). Analyses were completed using the summary measures after visual inspection of several individual scales (VT, GH, MH) did not indicate patterns in scores.

*Perceived Stress Scale (PSS)*

The PSS (Cohen, Kamarck, & Mermelstein, 1983; Appendix C) was used to
assess individual’s perceptions of their global stress. Global stress is the degree to which individuals appraise their lives as generally stressful, without reference to specific events or stressors (Golden-Kreutz et al., 2005). The PSS is a standardized, 10-item self-report questionnaire, and reflects perceptions over the past month. Examples of questions include the following: “How often have you felt nervous or stressed?” and “How often have you felt confident about your ability to handle your personal problems?” Based on a 5-point Likert scale ranging from 0 (never) to 4 (very often), total possible scores range from 0 to 40, with higher scores indicating greater overall stress. Perceived stress scores were obtained by reversing scores on the four positive items, then summing across all 10 items. The scale is frequently used, and reliability coefficients of .87 have been reported (Golden-Kreutz). In accord with several studies, the time frame of the PSS was adapted to 1 week, and reliability coefficients from .87-.91 for this application have been reported (Cohen et al., 2002).

**Positive Affect and Negative Affect Scale (PANAS)**

A self-report measure of affect, the Positive and Negative Affect Scale (Watson, Clark, & Tellegen, 1998; Appendix D) is a standardized, 20-item self-report questionnaire, and may be used to reflect immediate or past perceptions of affect. Individuals are asked to indicate how well various prompts reflect their experience over the past week. Examples of prompts include the following: “proud” and “jittery.” Using a 5-point Likert scale ranging from 1 (very slightly to not at all) to 5 (extremely), total possible scores range from 10 to 100, with higher scores indicating greater overall positive or negative affect (PA, NA, respectively). The scale is frequently used, and
reliabilities of .86 to .90 for PA, and .84 to .87 for NA have been reported; the scales are not correlated with each other, indicating divergent validity, and college student norms are available (Bood, Archer, & Norlander, 2004; Watson et al., 1998). Normative data for nonclinical populations suggests the following mean scores: 32 for PA and 15 for NA (Crawford & Henry, 2004).

*WHO Wellbeing Index, Five-Item, version 2 (WHO-WB)*

The WHO-WB (WHO, 1998; Appendix E) is a short screening instrument for depression created by the World Health Organization. Examples of items include the following: "I have felt calm and relaxed" and "I have felt cheerful and in good spirits." Using a 5-point Likert scale ranging from 5 (all of the time) to 0 (at no time), total possible scores range from 0 to 25, with higher scores indicating greater overall wellbeing over the past week. A recent validation study concluded the scale shows good internal consistency and external validity and recommends a cutoff score of 13 when used to screen for depression (Bonsignore, Barkow, Jessen, & Heun, 2001).

*Blood Pressure (BP)*

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) was recorded via Omron, HEM-637 wrist monitors. Resting BP greater than or equal to 140 mmHg systolic/90mm Hg diastolic was considered hypertensive (Stewart, France, & Sheffield, 2003). BP was measured twice at each measurement session throughout baseline and intervention phases; the two scores were averaged to minimize measurement variability, particularly the impact of regression to the mean and unusually stressful conditions.
(Ewart & Kolodner, 1994). Accuracy for BP is ± 3 mm Hg, or 2% standard error (Omron HealthCare Inc., 2002).

Heart Rate (HR)

HR was recorded via Omron, HEM-637 wrist monitors. As with BP, HR was measured twice at each measurement session throughout baseline and intervention phases; the two scores were averaged to minimize measurement variability (see above). Accuracy for pulse is 5% standard error (Omron HealthCare Inc., 2002).

Treatment Procedures: Outline of Brief Yoga Intervention

Yoga classes were designed to be as consistent as possible with both established teaching methods (e.g., Desikachar, 1995) and available knowledge about effective components (see Literature Review). Classes were 50 min, offered twice weekly before the change in football practice schedule and weekly thereafter (see Results). Classes utilized the following general format: centering, warm-up, vinyasa (flow), standing poses, floor poses, finishing poses, and shavasana (see Table 2). Initially, there was more time spent in warm-up exercises, while some principles of practice and alignment were explained. General principles of practice include the following: safety (including alignment), noncompetitiveness, supportive group attitude, and process-orientation. In order to improve the ecological validity of the study, research participants joined an established yoga class, with enrolled students who were not participating in the study.

Participants were encouraged to practice poses and breathing techniques outside of class, though whether this was done was not documented or assessed. In individual
Table 2

General Class Format for Brief Yoga Intervention

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time (min.)</th>
<th>Sample Poses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering</td>
<td>5</td>
<td>Deep breathing</td>
</tr>
<tr>
<td>Warm-up and Sun salutations</td>
<td>10</td>
<td>Breath of Joy, Sun salutation A and B</td>
</tr>
<tr>
<td>Standing poses</td>
<td>10</td>
<td>Warrier poses, Tree poses</td>
</tr>
<tr>
<td>Floor poses</td>
<td>10</td>
<td>Bow pose, Bridge pose</td>
</tr>
<tr>
<td>Finishing poses</td>
<td>10</td>
<td>Inversions, twists</td>
</tr>
<tr>
<td>Closing</td>
<td>5</td>
<td>Shavasana, meditation</td>
</tr>
</tbody>
</table>

exit interviews several participants volunteered they had tried poses, breathing techniques, and relaxation instructions outside of class. (See Individual Participant Experiences section.)

Components of Yoga Intervention

In broad terms, *Hatha* yoga generally involves two critical areas of practice: *asanas*, or physical postures, and *pranayama*, or breath techniques. From a yogic perspective, both these practices facilitate development of concentration, equanimity, and relaxation, thus are considered meditative. *Asanas*, or physical postures require physical effort and persistence, thereby building strength and flexibility, and after they are released, promoting relaxation in the body. *Asanas* also demand attention, and thus, may serve as a vehicle to enhanced concentration, equanimity, and relaxation. *Pranayama*, or breath techniques, may complement physical exertion, either increasing or reducing the intensity of the practice. As in many meditative practices, the breath is also used as a focal point for attention, providing another vehicle to enhanced concentration, equanimity, and relaxation. In yoga, the breath may also serve as an indicator to the yogi
of his/her level of exertion (e.g., if breathing is labored, it is likely the pose is not being implemented correctly, and may be inhibiting rather than advancing wellbeing). A more detailed discussion concerning these critical ingredients of yoga practice follows.

*Asanas or physical postures.* The physical postures practiced in yoga are believed to address both mind and body through the development of mental concentration, while complementary physical expansion and contraction allow release of muscular tension. As psychologist and physical therapist Judith Lasater (1995) explained:

> yoga alternately stimulates and soothes the organs. For example, by closing the abdomen with a forward bend and then opening it with a backbend, abdominal organs are squeezed, forcing the blood out, and then opened, so that fresh blood returns to soak the organs. With this movement of blood comes the enhanced exchange of oxygen and waste products across the cell membrane. (p. 7)

Deepak Chopra refers to poses in the Sun Salutation sequence as a “neuromuscular integration program (since) each of the postures in this sequence has a specific therapeutic effect on the physiology” (1991, p. 339). Inverted poses, for example, may slow the heart rate and dilate the blood vessels in the upper body (Lasater). *Asanas* used in this intervention were mainly drawn from the Primary Series, a standard sequence based on the teachings of Sri Pattabhis Jois. These poses are generally considered the safest for beginners (Militois, 2003). The Primary Series begins with poses that comprise the Sun Salutation A, *Surya Namaskar A*; additional poses and more advanced variations of poses were added gradually (see Appendix F). Utilizing teachings from John Friend, an advanced American yoga teacher, several principles of alignment were also introduced. The principles include the following: opening to grace, inner spiral, outer spiral, muscular energy, and organic energy (Friend, 2004). The principles
are used to help students become aware of and maintain safe postural alignment in a variety of poses.

One of the most important poses according to the ancient Yoga Sutras of Patanjali is shavasana, or corpse pose (Desikachar, 1995). It involves lying on one’s back on the floor, as comfortably as possible, and letting the entire body relax. Shavasana is considered one of the most difficult poses for western students who are often unfamiliar with awakened states of deep relaxation (Desikachar). It is during shavasana that the body is able to integrate the work done earlier in the practice; this is akin to moving very gently after a massage, or refraining from intense exercise after a Rolfing session while tiny fascia realign and heal. Corpse pose is also extremely important, and potentially very effective in reducing stress, because it is a time when the mind and body can completely relax (Kabat-Zinn, 1994b). As in Progressive Muscle Relaxation (Kabat-Zinn), individuals are guided to successively relax parts of the body; however, in this case, relaxation is done without an intentional contraction component.

Pranayama or breath techniques. Pranayama is an essential part of yoga practice, and multiple techniques were taught. The aim of pranayama is to “make the respiratory rhythm more regular, which in turn has a soothing effect on the entire nervous system” (Chopra, 1991, p. 358). First, deep abdominal breathing is practiced, fostering awareness of breathing. Longer exhalations are also encouraged, which promotes the relaxation response, “a physiological state characterized by a slower heart rate, metabolism, rate of breathing, lower, and slower brain wave patterns” (Benson & Stuart, 1992, p. 36). The most prominent breath technique used was ujjayi, or ocean-sounding breath, in which breathing is consciously made audible to facilitate meditation. In this breath technique,
breathing is done through the nose while the jaw is relaxed, allowing the breath to move through the back of the throat (Desikachar, 1995).

_Meditation._ Yoga is a moving meditation (Cope, 1999) meaning the attention is focused on present moment awareness of the breath and sensations in the body while moving through the asanas. This level of conscious attention is to be carried into the motionless pose of rest, shavasana (described above). Thus, meditation is a central component of yoga even though many Hatha yoga classes do not include a motionless seated meditation phase. This is in contrast to mindfulness and meditation approaches in which the stillness of the seated position is considered foundational to focusing the attention (Kabat-Zinn, 1994b). However, the distinction noted here might be less substantive than aesthetic, as many schools of meditation also include moving meditations (e.g., mindful walking in Vietnamese Buddhism, walking and working in Zen Buddhism). Similarly, seated meditation is considered part of the yogic path, but is generally introduced later as one becomes more accomplished at focusing the attention inward rather than on external stimuli. In yoga, the moving meditation is believed to be easier and to more readily transfer to everyday life. In some ways this is similar to the argument made for using PMR when first teaching relaxation to anxious clients, as the contraction phase is intended to make it easier for them to release and notice the absence of tension than if they were just instructed to relax. However, after a few minutes in Shavasana many teachers invite students to move into a still seated posture for a brief meditation (Cope). This was the approach utilized in this study, and some participants did sit briefly (approximately 3 minutes) for meditation at the end of some class sessions.
Philosophy of Yoga Intervention

An important foundation for the practice of yoga may be found in the yamas and the niyamas. Known as preliminary practices, these recommendations of ethical restraint and daily observance are described in Patanjali’s Yoga Sutras (Cope, 1999). Through their practice, the more gross obstacles in our daily lives (e.g., frustration) are dealt with skillfully. These preliminary practices are explained by Desikachar (1995; see Appendix G), one of the most recognized yogic teachers of 20th century. In general, the yamas largely guide interactions with others, in the aim of simplifying life and directing energy towards higher levels of development, while the niyamas are more personal, and address the attitude one adopts towards oneself. These concepts were introduced in classes in the form of optional intentions during centering periods, or offered for reflection and continued practice outside of class, much like theoretical explanations of specific techniques and/or treatment course are sometimes shared with clients in psychotherapy to promote greater understanding of the purpose of the intervention and facilitate generalization.

An additional philosophical emphasis in the yoga intervention was on awareness of and acceptance of sensations and emotions. Generally based on the “Riding the Wave” technique (Cope, 1999), participants were encouraged to accept sensations and emotions arising during yogic practice. In Cope’s 5-part technique, the attention is brought consciously to the flow of the emotions through five steps: breathe, relax, feel, watch, and allow. Though this particular technique is drawn from the Kripalu yoga approach, meditative practices generally aim to develop awareness and acceptance of sensations, emotions, and later, thoughts (Cope). Foundational to this practice of awareness and
acceptance is an attitude of nonjudgment. The physical demands of yoga poses provide an excellent opportunity to cultivate this attitude of non-judgment and thereby strengthen one’s ability to be with strong and difficult sensations and/or emotions, and to resist habitual patterns of avoidance and denial. An example follows:

As you are in this pose (e.g., downward dog), let’s take the opportunity to contact emotions that may arise. For example, you may notice sensations in your body, such as discomfort or fatigue. See whether there is an emotion associated with this sensation, such as frustration or fear. Whatever emotion you find is fine, even if it is a void, or nothingness. Whatever emotion you find, breathe into it. As you breathe, consciously invite your whole body to relax: relax while in the pose, and relax in the moment as it is. As you relax, allow yourself to focus on the emotion. Watch it closely and gently, noticing if it’s intensity ebbs and flows, or takes on hues of other emotions, such as sadness or even joy. Allow the emotion to be with you in this moment; and allow yourself to be at ease in this moment with this emotion here in the pose. Just continue to breathe.

Class Schedule

Classes were conducted through the Department of Health, Physical Education, and Recreation (HPER) at Utah State University and were 50 minutes in length. Study participants joined existing for-credit classes composed of approximately 25 students in a mixed levels yoga class. Classes were held twice weekly prior to spring break. Following spring break, due to the change in schedules of required football practices, an additional class for study participants was held once weekly at a time convenient for participants.
Students not involved in the study from the regular physical education yoga classes were invited to attend these additional classes and several did. Thus participants were involved in group-format classes comprised of football players and noncollegiate athletes throughout the intervention; this was done in an effort to increase external validity by paralleling many community settings in which levels of both athleticism and experience with yoga are often mixed.
CHAPTER IV
RESULTS

The goal of the analytic strategy was to elucidate the main effects of a yoga intervention on stress-related psychological and physiological variables (e.g., perceived stress, BP, respectively). Baseline levels of responding were based on multiple preintervention assessment scores. Changes in these scores corresponding to the introduction of and participation in the yoga intervention may be associated with individual effects of the intervention. Following single-subject methodology, examining participant results separately allows one to capture the actual experience of an individual in the study. To further inform and clarify data, brief individual exit interviews were conducted at the end of the intervention (not coded). As there were multiple replications, final conclusions were drawn based on results across participants.

For the first research question, what is the relationship between participation in a brief yoga intervention and perceived stress level in an athletic African American college sample, baseline levels of perceived stress (PSS scores) were compared to intervention levels. For the second research question, what is the relationship between participation in a brief yoga intervention and psychological symptoms of stress in an African American college sample, baseline scores on measures of psychological stress (i.e., MCS scale of SF-36, v.2, NA and PA scales of PANAS) were compared to intervention scores on these measures. For the third research question, what is the relationship between participation in a brief yoga intervention and physiological symptoms of stress in an African American college sample, baseline measurements of physiological symptoms (i.e., PCS Scale of
SF-36, SBP, DBP, HR) were compared to intervention measurements. For the fourth research question, what is the relationship between participation in a brief yoga intervention and wellbeing in an African American college sample, baseline scores on measure of psychological wellbeing (i.e., WHO-5) were compared to intervention scores on this measure.

Analysis

Preliminary analyses were primarily visual, through graphing each individual’s scores on each measure. Data were examined for trends in the sequential psychological and physiological measurements, and as described by Jones (2003) were evaluated by slope through visual inspection. Basic descriptive data (e.g., mean, median, standard deviation) were also calculated for each variable, for baseline and intervention phases.

A simplified form of time series analysis (C statistic) was used as applicable given number of data points available. The C statistic indicates the magnitude of change (i.e., rapidity with which it occurs) and whether this is greater than what would be expected given random variation. The C statistic approach is particularly well-suited to this data set as it allows inclusion of all measurements, rather than reduction to one averaged baseline score and one averaged intervention score (as would occur in a t test). Additionally, due to the serial dependency of the data, that is, preceding measurements are correlated with or predictive of subsequent measurements, t and F tests are inappropriate (Tyron, 1982). As noted by Tyron, “the main logical question answered by the C statistic is whether or not the time series contains any trends, i.e., any systematic departures from random variation” (p. 425). Critical value for statistical significance with
alpha at .05 is 1.64 ($N > 8$); with alpha at .01, critical values are 2.17 to 2.21 ($N = 8 - 11$), where $N$ refers to number of data points in the individual’s intervention phase (Tyron).

The direction of the trend is concluded through visual inspection (Jones, 2005). As noted by Jones,

A primary advantage of the $C$ statistic for time series analysis is the significant reduction in the number of data points required. While not a substitute for the more complex time series techniques, neither does it require the collection of 50-100 data points per phase (variable) before analysis. In fact the $C$ statistic appears to have little loss in power to detect a trend with as few as eight data points (measurements) per variable. (p. 23)

Tyron further explains how the $C$ statistic is calculated and the basic assumption of 8 data points (see Appendix I). Additionally, for accurate inferences to be drawn the baseline phase of the time series should be free of trends so the intervention phase is compared to random variation (Kazdin, 1982). Tyron further notes the standard error of $C$ is entirely dependent on the number of data points, and may be easily calculated (see Appendix H), allowing calculation of $Z$, which is the ratio of $C$ to its standard error ($Z = C/Se$).

Clinical significance was also assessed, in order to interpret the relevance of observed changes. Clinical significance has multiple interpretations, though common ones include changes that are recognizable by peers & significant others (Kazdin, 1977); elimination of the presenting problem (Kazdin & Wilson, 1978); and a return to normative levels of functioning (Jacobson & Traux, 1991). Clinically significant change was inferred if the observed scores represented a movement from dysfunctional to functional population (e.g., drop below clinical cutoff level).
Attendance

Measurement sessions were conducted as closely as possible before the start of yoga classes, in a separate room in the same building where yoga classes were held. Though participants reported understanding they were to attend both measurement sessions and yoga classes, there were distinct differences in attendance between measurement sessions and yoga classes for nearly all participants. Only one participant attended less than 92% of possible yoga classes; this is particularly significant as the level of attrition seen in recent yoga studies has been as high as 20% (Varma, 2002). However, only three of seven participants attended 92% or more of scheduled measurement sessions. This difference in attendance is further explored in the description of individual participants’ experiences and in the recommendations section. In sum, each participant completed at least two weekly baseline measurement sessions and at least five measurement sessions during the yoga intervention phase. Time series analyses were only conducted in cases with three or more baseline measurements in order to allow rudimentary assessment of pre-intervention trend.

Unfortunately, there was a 3-week gap in attendance, including both measurement sessions and yoga classes for all participants. This was due to conflicts with unanticipated football team activities (i.e., max testing during week 9) and change in practice schedule (week 11); a 1-week gap would have been unavoidable, as all participants left the area for USU spring break (week 10). Further, once spring ball started in week 11, participants were no longer able to attend twice-weekly sessions, and it was agreed to adjust to a once-weekly approach in order to complete the study. It
should be noted several participants emailed the researcher as soon as conflicts were apparent and apologized for not being aware of the schedule change earlier. Detailed attendance information is presented in individual results section and below (Table 3).

Individual Participant Experiences

This section is organized by negative, inconclusive, and positive findings. Of those participants attending more than 65% of yoga and/or measurement sessions, two (Ss1, Ss6) showed inconclusive or mixed outcomes, and three (Ss4, Ss5, Ss7) showed positive outcomes. The two participants (Ss2 and Ss3) with low attendance at yoga and/or measurement sessions showed mixed results, though any conclusions about their experiences are very tenuous given the limited assessment, and in the case of Ss2, the limited exposure to the intervention as well. Each participant’s data is presented as well as information from behavioral observations during class, and impressions shared by the participants during study end interviews. Both statistical and clinical significance levels were considered, with clinical significance being considered normative functioning or a recognizable level of change as has been accepted elsewhere (Jacobson & Traux, 1991).

Negative Outcomes

Participant 3. It should be noted this participant attended less than 65% of measurement sessions, greatly limiting interpretation of his experience. Viewed as a whole, this participant's results are inconclusive, though there is indication of possible adverse effects from participating in the intervention (see Table 4). There were no statistically significant results. There were three clinically significant results: negatively,
Table 3

*Participant Percentage Attendance at Yoga Classes and Measurement Sessions*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Yoga Classes %</th>
<th>Measurement Sessions %</th>
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<tbody>
<tr>
<td>1</td>
<td>92</td>
<td>77</td>
</tr>
<tr>
<td>2</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>62</td>
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<tr>
<td>4</td>
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<td>100</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
<td>73</td>
</tr>
</tbody>
</table>

Table 4

*Results, Participant 3*

<table>
<thead>
<tr>
<th></th>
<th>MCS</th>
<th>PSS</th>
<th>NA</th>
<th>PA</th>
<th>WB</th>
<th>PCS</th>
<th>SBP</th>
<th>DBP</th>
<th>HR</th>
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</thead>
<tbody>
<tr>
<td>Change</td>
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<td>neg</td>
<td>pos</td>
<td>pos</td>
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<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bline M/ SD</td>
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<td>13.00/40.00</td>
<td>20.00/132.50</td>
<td>66.25/65.75</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1.30/1.41</td>
<td>0/1.41</td>
<td>5.98/4.24</td>
<td>.35/4.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga M/ SD</td>
<td>71.80/11.67</td>
<td>15.16/39.00</td>
<td>18.83/62.89</td>
<td>78.5/69.21/</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>1.12/1.75</td>
<td>2.16/2.61</td>
<td>.75/2.73</td>
<td>6.93/6.24</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>2.16/2.61</td>
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</table>

there was an increase in DBP and a decrease in MCS; positively, there was an increase in PCS. Though there were changes on other measures these were of minimal points, making the overall impact of the intervention unclear (see Appendix I).

Regarding participant’s verbal report, he reported in the interview,

I would do certain things at home to help me relax, or when I would go to bed, I would think about the way you talk to me in relaxation, like the body getting light and lighter. Sometimes coming to class from lifting, I was really sore, but with the...
breathing you helped us make it more relaxing. With some things you stressed do it a certain way, like with the breathing, and it would do something different to my body. I would quit worrying about things too much. It frees my mind in a way.

His attendance at yoga classes was 100%; in measurement sessions, his attendance was only 62%. In yoga classes, he was consistently focused, and resisted distractions from other participants; he always took a spot in the front, which he said helped him focus. He seemed particularly attentive to internal aspects such as breathing practices. He grasped alignment principles quickly and approached new poses eagerly.

Inconclusive Outcomes

Participant 1. Viewed as a whole, this participant's results reflect inconsistent effects in physical and psychological domains (see Table 5). There were statistically significant differences between baseline and intervention scores on two measures: a decrease on the MCS of the SF-36, which was not clinically meaningful, and an increase in DBP. There were also notable and clinically significant though not statistically significant increases in positive affect and wellbeing, reflecting benefits in the psychological domain (see Appendix J).

Participant’s attendance was 92% at yoga classes; he was less consistent with the measurement sessions, attending only 77%. In yoga classes, he was usually focused; at times he seemed frustrated with some poses, and would come out of them quickly. However, he reported wanting to continue practicing yoga, and recommended increasing frequency of classes. From external observations, he appeared to have been invested in the yoga classes.
Table 5

Results, Participant 1

<table>
<thead>
<tr>
<th></th>
<th>MCS</th>
<th>PSS</th>
<th>NA</th>
<th>PA</th>
<th>WB</th>
<th>PCS</th>
<th>SBP</th>
<th>DBP</th>
<th>HR</th>
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</thead>
<tbody>
<tr>
<td>Change</td>
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<td>pos</td>
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<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Bline M/SD</td>
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<td>8.00/</td>
<td>11.00/</td>
<td>38.00/</td>
<td>19.67/</td>
<td>72.95/</td>
<td>119.00/</td>
<td>55.50/</td>
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</tr>
<tr>
<td></td>
<td>.62</td>
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<td>.58</td>
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<td>5.00</td>
<td>2.65</td>
<td>2.25</td>
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<tr>
<td>Yoga M/SD</td>
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<td>11.57/</td>
<td>43.29/</td>
<td>24.29/</td>
<td>72.55/</td>
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<td>79.64/</td>
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<td>1.94</td>
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<td>1.18</td>
<td>9.78</td>
<td>6.06</td>
<td>6.51</td>
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</table>

Regarding participant’s verbal report, he stated several times he really enjoyed yoga. In the interview he added,

I really like yoga. I thought I was flexible, but hmm. The study was cool, the paperwork kind of sucked, but knowing your and heart rate was cool. I liked the whole thing; I’d like to get into another yoga class. The breathing I tried to use in practice, but I couldn’t really see that working; it’s too bad we only did it once a week, maybe that’s why. I’m really glad to know the things we learned so I can stretch on my own.

Participant 2. This participant’s results are inconclusive: Though there is some indication of physiological benefit, psychological changes appear adverse (see Table 6). It should be noted this participant might not have attended enough yoga sessions to be able to benefit. There were no statistically significant results; there was one clinically significant result, a decrease in WB scores (see Appendix K).

This participant had the lowest levels of attendance across all aspects of study: 62% at yoga classes, and 69% of measurement sessions. Though he often joked in yoga
Table 6

Results, Participant 2

<table>
<thead>
<tr>
<th></th>
<th>MCS</th>
<th>PSS</th>
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<th>PA</th>
<th>WB</th>
<th>PCS</th>
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<td>Neg</td>
<td>pos</td>
<td>~</td>
<td>Pos</td>
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<tr>
<td>Statistical Sig.</td>
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<td></td>
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</tr>
<tr>
<td>Bline M/ SD</td>
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<td>42.50/.71/</td>
<td>18.50/.71/</td>
<td>70.48/3.85/</td>
<td>126.50/0.71/</td>
<td>80.50/126.50/</td>
<td>77.50/6.36/</td>
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</tr>
<tr>
<td>Yoga M/ SD</td>
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<td>15.86/3.9/</td>
<td>39.42/2.7/</td>
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<td>64.27/9.8/</td>
<td>117.71/9.4/</td>
<td>77.92/12.43/</td>
<td>71.00/6.36/</td>
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</tr>
</tbody>
</table>

classes, he also seemed intrinsically interested, and asked thoughtful questions, for example, inquiring about purpose of teacher’s own centering practice. He struggled with tightness and exhaustion, yet persisted in trying poses, and seemed to relax completely, even falling asleep occasionally. He appeared to have only partially invested in the classes/study, but may still have physically benefited.

Regarding participant’s verbal report, he stated in the interview,

It was helpful in dealing with the stress of practice. Didn’t always want to do it, but really felt better after class in my body and mentally too. During spring ball with all the course work at the same time, I was really exhausted. And yoga was really helpful, especially the breathing.

Participant 6. This participant did not show substantial changes on most measures (see Table 7). The statistically significant decrease in NA was not clinically significant. There was a slight increase in PSS and temporary decreases in PA and WB. Positive changes were decreases in SBP and HR, and an increase in PCS (see Appendix L).
Table 7

**Results, Participant 6**

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<td>20.00/ .58</td>
<td>64.31/ 3.14</td>
<td>127.5/ 5.13</td>
<td>76.18/ 5.04</td>
<td>67.68/</td>
</tr>
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</table>

This participant frequently communicated his enthusiasm for yoga, both in person and via email. In the exit interview he added,

Yoga is pretty good. If I had to choose one word, I would say “awesome!”

Getting the heart rate info in the study was good too. I thought I couldn’t be any more relaxed. My general approach is, what’s the use of stress? You just do the work, then you’re chilling. But this helped me get over a plateau of relaxation. Yoga helped me a lot. It loosened me up, made my muscles more flexible. And it was fun!

His attendance was 100% at yoga classes and measurement sessions. In yoga he was consistently focused and maintained concentration despite distractions. He quickly internalized alignment adjustments, approached new poses eagerly, and seemed to relax completely. He appeared to have invested in classes/study, and to have benefited.

**Positive Outcomes**

**Participant 4.** Viewed as a whole, this participant's results seem to generally reflect beneficial changes primarily in psychological measures (see Table 8). Two
Table 8

Results, Participant 4

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</tr>
<tr>
<td>Bline M/ SD</td>
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<td>114.44/ 3.41</td>
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changes were both statistically and clinically significant: a decrease in PSS and an increase in PA. There were also clinically significant increases in WB and PCS, and a decrease in HR (see Appendix M).

Regarding participant’s verbal report, he stated several times he really enjoyed yoga. In the interview he added,

> I wish we could have done it for longer so I could get more flexible. It helped me be relaxed and ready to go run in practice. My muscles relaxed, but I think with all the working out for football, they still tighten up again.

Evidence from attendance suggests this participant did enjoy the yoga classes and was committed to participating in the study: his attendance was 100% at yoga classes, and he only missed one measurement session. In yoga classes, he seemed to grasp the alignment aspects of the poses quickly, and carry these from one session to the next; he was consistently focused, but also would smile easily and frequently. He appeared to have both invested in the classes/study, and to have benefitted primarily psychologically.
Participant 5. Viewed as a whole, this participant did not show substantial changes on most measures though there is indication of positive results (see Table 9). There was one statistically significant change (with alpha at .05), an increase on the PCS of the SF-36, which was also clinically significant. There were also clinically significant beneficial changes in both NA and PA. Regarding physiological measures, there were very slight decreases in two measures, neither clinically or statistically significant (see Appendix N).

Regarding the participant’s verbal report, he stated in the interview,

Yoga’s cool, I liked it and I’d like to do it again, if I can get into a class. It hard to fit into words, but it made my body feel so much better. After our practice workouts, we just go home and crash on the couch ‘cause we’re so tired, we don’t stretch. But after yoga, my body felt so good. It was great!

His attendance was 100% at yoga classes, and he only missed one measurement session. In yoga classes, he had to work a little bit to accomplish alignment adjustments and struggled with tightness in low back and legs, but he was persistent and focused; he seemed to let go completely in relaxation, and actually fell asleep one time. He appeared to have invested in both classes/study and to have experienced some benefit.

Participant 7. This participant did not show substantial changes on most measures but results appear primarily beneficial (see Table 10). The only statistically significant change was a decrease in NA (also clinically significant). There were also clinically significant beneficial changes in MCS, PA, SBP, and DBP. However, there was also a clinically significant decrease in WB and a slight increase in HR (see Appendix O).
Table 9

Results, Participant 5

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Table 10

Results, Participant 7

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Regarding the participant’s verbal report, he reported in the interview, Yoga is something I would probably do again. I got more flexible, and it stretched me out a lot more before practice. Some of the positions I didn’t like because I’m tight in the ankles, and I actually have bad ankles, so it hurt. The relaxation I loved! It put me in a good mood—that quiet time, soft music, soothing.

His attendance was 100% at yoga classes; yet only 73% at measurement sessions. In yoga classes, he often laughed at poses and attempted to distract others; however, he
was consistently quiet during relaxation. Per his peers, his joking was consistent with his behavior in other settings, such as running sprints in football; it may have been reflective of discomfort and physical difficulty with poses. He seemed less invested in the classes and study than his peers, but reported enthusiasm for and benefits from yoga classes.

Individual Participant Results Summarized

Though this was a single-subject study, the multiple replications allow limited general conclusions regarding effects of the intervention. Results were summarized across participants and measures to allow conclusions to be more readily drawn. Both clinically significant and statistically significant results were included. As noted above, Participant 2 received less than 65% of the intervention and so was not included in this summary, as his case is not considered to represent a replication of the intervention. For clarity, beneficial and potentially adverse effects are presented separately (see Tables 11 and 12, respectively). It should be noted that there were many statistical significance tests (63), inflating the Type I error rate, and the number of successes is low (4/63 = .06); however, as noted by Jones (2005), this binomial calculation is a direct probability, so the "typical standard .05 or .01 for statistical significance does not necessarily apply" (p. 27).

Results by Measures

Mental Health Summary

Perception of mental health was assessed through the MCS scale of the SF-36. Regarding MCS, there were three notable results. There were two decreases in MCS, possibly representing adverse effects. This decrease was statistically significant ($\alpha = .01$)
Table 11

Beneficial Effects of Clinical (C) and/or Statistical (S) Significance, All Participants and Measures

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Table 12

Adverse Effects of Clinical (C) and/or Statistical (S) Significance, All Participants and

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for one participant (1): $C = 0.734$, $Z = 2.585$, $p < 0.004$; and clinically significant for another (3). There was a clinically significant increase for one participant (7). Most participants scored above norm in both baseline and intervention phases; for one (4), scores generally hovered around norm.

Perceived Stress

Perceived level of stress was assessed with the PSS. There were two notable
results. There was a statistically significant ($\alpha = .05$) increase for one participant (3):

$$C = 0.638, Z = 2.068, p < .019.$$ Only one participant (4) scored above nonclinical norm during baseline measurement sessions; his scores dropped to below the norm during the intervention phase, representing a clinically and statistically significant ($\alpha = .01$) decrease in perceived stress: $C = 0.661, Z = 2.413, p < 0.007$. For all but one participant, there was a slight increase in scores immediately after starting intervention, and an eventual decrease in scores; for two individuals (3, 4), scores during the last half of intervention dropped to below baseline levels.

**Affect**

Affect was measured using the PANAS positive and negative affect scales (PA and NA, respectively). Regarding PA, there were two notable results. One participant (4) experienced a statistically significant increase in scores: $C = 0.567, Z = 2.071, p < 0.019, \alpha = .05$. For two additional participants (1, 7) there were clinically significant increases in scores, representing a change of 11pts for one and movement into the normative range for the other. For another participant (5), there was a clinically significant drop in scores. All participants scored at or just above the norm on this scale for majority of baseline and intervention sessions, suggesting generally healthy levels of positive affect for the group. Regarding NA, there were three notable differences in scores during the intervention as compared to baseline levels. One participant (6) showed a statistically significant ($\alpha = .01$) increase in scores: $C = 0.694, Z = 2.535, p < 0.005$. However, this was not of clinical significance as it represents a ½ point drop in scores already below the norm. Two participants (5, 7) showed clinically significant and beneficial decreases in scores, and
for the latter this was also statistically significant \((\alpha = .01)\): \(C = 0.694, Z = 2.535, p < 0.005\). Four participants (2, 4, 5, 7) were slightly above norm during baseline phase, and dropped to norm or slightly below during intervention phase. When results are examined together for the PA and NA, two participants (4, 7) showed a combination of an increase in PA and a decrease in NA. For another participant (5), both PA and NA scores decreased, possibly suggesting a decrease in emotionality.

*Wellbeing*

Wellbeing was assessed using the WHO-WB. For this measure, there were no statistically significant results. There were several clinically significant results. For two participants (1, 4) these represented beneficial changes: for the former, this was a 5-point increase to the scale’s limit; for the latter this was a 4-point increase and move to above clinical cutoff. For two participants (2, 7) these represented adverse changes: however, the former had less than 65% attendance and may not have received enough of the intervention to assess impact; for the latter, this was a 5-point decrease from clinical cutoff. Interestingly, this was the only adverse change for this participant.

*Physical Health Summary*

Perception of physiological health was assessed through the PCS of the SF-36. There were three notable results, all of these representing beneficial changes. One participant (5) had a clinically and statistically significant \((\alpha = .05)\) increase in scores during intervention as compared to baseline levels: \(C = 0.489, Z = 1.721, p < 0.042\). Two other participants (3, 4) also experienced clinically significant increases of 11 and 16
points, respectively. All participants scored at or above norm for majority of baseline and intervention sessions.

**Blood Pressure**

For SBP, there were no statistically significant results. There was one clinically significant result, a decrease for one participant (7) representing a beneficial change. For DBP, there were three notable results. Two participants (1, 3) showed adverse effects with clinically significant increases in scores; for the former this difference was also statistically significant ($\alpha = .05$): $C = 0.51$, $Z = 1.726$, $p < 0.042$. Another participant (7) showed a clinically significant decrease in scores, representing beneficial effects.

**Heart Rate**

For HR, there were no statistically or clinically significant results. Recordings of HR for all participants were within normal range.
CHAPTER V
DISCUSSION

This study examined the relationships between participation in a brief yoga intervention and several indicators of stress, health, and wellbeing in an athletic African American college male sample. Due to population limitations, this study was completed using a small sample design, in this case, single-subject with replication. Outcome measures included perceived stress, psychological health, affect, physiological health, heart rate, and wellbeing. Baseline measurements were taken prior to intervention, and compared to measurements collected during the intervention using visual analysis, pre-post comparison of means, and time series statistics. Clinical significance was also considered, using movement into or out of clinical range of population, means, and standard deviations.

Hypotheses

For the first research question, what is the relationship between participation in a brief yoga intervention and perceived stress level in an athletic African American college sample, the hypothesis specified that stress levels would decrease with participation in the intervention. Only one participant showed a statistically and clinically significant decrease in stress levels. The majority of participants did not show much change in stress levels. One possible explanation of these results is that though stress levels did not decrease for these individuals, yoga may have acted as a buffer to keep stress levels from further increasing over the course of the semester (e.g., midterms, finals). For one
participant there was a statistically significant increase in stress levels, representing a possibly adverse effect or a failure to buffer something extraneous to the intervention. It is interesting to note that for all but this one participant, there was a small increase in stress level after starting the intervention, with an eventual drop to below baseline levels. One possible explanation for this result is that like psychotherapy or exercise, there may be an initial period of difficulty when one begins a new activity, and after the methods, perspectives, and/or skills being taught have been internalized, stress decreases to below initial levels (UCSB Counseling Center, 2000). It is also possible the measures were not sensitive enough to detect small changes, or the measures did not assess the constructs in which participants experienced benefits, for example, the intervention may not have reduced stress but may have increased self-confidence or perceived physical health.

For the second research question, what is the relationship between participation in a brief yoga intervention and psychological symptoms of stress in an African American college sample, we hypothesized scores on measures of psychological health (i.e., MCS scale of SF-36, v.2, NA and PA scales of PANAS) would improve. Results were mixed, with little change in the majority of scores, some beneficial statistically and clinically significant changes, and a few possibly adverse significant changes. The intervention seemed to differentially impact these measures as changes were not consistent across them. This suggests the measures were assessing different constructs, that is, an increase in PA is not equivalent to a decrease in NA (Watson et al., 1988).

For the third research question, what is the relationship between participation in a brief yoga intervention and physiological symptoms of stress in an African American college sample, we hypothesized physiological symptoms (i.e., PCS Scale of SF-36,
SBP, DBP, HR) would improve. Results in this domain were the most extreme: on one measure there were only positive changes (PCS), yet another had the most negative results (DBP). Positive changes came in the perception of physical health, emphasizing functioning. Given the athleticism of this sample, the improvement is particularly noteworthy; also, as perceived health is a consistent independent predictor of mortality it is an important domain (Idler & Benyamini, 1997). Negative changes came in diastolic, which is inconsistent with findings in two studies in which DBP decreased significantly (Sivasankaran, 2006; Varma, 2002). In both studies participants were exposed to significantly more yoga than in the present study. Varma had a long intervention phase (9 months), and Sivasankaran was brief (6 weeks) yet intense (1.5 hours, 3x/wk). In contrast, the failure to positively impact DBP seen in the present study is consistent with conclusions of a recent meta-analysis in which yoga did not impact DBP (Ospina et al., 2007).

One possible explanation of the negative movement in DBP seen in this study may be the increased academic and athletic demands on participants over the course of the semester, including possible fatigue resulting from “spring ball” in which players attend practice 4 days/week in addition to regular academic loads. As several researchers have noted, student athletes have substantial stressors, including unique pressures related to performance expectations, and that they tend not to seek counseling (Wilson & Pritchard, 2005). These researchers also note these stressors may be most disruptive for freshman, since the increased athletic demands of college are new, they no longer have the same “star” status, and may not yet be aware of available resources (Wilson & Pritchard). In fact this might shed some light on the one participant who attended less
than 65% of possible yoga classes, as he was the only first year student; all others were second year students.

For the fourth research question, what is the relationship between participation in a brief yoga intervention and wellbeing in an African American college sample, the hypothesis specified that scores on measure of psychological wellbeing (i.e., WHO-5) would increase. There were some increases, one decrease, and the majority experienced no change. In this domain, there may have been measurement limitations (ceiling effect), as most participants scored high on wellbeing during baseline, and the scale has only 5 points. Thus a measure with greater sensitivity and a higher range of functioning would have been more appropriate with these participants, and perhaps with student athletes generally. Finally, gender may be important in understanding wellbeing outcomes. A recent lifestyle intervention including meditation and relaxation found more benefit for women than for men in, suggesting gender effects may be important to explore (Michalsen et al., 2005).

General Conclusions

When summarized across replications, the results of this study are inconclusive, albeit with positive indications, particularly in positive affect and perceived physical functioning. This is consistent with conclusions of reviews cited in this paper (e.g., Arpita, 1990), though some individual studies have shown substantial positive benefits (e.g., Waelde et al., 2004). One explanation for the mixed results seen in this study may be the brevity of this intervention and relatively low exposure to yoga participants received. Participants received only 6 weeks of yoga classes, half of these or more being
only one class per week due to unanticipated schedule conflicts with athletic demands. Additionally there was a gap of three weeks in the intervention. With these conditions, it is remarkable that there were still positive changes. Although these conditions are undesirable in a research setting, they may actually make results more ecologically valid as attendance at yoga classes frequently waxes and wanes, as with regular exercise generally.

Another possible explanation for the weakness of the findings is perhaps there were not many gains to be made because this was a generally healthy sample. As opposed to beginning with people who were not at all fit or were experiencing disabling pain, this group was already very capable, thus may not have noticed much increased difference in functioning. This also applies psychologically, as participants generally had remarkably low levels of perceived stress and negative affect, and high levels of wellbeing. Just as an exercise intervention or weight loss reduction program for someone already exercising regularly would have to be more specific and likely more intense to yield effects than one for someone less active. This explanation would be consistent with a recent meta-analysis in which yoga did have an impact on stress reduction for individuals with one of several conditions (i.e., hypertension, other cardiovascular diseases, and substance abuse; Ospina et al., 2007).

An additional possible explanation of limited impact is some factor specific to this intervention. In order to increase the generalizability and practical applications of the study, this intervention was designed as a standard introductory and/or mixed-level yoga class. Therefore participants were integrated into an existing mixed-level class in which there were many beginners. The intervention was based on yogic principles and
traditions regarding sequencing a class and standard poses for beginners. Modifications, however, were specifically made with the football players particular physical challenges in mind (e.g., for poses involving hamstrings or calves, we first spent several minutes in preparatory poses as these areas were generally tight). Notably, the poses utilized in this intervention were also used by yoga teachers in off-season training sessions with National Football League teams (Curnutte, 2004; Maisel, 2005). Also, a similar sequence of poses has been recommended by Yoga Journal, a major resource for American practitioners, for alleviation of anxiety (Haiken, 2005). This suggests the poses were appropriate both to this sample, football players, and for the goal of the intervention, stress-reduction.

However, it is possible that greater gains would have been noted if the class had been specifically targeted to--and perhaps more importantly, restricted to--football players. Although this could increase the cost of applying this intervention, it might have alleviated some scheduling challenges and may have removed a potential source of stress, that is, comparisons participants may have made between themselves and the nonathletes in the class who were sometimes more flexible (and thus able to go deeper into poses) than themselves. Being used to excelling in the physical and athletic domain and feeling a bit on display as the only obvious athletes in the class, they may have experienced some stress or frustration during the class which could be avoided by having a class with other players experiencing the same challenges.

Though these conclusions are based on the sample as a whole and the initial research questions, the results at the individual level are actually more interesting. There were three participants with meaningful positive results, two with inconclusive mixed
results, one with possible negative results who attended less than 65% of measurement (data collection) sessions, and one who attended less than 65% of intervention sessions (yoga classes). Quick explanations for these differing results, such as variation in attendance, have not held up to examination. It is possible there is something subtle, such as coping style, which for some participants simply fit better with yogic teachings. As noted by Suinn (2005) in an article on stress management in sports, there may be at least three different domains through which stress is exhibited (i.e., autonomic-physiological, somatic-behavioral, cognitive-affective) and matching the stress-reduction to the particular domain is most effective. Though yoga includes teachings addressing all these domains, the initial teachings beginners might most absorb seem most similar to interventions generally applied in the autonomic-physiological (e.g., biofeedback) and somatic-behavioral (deep relaxation) domains.

The mixed results seen here suggest that rather than having no impact, the impact of yoga is yet unclear, which is consistent with findings of a recent meta-analysis on forms of meditation (Ospina et al., 2007); with millions of American practitioners and many claims of benefit, yoga is worthy of further research. Recent studies have shown benefit for those involved in longer or more intensive interventions (Varma, 2002, and Sivasankaran et al., 2006, respectively). Therefore, the message of this study may be yoga is akin to familiar physical and psychological interventions. As with exercise, even for those already exercising regularly, there is an initial strain and interventions needs to be long enough for the body to reset (e.g., rebuild muscles, recover from soreness, develop noticeable strength, increase metabolism); still there is some quick benefit just as a short walk may boost mood temporarily. As with psychotherapy, there is initial strain
(e.g., recognition of distress) and again the intervention needs to be long enough to develop skill (e.g., challenge/reframe negative thoughts) or internalize benefits (e.g., positive regard of therapist, or reprocessing of trauma).

Limitations

In addition to the factors addressed above, another limitation with the study is participant satisfaction was not expressly measured; however, based on exit interviews and evidence from attendance some general conclusions may be tentatively drawn. Participants uniformly reported enjoying the yoga classes. Without prompting, each participant said he would like to continue taking yoga and we should have had more classes as part of the study. Only one of the seven missed more than one class period, and several missed none. Participants reported they struggled with some poses, but felt better physically after the classes; they also mentioned enjoying the relaxation and breathing exercises. Different aspects of the yoga intervention seemed to appeal more to different participants, but generally, yoga was appealing to this sample and the classes were enjoyed, despite the possibility there was some comparison and self-evaluation taking place.

There are several other limitations of this study. First, the single-subject design even with replications is not as strong as a randomized control study. However, this design did allow a focus on the individual which it is hoped will deeply inform future studies; as noted recently, “small-scale studies dealing with well-defined clinical populations may be far more informative for the clinician than large-scale, multi-center studies” (Fava, 2006, p. 207). Another limitation is that measurements might have
occurred immediately after yoga classes to measure short-term effects in addition to the long-term generalized effects. Other measurement issues include having more objective behavioral outcomes, such as visits to student health center; this was intended here but was deemed too invasive and abandoned in this study due to concerns with access to the population and feasibility. Psychological and physiological measures might be more sensitive at higher functioning levels; perhaps including measures of exceptional functioning or more performance oriented measures would help clarify changes or possible benefits. It might also be helpful to include physiological measures across domains, as there has been some inconsistency in the impact of stress reduction and relaxation interventions on: for example, in a study utilizing meditation and post-exercise assessment, participants did not exhibit changes in though they did show significant decreases in blood lactate concentrations (Solberg et al., 2000). Finally regarding measures and assessment, it would have been helpful to have a journal of stressful events or weekly record of experienced significant events to help interpretation of fluctuations in stress scores.

Perhaps the most obvious limitation is that the amount of yoga training received was very low. This was due to both the brief study length (intended) and unanticipated scheduling challenges with required football activities (unintended). However, this may actually bode well for future studies, in that finding some modest positive outcomes with such a low “dose” suggests greater effects are quite possible with more sustained and/or intensive interventions. Based on the results of this study, and the literature, future research is definitely warranted.
Future Research

Based on the preceding comments, future research should incorporate measure of participant satisfaction, objective behavioral indicators, and multiple time frames for measurement (assessing short and long-term impact), ideally in a more experimentally rigorous design. Per the participants' reports and these results, future studies should include more classes per week and a longer intervention to see greater impact. Also, if a football-specific class were developed and taught, it would be useful to include measures of performance (e.g., BMI/injury status, recovery time, endurance, sprint times), which are likely to be of great importance to program directors and participants. Future studies could also examine whether participants try techniques outside of class, and if so, which ones, and whether this is predictive of benefit. It would also be very useful to gather information about other stressors that might interfere with treatment participation or effects, possibly through inclusion of a weekly stressful life events inventory or journaling, so these factors can be better understood and eventually possibly incorporated into the treatment itself to improve participation and, thus, outcomes. A potential study building on this one would again be focused on African American male college football players, though in a multiple baseline design to facilitate analysis, and it would be conducted exclusively during the off-season (early part of spring semester before break) with baseline measurements as early in January as possible; both baseline measurements and intervention measurements would be conducted 3x/wk, with 1.5hr yoga sessions immediately preceding intervention sessions and measurements including perceived stress, stressful events journal, affect, flow/optimal experiences, and performance
indicators (e.g., sprint times), as well as physiological indicators such as blood lactate concentrations, VO2 max, and/or salivary cortisol levels.
REFERENCES


Appendix A:

Informed Consent
Informed Consent Form

Yoga as Intervention for Stress-Reduction and Enhanced Well-Being

Introduction/Purpose: Melanie Domenech Rodriguez and Jennifer Fallon in the Psychology Department at Utah State University are conducting a research study into the potential of yoga to benefit health.

Procedures: If you agree to be in this study, you will be asked to complete brief survey measures, wear a blood pressure wrist monitor, and participate in a yoga class. The brief survey measures are filled out weekly throughout the semester, and take less than 30 minutes to complete. Blood pressure will be recorded while forms are being completed. You will be asked to attend a bi-weekly yoga class for 6 weeks, though you may continue longer.

Risks: Potential risks include mild physical discomfort from the yoga class, or the wrist monitor, and increased awareness of stress levels through survey measures. As with any physical activity, there is a risk of physical injury from engaging in the yoga poses.

Unforeseeable Risks: As an experiment, there may be some currently unforeseeable risks. If there are any changes in the risks resulting from participation in the research, you will be notified immediately.

Benefits: There may or may not be any direct benefit to you from these procedures. Potential benefits include increased fitness, flexibility, and relaxation. Participants who complete all phases of the study may receive one Physical Exercise credit for Spring Semester 2006. For each yoga class session attended, you will be given one raffle entry to be entered into a drawing for cash and prizes given away at the end of the study. Information from this study may benefit psychological and medical knowledge.

Contacts: If you have any further questions about the study that are not answered in the information session, or you have concerns, you may contact Ms. Fallon through the Psychology Dept., USU, 797-1460 or Dr. Domenech Rodriguez at 797-3059.

Voluntary nature of participation and right to withdraw: Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without loss of benefits. The investigator reserves the right to withdraw you from this study without your consent at any time if you indicate having a life-threatening illness, and/or engage in dangerous or offensive behavior.

Confidentiality: Research records will be kept confidential, consistent with state and federal regulations. Your name will not appear on any forms, and data will be stored in numerical format.

IRB approval statement: The Institutional Review Board (IRB) for the protection of human participants at USU has reviewed and approved this research study.

Copy of consent: You have been given two copies of this form. Please sign both and retain one copy for your files.

Investigator Statement: "I certify this research study has been explained to the individual named below by me or my research staff, and that the individual understands the nature and purpose, the possible risk and benefits associated with taking part in this research study. Any questions raised have been answered."

Signature of PI: ___________________________ Date: 12/20/05
Melanie Domenech Rodriguez, Ph.D.

Signature of Student Researcher: ___________________________ Date: 12/20/05
Jennifer Fallon, M.S.

Signature of Participant: ___________________________ Date:
Appendix B:

Demographic Form
Thank you for your interest in participating in this study. The demographic information requested below will be kept confidential, and will not be associated with information that could identify you. Please do not put your name on this sheet. Also, you may at any time decline to participate.

Please provide the following information:

Age: ____________________________

Ethnicity: ____________________________

Health Status (indicate life-threatening conditions, serious injury): ____________________________

Current physical activity level (estimate hours/day of moderate intensity): ____________________________

Prior yoga experience: ____________________________

If you have any questions, please contact:

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Department of Psychology,
Utah State University, 2810 Old Main Hill, Logan, UT 84322
voice: (435) 881-1353
ejfallon@cc.usu.edu

Melanie Domenech Rodriguez, Ph.D.
Department of Psychology,
Utah State University, 2810 Old Main Hill, Logan, UT 84322
voice: (435) 797-3059; fax: (435) 797-1448
mdr88@cc.usu.edu
Appendix C:

Perceived Stress Scale
Perceived Stress Scale-10 Item

Instructions: The questions in this scale ask you about your feelings and thoughts during the last week. In each case, please indicate with a check how often you felt or thought a certain way.

1. In the last week, how often have you been upset because of something that happened unexpectedly?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

2. In the last week, how often have you felt that you were unable to control the important things in your life?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

3. In the last week, how often have you felt nervous and “stressed”?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

4. In the last week, how often have you dealt successfully with irritating life hassles?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

5. In the last week, how often have you felt that you were effectively coping with important changes that were occurring your life?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

6. In the last week, how often have you felt confident about your ability to handle your personal problems?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

7. In the last week, how often have you felt that things were going your way?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often

8. In the last week, how often have you found that you could not cope with all the things that you had to do?

   _0=never  _1=almost never  _2=sometimes  _3=fairly often  _4=very often
9. In the last week, how often have you been able to control irritations in your life?
   0 = never  1 = almost never  2 = sometimes  3 = fairly often  4 = very often

10. In the last week, how often have you felt that you were on top of things?
    0 = never  1 = almost never  2 = sometimes  3 = fairly often  4 = very often
Appendix D:

Positive and Negative Affect Scales
PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that word. Indicate to what extent you have felt this way during the past week. Use the scale to record your answers.

<table>
<thead>
<tr>
<th>(1) = Very slightly or not at all</th>
<th>(2) = A little</th>
<th>(3) = Moderately</th>
<th>(4) = Quite a bit</th>
<th>(5) = Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interested</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Distressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Excited</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Upset</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Strong</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Guilty</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Scared</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Hostile</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. Enthusiastic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Proud</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Irritable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. Alert</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Ashamed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Inspired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Determined</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Attentive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. Jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19. Active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. Afraid</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Appendix E:

WHO Wellbeing Questionnaire (5)
Please put a circle on each of the five statements that is closest to how you have been feeling over the last week. Notice that the higher numbers indicate better wellbeing.

<table>
<thead>
<tr>
<th>Over the last week</th>
<th>All the time</th>
<th>Most of the time</th>
<th>More than half of the time</th>
<th>Less than half of the time</th>
<th>Some of the time</th>
<th>At no time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel cheerful and in good spirits</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>I feel calm and relaxed</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>I feel active and vigorous</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>I wake up feeling fresh and rested</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>My daily life is filled with things that interest me</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Appendix F:

List of Postures
<table>
<thead>
<tr>
<th>Sanskrit Name</th>
<th>English Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garbhasana</td>
<td>Child’s Pose</td>
</tr>
<tr>
<td>Shavasana</td>
<td>Corpse Pose</td>
</tr>
<tr>
<td>Tadasana</td>
<td>Mountain</td>
</tr>
<tr>
<td>Uttanasana</td>
<td>Forward Bend</td>
</tr>
<tr>
<td>Adho Mukha Svanasana</td>
<td>Downward-Facing Dog</td>
</tr>
<tr>
<td>Bhujangasana</td>
<td>Cobra</td>
</tr>
<tr>
<td>Urdhva Mukha Svanasana</td>
<td>Upward-Facing Dog</td>
</tr>
<tr>
<td>Chaturanga Dandasana</td>
<td>Sun Salutation A</td>
</tr>
<tr>
<td>Surya Namaskar A</td>
<td>Plank</td>
</tr>
<tr>
<td>Pavana Muktasana</td>
<td>Wind-Relieving Pose</td>
</tr>
<tr>
<td>Supita Matsyendrasana</td>
<td>Supine Knee-Down Twist</td>
</tr>
<tr>
<td>Utkatasana</td>
<td>Squat</td>
</tr>
<tr>
<td>Virabhadrasana I</td>
<td>Warrior I</td>
</tr>
<tr>
<td>Surya Namaskar B</td>
<td>Sun Salutation B</td>
</tr>
<tr>
<td>Vrikshasana</td>
<td>Tree</td>
</tr>
<tr>
<td>Garudasana</td>
<td>Eagle</td>
</tr>
<tr>
<td>Janushirshasana</td>
<td>Seated Head to Knee</td>
</tr>
<tr>
<td>Paschimatanasana</td>
<td>Seated Forward Bend</td>
</tr>
<tr>
<td>Matsyendrasana</td>
<td>Seated Twist</td>
</tr>
<tr>
<td>Trikonasana</td>
<td>Triangle</td>
</tr>
<tr>
<td>Virabhadrasana II</td>
<td>Warrior II</td>
</tr>
<tr>
<td>Virabhadrasana III</td>
<td>Warrior III</td>
</tr>
<tr>
<td>Ardha Chandrasana</td>
<td>Half-Moon</td>
</tr>
<tr>
<td>Kapotasana</td>
<td>Pigeon</td>
</tr>
<tr>
<td>Setu Bandhasana</td>
<td>Bridge</td>
</tr>
<tr>
<td>Halasana</td>
<td>Plow</td>
</tr>
<tr>
<td>Ardha Sarvangasana</td>
<td>Half Shoulderstand</td>
</tr>
<tr>
<td>Ustrasana</td>
<td>Camel</td>
</tr>
<tr>
<td>Urdhadamurasana</td>
<td>Wheel (backbend)</td>
</tr>
<tr>
<td>Bakasana</td>
<td>Crow/Crane</td>
</tr>
<tr>
<td>Navasana</td>
<td>Boat</td>
</tr>
<tr>
<td>Badakonasana</td>
<td>Bound Angle</td>
</tr>
<tr>
<td>Parvritta Trikonasana</td>
<td>Revolved Triangle</td>
</tr>
<tr>
<td>Parvritta Parsvokanasana</td>
<td>Revolved Side Angle Pose</td>
</tr>
<tr>
<td>Parvritta Ardha Chandrasana</td>
<td>Revolved Half-Moon</td>
</tr>
<tr>
<td>Salabhasana</td>
<td>Locust</td>
</tr>
<tr>
<td>Virasana</td>
<td>Hero</td>
</tr>
<tr>
<td>Lotus</td>
<td>Partial and Full</td>
</tr>
<tr>
<td>Adho Mukha Vrkasana</td>
<td>Handstand (prep only)</td>
</tr>
<tr>
<td>Salamba Sirsasana</td>
<td>Headstand</td>
</tr>
</tbody>
</table>
Appendix G:

Summary of Ethical Practices
Summary of Ethical Practices: *Yamas* and *Niyamas* as described by Desikachar (1995)

<table>
<thead>
<tr>
<th>Practice:</th>
<th>Meaning:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yamas:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Ahimsa</em></td>
<td>Non-harming; thorough consideration of others</td>
</tr>
<tr>
<td><em>Satya</em></td>
<td>Non-lying; truthfulness</td>
</tr>
<tr>
<td><em>Asteya</em></td>
<td>Non-stealing</td>
</tr>
<tr>
<td><em>Brahmacharya</em></td>
<td>Abstaining from sensual indulgence</td>
</tr>
<tr>
<td><em>Aparigraha</em></td>
<td>Non-possessiveness</td>
</tr>
<tr>
<td><strong>Niyamas:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Sauca</em></td>
<td>Purity</td>
</tr>
<tr>
<td><em>Santosh</em></td>
<td>Contentment</td>
</tr>
<tr>
<td><em>Tapas</em></td>
<td>Austerity</td>
</tr>
<tr>
<td><em>Svadhyaya</em></td>
<td>Self-study</td>
</tr>
<tr>
<td><em>Ishvara-pranidhana</em></td>
<td>Surrender</td>
</tr>
</tbody>
</table>

**Ahimsa**

Literally translated as the ‘absence of injustice’ or ‘cruelty,’ (*a–* *himsa, himsa* means injustice or cruelty) *ahimsa* more closely means “kindness, friendliness, or thorough consideration of others” (Desikachar, 1995, p.98). Though often taken to mean a life of vegetarianism, more important according to Desikachar, is careful consideration of the implications of an action, and choosing to avoid what would cause us harm or harm others. For example, if it would cause others more harm for one to deny oneself adequate nutrition, it may be appropriate to eat meat. This is the foundation of all the ethical guidelines.

**Satya**

Though it is sometimes translated simply as “to speak the truth,” *satya* also incorporates consideration. Desikachar explains that *satya* should never come into conflict with the principle of *ahimsa*, and that for those who remain true to this principle, there will be no conflict between speech and action (p.100).

**Asteya**

Literally translated as the absence of stealing (*a–* *steya, steya* means to steal), *asteya* means more than avoiding gross obvious examples of theft. It is better understood as refraining from taking anything that does not belong to us, and not taking advantage of someone who has trusted us (p.99).
Brahmacarya
This principle is often narrowly translated as abstinence from sexual activity. But as Desikachar explains, it more precisely means we should form relationships that foster our understanding of the highest truths, rather than getting lost in sensory pleasures (p.99). The intent of this yama is to focus one’s energy on pursuing the path of yoga.

Aparigraha
Literally translated as not seizing opportunity, (a-parigraha, parigraha means “to take” or “seize”), Desikachar suggest this may be a challenging principle, but that may be observed in our relationships with nature, as well as with each other. “To take only what is necessary, and not to take advantage of a situation” (p.99) might mean to live in balance with our environment, or to take only what we have earned. Following this helps one be less driven by greed, material possessions, and exploitation of others; thereby also avoiding getting ensnared in the obligations that often accompany unearned rewards.

Sauca
Translated as ‘cleanliness,’ it has both inner and outer aspects. The outer aspect is simple sanitary cleanliness. The inner aspect refers to healthy functioning of the body and clarity of mind. Yoga practice is considered essential in attending to inner sauca (p.101).

Samsota
Desikachar explains samsota means “modesty, and the feeling of being content with what we have” (p.101). When things go wrong, acting in accordance with samsota would mean accepting what has happened, then learning from the situation -- rather than spending energy denying what is or complaining about it. Both modesty and contentment are important aspects of this attitude.

Tapas
Literally, tapas means ‘to heat the body,’ and thereby cleanse it. As a niyama, it means to keep the body fit and well-functioning. This is done in many ways, including asana practice, and giving attention to our eating and breathing patterns. As Desikachar eloquently explains, these practices help prevent the buildup of ‘rubbish’ in the body (p.101). Tapas, though sometimes explained as self-denial, “should not cause suffering” (p.102). A better interpretation is well-reasoned and healthy self-discipline.

Svadhyaya
In a literal translation, svadhyaya means ‘to get close to oneself’ (p.101). Reading ancient texts is a frequent translation, but Desikachar explains the intention is to give one reference points, and says a book of personal relevance may provide the same effect. According to Desikachar, all learning and reflection that helps you learn more about yourself is in keeping with this niyama.
Isvarapranidhana
This term may be translated as to “lay all your actions at the feet of God” (p.102). Desikachar explains that this attitude encourages one to be satisfied with having done one’s best, regardless of the results. Rather than focusing on outcome, there is emphasis on process. Therefore, one may comfortably let go of, or release, the fruits of one’s actions, having done the best one could in the moment.
Appendix H:

Statistical Equations
Statistical Equations

\[
C = 1 - \frac{\sum_{i=1}^{N-1} (X_i - X_{i+1})^2}{2 \sum_{i=1}^{N} (X_i - X)^2}
\]

\[
Se = \sqrt{\frac{N + 2}{(N - 1) (N + 1)}}
\]

\[Z = C/Se\]

Appendix I:

Participant 3: Graphs
Figure 1. Participant 3’s MCS scores, before and during intervention.

Figure 2. Participant 3’s PSS scores, before and during intervention.

Figure 3. Participant 3’s NA scores, before and during intervention.

Figure 4. Participant 3’s PA scores, before and during intervention.
Figure 5. Participant 3's WB scores, before and during intervention.

Figure 6. Participant 3's PCS scores, before and during intervention.

Figure 7. Participant 3's SBP scores, before and during intervention.

Figure 8. Participant 3's DBP scores, before and during intervention.

Figure 9. Participant 3's HR scores, before and during intervention.
Appendix J:

Participant 1: Graphs
Figure 10. Participant 1’s MCS scores, before and during intervention.

Figure 11. Participant 1’s PSS scores, before and during intervention.

Figure 12. Participant 1’s NA scores, before and during intervention.

Figure 13. Participant 1’s PA scores, before and during intervention.
Figure 14. Participant 1’s WB scores, before and during intervention.

Figure 15. Participant 1’s PCS scores, before and during intervention.

Figure 16. Participant 1’s SBP scores, before and during intervention.

Figure 17. Participant 1’s DBP scores, before and during intervention.

Figure 18. Participant 1’s HR scores, before and during intervention.
Appendix K:

Participant 2: Graphs
Figure 19. Participant 2’s MCS scores, before and during intervention.

Figure 20. Participant 2’s PSS scores, before and during intervention.

Figure 21. Participant 2’s NA scores, before and during intervention.

Figure 22. Participant 2’s PA scores, before and during intervention.
Figure 23. Participant 2’s WB scores, before and during intervention.

Figure 24. Participant 2’s PCS scores, before and during intervention.

Figure 25. Participant 2’s SBP scores, before and during intervention.

Figure 26. Participant 2’s DBP scores, before and during intervention.

Figure 27. Participant 2’s HR scores, before and during intervention.
Appendix L:

Participant 6: Graphs
Figure 28. Participant 6's MCS scores, before and during intervention.

Figure 29. Participant 6's PSS scores, before and during intervention.

Figure 30. Participant 6's NA scores, before and during intervention.

Figure 31. Participant 6's PA scores, before and during intervention.
Figure 32. Participant 6’s WB scores, before and during intervention.

Figure 33. Participant 6’s PCS scores, before and during intervention.

Figure 34. Participant 6’s SBP scores, before and during intervention.

Figure 35. Participant 6’s DBP scores, before and during intervention.

Figure 36. Participant 6’s HR scores, before and during intervention.
Appendix M:

Participant 4: Graphs
Figure 37. Participant 4’s MCS scores, before and during intervention.

Figure 38. Participant 4’s PSS scores, before and during intervention.

Figure 39. Participant 4’s NA scores, before and during intervention.

Figure 40. Participant 4’s PA scores, before and during intervention.
Figure 41. Participant 4’s WB scores, before and during intervention.

Figure 42. Participant 4’s PCS scores, before and during intervention.

Figure 43. Participant 4’s SBP scores, before and during intervention.

Figure 44. Participant 4’s DBP scores, before and during intervention.

Figure 45. Participant 4’s HR scores, before and during intervention.
Appendix N:

Participant 5: Graphs
Figure 46. Participant 5's MCS scores, before and during intervention.

Figure 47. Participant 5's PSS scores, before and during intervention.

Figure 48. Participant 5's NA scores, before and during intervention.

Figure 49. Participant 5's PA scores, before and during intervention.
Figure 50. Participant 5’s WB scores, before and during intervention.

Figure 51. Participant 5’s PCS scores, before and during intervention.

Figure 52. Participant 5’s SBP scores, before and during intervention.

Figure 53. Participant 5’s DBP scores, before and during intervention.

Figure 54. Participant 5’s HR scores, before and during intervention.
Appendix O:

Participant 7: Graphs
Figure 55. Participant 7’s MCS scores, before and during intervention.

Figure 56. Participant 7’s PSS scores, before and during intervention.

Figure 57. Participant 7’s NA scores, before and during intervention.

Figure 58. Participant 7’s PA scores, before and during intervention.
Figure 59. Participant 7’s WB scores, before and during intervention.

Figure 60. Participant 7’s PCS scores, before and during intervention.

Figure 61. Participant 7’s SBP scores, before and during intervention.

Figure 62. Participant 7’s DBP scores, before and during intervention.

Figure 63. Participant 7’s HR scores, before and during intervention.
VITA

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Education:

Ph.D.  
2003 - 2007  
Utah State University (APA-accredited), Logan, UT.  
Combined Clinical, Counseling, and School Psychology  
Emphasis: Health Psychology  
Title: Yoga as an Intervention for Stress Reduction with African Americans  
Dissertation Chair: Melanie Domenech Rodriguez, Ph.D.

M.S.  
1999 - 2003  
Utah State University, Logan, UT.  
Combined Clinical, Counseling, and School Psychology  
Emphasis: Clinical and Counseling Health Psychology  
Title: Roles of Religious Orientation and Health Locus of Control in an Aging Population  
Thesis Chair: Kevin Masters, Ph.D.

B.A.  
1990 - 1994  
Northwestern University, Evanston, IL.  
American History  
Additional concentrations: African Studies and Creative Writing.

Awards and Scholarships:

2001-2002  Ford Foundation Doctoral Scholarships Honorable Mention  
1999-2001  Utah State University Graduate School Martin Luther King, Jr. Scholarship for Minorities  
1999-2000  Utah State University Graduate School President’s Fellowship

Professional Memberships:

American Psychological Association  
International Society for Traumatic Stress Studies  
Utah Psychological Association  
Position: Campus Representative, 1999 – 2000

Clinical Experience:
Psychology Resident Intern

Department of Psychology, Veterans Affairs Healthcare System
Long Beach, CA
Director of Training: Kenneth Cole, Ph.D.

Rotations:

Post-Traumatic Stress Disorder (PTSD) Team
Supervisor: John Huang, Ph.D.
Responsibilities: Conduct diagnostic intake interviews addressing adjustment and/or PTSD symptoms; provide individual therapy; co-facilitate marital and/or group therapy; teach self-care techniques (e.g., relaxation and mindfulness); collaborate with inter-disciplinary service and research team; coordinate with additional VA services.

Women’s Mental Health Clinic
Supervisor: Lori Katz, Ph.D.
Responsibilities: Conduct diagnostic intake interviews with female veterans; addressing trauma; provide individual therapy with emphasis on re-processing; co-facilitate group therapy within specialized women’s military sexual trauma program; teach self-care techniques; work closely with interdisciplinary service team and outside agencies.

HIV, Oncology, Hospice Service
Supervisor: Adrienne House, Ph.D.
Responsibilities: Conduct psychological evaluations for organ transplant program; provide individual and/or family therapy with focus on coping, treatment adherence, and end-of-life issues; provide consultation in interdisciplinary service teams.

Substance Abuse Treatment Center
Supervisor: Hank Benedict, Ph.D.
Responsibilities: Conduct diagnostic intake interviews addressing substance abuse issues; provide individual therapy; co-facilitate treatment groups, including initiating a women’s substance abuse group; address secondary diagnoses; provide consultation.

Evaluation Psychology
Supervisor: Kenneth Cole, Ph.D.
Responsibilities: Conduct diagnostic intake interviews addressing range of concerns and symptoms; provide long-term individual or couples therapy; facilitate acceptance and commitment therapy group (ACT); provide consultation to referring providers.
05/2004 - 12/2004
Student Therapist
Community Clinic, Department of Psychology
Utah State University, Logan, UT.
Supervisor: Carolyn Barcus, Ed.D.
Responsibilities: Conduct diagnostic interviews, provide individual therapy to adults with pain, PTSD, histories of neglect and/or abuse.

01/2004 - 04/2004
Clinical Research Therapist
Community Clinic, Department of Psychology
Utah State University, Logan, UT.
Supervisors: M. Scott DeBerard, Ph.D., & Susan Crowley, Ph.D.
Responsibilities: Co-facilitate groups in fibromyalgia pain management study; deliver interventions including relaxation techniques, anger management, and communication.

09/2003 - 04/2004
Student Therapist
Counseling Practicum, Student Counseling Center
Utah State University, Logan, UT.
Supervisor: Mark Nafziger, Ph.D.
Responsibilities: Conduct assessments, intakes, and individual therapy with students; contribute to treatment team; participate in multicultural outreach opportunities.

09/2003 - 04/2004
Student Therapist
Health Psychology Clinical Practicum, Cardiac Rehabilitation
Brigham City Hospital, Brigham City, UT.
Supervisor: Kevin Masters, Ph.D.
Responsibilities: Conduct assessments and therapy as part of multidisciplinary team in medical setting; provide classes on stress and coping, focused on cardiovascular health.

09/2002 - 05/2004
Student Therapist
School Practicum, Community Clinic, Department of Psychology
Utah State University, Logan, UT.
Supervisor: Gretchen Gimpel Peacock, Ph.D.
Responsibilities: Conduct diagnostic interviews with children and parents; provide interventions with children and their parents; conduct disability evaluations.
09/2002 - 06/2003 Neuropsychological Technician.  
*Cache County Study on Memory in Aging, Center for Epidemiological Studies*  
Utah State University, Logan, UT.  
Supervisor: JoAnn Tschanz, Ph.D.  
Responsibilities: Administer neuropsychological battery to older adults, provide case summaries; and attend diagnostic case conferences.

10/2001 - 4/2002 Clinical and Research Asst. in Health Psychology  
*Department of Health, Physical Education, and Recreation*  
Utah State University, Logan, UT.  
Supervisors: Edward Heath, Ph.D. and Kevin Masters, Ph.D.  
Responsibilities: Provide psychosocial and behavioral interventions to facilitate adherence to exercise and lifestyle change programs; conduct physiological testing.

10/2000 - 05/2001 Student Therapist  
*Community Clinic, Department of Psychology*  
Utah State University, Logan, UT.  
Supervisor: David Stein, Ph.D.  
Responsibilities: Conduct diagnostic interviews and provide therapy with adolescent females and parents addressing eating disorders, body image, and developmental issues.

01/2000 - 05/2002 Student Therapist  
*Community Clinic, Department of Psychology*  
Utah State University, Logan, UT.  
Supervisor: Susan Crowley, Ph.D.  
Responsibilities: Conduct diagnostic interviews and provide therapy: focus on multicultural students, multimodal interventions for suicide and depression.

**Research Experience:**

05/2004 Developmental Assessment Research Consultant  
*Early Intervention Research Institute*  
Utah State University, Logan, UT.  
Supervisor: Mark Innocenti, Ph.D.  
Responsibilities: Administer new battery for screening children (ages 3 and 4) with variety of developmental delays and range of severity; evaluate utility of battery.
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<tr>
<th>Date</th>
<th>Position</th>
<th>Institution/Program</th>
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<tr>
<td>10/2001 - 5/2002</td>
<td>Project Manager</td>
<td>Utah State University – Faculty and Staff Wellness Center</td>
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<tr>
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<td><em>Department of Health, Physical Activity, and Recreation</em></td>
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<td>Utah State University, Logan, UT.</td>
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<td>Supervisor: Edward Heath, Ph.D.</td>
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<td>Responsibilities: Conduct recruitment, assessment, and preliminary analyses of exercise adherence program; evaluate physical fitness assessment protocol.</td>
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<tr>
<td>05/2001 - 09/2001</td>
<td>Project Manager</td>
<td>Penn. State University - Minority Internship Research Training Program</td>
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<td><em>Department of Bio-behavioral Health</em></td>
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<td>Penn. State University and University of Dakar, Senegal</td>
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<td>Supervisor: Gary King, Ph.D.</td>
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<td>Responsibilities: Collaborate with Senegalese team in pilot research on tobacco use as part of multi-site World Health; supervise team of American research assistants.</td>
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<tr>
<td>09/2000 - 05/2001</td>
<td>Research Assistant - Project Manager</td>
<td>Department of Psychology,</td>
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<td>Utah State University, Logan, UT.</td>
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<td>Supervisor: Kevin Masters, Ph.D.</td>
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<tr>
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<td>Responsibilities: Coordinate multi-site study with approx. 200 participants funded by National Institute on Aging; conduct lab sessions; supervise team of research assistants.</td>
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<tr>
<td>April 2001</td>
<td>Research Assistant</td>
<td>Department of Health, Physical Activity, and Recreation</td>
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<td>Utah State University, Logan, UT.</td>
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<td>Supervisor: Edward Heath, Ph.D.</td>
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<td>Responsibilities: Evaluate validity, reliability, and applicability of physical activity assessments (SOFIT and BEST) designed for use by elementary school professionals.</td>
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**Publications:**


**Presentations:**


**Teaching Experience:**

01/2005 - 8/2005  
Instructor  
Abnormal Psychology  
*Department of Psychology*  
Utah State University, Logan, UT.  
Responsibilities: Develop and deliver curriculum for approx. 80 students; create lectures, exams, group projects and grading scheme; supervise assistants. (2x)

09/2002 - 12/2004  
Instructor  
History and Systems of Psychology  
*Department of Distance Education*  
Utah State University, Logan, UT.  
Responsibilities: Develop and deliver satellite curriculum for approx. 110 students; create lectures, exams, and grading scheme; address academic dishonesty. (2x)

Instructor  
Yoga  

Department of Health, Physical Education, and Recreation  
Utah State University, Logan, UT.  

Responsibilities: Develop and deliver curriculum for 1h and 1 ½h yoga classes for approx. 30 beginning and continuing students; create group projects; grading. (6x)