The Impact of Yoga on Psychological Health in Older Adults

Kimberlee Bethany Bonura
THE FLORIDA STATE UNIVERSITY
COLLEGE OF EDUCATION

THE IMPACT OF YOGA
ON PSYCHOLOGICAL HEALTH IN OLDER ADULTS

By

KIMBERLEE BETHANY BONURA

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The members of the Committee approve the dissertation of Kimberlee Bethany Bonura defended on April 24, 2007

Gershon Tenenbaum
Professor Directing Dissertation

Neil Charness
Outside Committee Member

F. Donald Kelly
Committee Member

Robert Eklund
Committee Member

Approved:

Gary Peterson, Chair, Department of Educational Psychology and Learning Systems

The Office of Graduate Studies has verified and approved the above named committee members.
For my mother, Sandra Hoirup Bethany, who always believes in me, and who always believed this was possible.

and

In memory of my grandparents, Adrian Boyum and Edna Hoirup Boyum.
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Currently, 17% of individuals over age 50, and 6% of individuals over age 65, have tried mind-body therapies (Wolsko et al., 2004); 16.5% of yoga practitioners are age 54 or older (Saper et al., 2004). National survey data indicates a large portion of mind-body therapy users implement these practices for the management of disorders, which are either psychological or psychosomatic. Among yoga practitioners, 63.7% reported implementing yoga techniques for wellness and preventative benefits, and 47.9% reported implementing yoga techniques for the management of specific health conditions. Because increasing numbers of older adults are engaged in yoga, it is important to understand how yoga impacts this population. We studied the impact of a six-week yoga intervention on the psychological health of senior citizens. Older adults ($N = 98$; Mean age = 77.04, $SD = 7.28$) were randomly assigned to 3 groups: Chair Yoga, Chair Exercise, and no-treatment control group. Classes were held for 45-minute weekly sessions, over six weeks, and daily home practice was supported. All participants were assessed pre-intervention, post-intervention, and at one-month follow-up for anger, anxiety, depression, well-being, general self-efficacy, and self-efficacy for daily living. Time by group interactions were significant for all trait variables. Yoga participants improved more than both exercise and control participants, in anger ($ES = 1.01$, 0.12, and 0.11 respectively, from pretest to posttest; and 0.89, -0.01, and 0.17 from pretest to follow-up), anxiety ($ES = 0.58$, 0.31, 0.18, and 0.89, 0.28, 0.27), depression ($ES = 0.53$, 0.07, 0.05, and 0.54, 0.01, 0.04), well-being ($ES = 0.49$, 0.36, 0.01, and 0.53, 0.28, -0.08), general self-efficacy ($ES = 0.98$, 0.35, -0.12, and 0.73, 0.43, -0.12), and self-efficacy for daily living ($ES = 0.87$, 0.35, 0.07, and 0.51, 0.24, 0.09). Changes in self-control were associated with changes in general self-efficacy and trait anxiety. Self-control is proposed as a mechanism underlying the impact of yoga on psychological health.
INTRODUCTION

In national surveys, 7.5% of individuals reported having tried yoga at least once (Saper, Eisenberg, Davis, Culpepper, & Phillips, 2004). Within the past 12 months, 7.0% of participants had used meditation and 3.7% had used physical yoga techniques (Wolsko, Eisenberg, Davis, & Phillips, 2004). National survey data indicates that a large portion of mind-body therapy users implement these practices, at least in part, for the management of disorders, which are either psychological or psychosomatic (Wolsko et al.). For instance, 34% of respondents with anxiety spectrum disorders reported using mind-body therapies in the management of their condition. Similarly, mind-body therapies were used in the management of symptoms for 26.5% of respondents with depression; 19.5% with chronic pain unrelated to headaches, neck, back, or chest pain; 18.5% with headaches; 18% with back or neck pain; 18% with heart problems or chest pain; 13.3% with insomnia; and 12.1% with fatigue. Other respondents indicated use of mind-body therapies in managing symptoms of dermatological conditions, weight problems, high blood pressure, and menstrual conditions, among other health problems. Wolsko et al. estimated that at least 6 million Americans use mind-body therapies for the management of anxiety symptoms, and that at least 11 million Americans use mind-body therapies for the management of chronic back or neck pain. Among yoga practitioners, 63.7% reported implementing yoga techniques for wellness and preventative benefits; 47.9% reported implementing yoga techniques for the management of specific health conditions (Saper et al.). Because “people can participate in meditation without feeling they are patients” (Murray, 1982, p. 108), Murray suggested that individuals may use yoga and meditation techniques, rather than seek medical treatment for psychological distress.

However, while many yoga practitioners are implementing these techniques specifically to address physical and psychological health issues, a comprehensive understanding of the benefits of yoga practice for health is lacking. A few literature reviews have been conducted concerning the efficacy of yoga. For instance, see Jayasinghe’s review of yoga’s role in cardiac health (2004), Raub’s review of the effects of yoga on musculoskeletal and cardiopulmonary function (2002); Brown and Gerbarg’s (2005) two-part review of Sudarshan kriya yoga; and Bower, Woolery, Sternlieb, and Garet’s (2005) review of yoga for cancer patients. Yoga has also
been included as a technique in reviews of treatment protocols for specific medical conditions (for instance, Elder’s 2004 review of Ayurvedic techniques for diabetes care; Frumkin, Nathan, Prout, & Cohen’s 1978 review of nonpharmacologic control of hypertension; and Gerritsen et al.’s 2002 review of carpal tunnel syndrome treatments). However, in spite of the prevalent usage of yoga as a tool for promoting wellness and psychological health, a comprehensive review of the research literature investigating yoga’s effectiveness has not been undertaken, nor has any review surveyed the body of research on yoga’s psychological effects. Because of the increasing popularity of mindful exercise, its potential effectiveness, and the lack of solid empirical support, Netz and Lidor (2003) concluded that further research is needed to evaluate the “contribution of [mindful] activities to the body and mind” (p. 416).

While the potential effects of yoga practice have been noted, this has not been sufficiently examined in older adults. This may be of consequence because older adults are particularly prone to psychological distress. Issues of aging, including functional impairments, lifestyle changes, social isolation due to retirement, and the loss of spouses and friends, can all contribute to impaired psychological functioning. The National Institute of Mental Health (U.S. Department of Health and Human Services, 2006) reported that approximately 18% of the population suffers from an anxiety disorder at any particular time. Furthermore, while the National Institute of Mental Health reports that only 6% of women and 3% of men suffer from depression, depressive symptoms are reported by approximately 15% of the older population (Koenig & Blazer, 1992). An estimated 20% of senior citizens experience a mental health problem (Winerman, 2006).

According to the U.S. Census Bureau (U.S. Department of Commerce, 2005), individuals age 65 years and older currently comprise 12.3% of the population, and are expected to constitute 25% of the population by 2050 (Winerman, 2006). As the percentage of older adults in the United States continues to increase, exercise research focusing on the elderly population is merited. According to the National Institute of Aging (NIA) Financial Year 2005 Justification (U.S. Department of Health and Human Services), “79% of people age 70 and older have at least one of seven potentially disabling chronic conditions. The burden of such chronic conditions is felt not only by individuals but also by families, employers, and the health care system” (p. 12). Therefore, practices that increase the health of older adults are important for the fiscal and overall well-being of the individual and of the nation. The NIA Justification further indicates that
“aging itself is not the cause of disease, disability, and frailty” (p. 6) and encourages research which will further illuminate how to prevent disease and maintain health and functional independence into old age.

Currently, 17% of individuals over age 50, and 6% of individuals over age 65, have tried mind-body therapies (Wolsko et al., 2004), and 16.5% of yoga practitioners are age 54 or older (Saper et al., 2004). Therefore, because this growing population may be prone to psychological distress, and because increasing portions of this population are trying mind-body fitness practices such as yoga, it is important to better understand how mind-body therapies, such as yoga, operate within the population of older adults. Although a few previous studies have investigated yoga’s impact on older adults (for instance, Allen & Steinkohl, 1987; Haber, 1988), these have utilized small samples with qualitative and anecdotal descriptions of effects. Yoga classes can be implemented in community-based settings to large numbers of individuals at low cost. They are free from the stigma of medical care (Murray, 1982), and therefore, offer the potential of providing affordable preventative mental health care to large numbers of older adults. Thus, further investigation of yoga’s impact on the psychological health of older adults is warranted.

More specifically, the potential benefits of yoga in the older population must be empirically investigated.

The purpose of this research project is three-fold. First, to review the impact of exercise interventions on psychological health in older adults, and provides a rationale for investigation of yoga as a protocol for promoting psychological health in older adults. Second, to provide a comprehensive review of the body of yoga research, which highlights the strengths and weaknesses of a yoga intervention for health and wellness purposes. Finally, to present the results of empirical investigation concerning the impact of yoga on psychological health in older adults and proposes cognitive-behavioral theory as a framework within which to understand the mechanisms of yoga.
Research indicates that regular physical activity improves physical health, reduces the rate of premature mortality, and decreases the likelihood of numerous diseases, including coronary heart disease, hypertension, colon cancer, and diabetes mellitus (U.S. Department of Health and Human Services, 1996). Physical activity also promotes psychological functioning and well-being across populations (see Salmon, 2000 for review). Regular physical activity reduces symptoms of anxiety and depression (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Ross & Hayes, 1988; Stephens & Craig, 1990), and lowers participants’ stress levels (Berger 1994).

Evans (1999) proposed that older adults benefit from regular exercise more than any other age group. The low functional independence and high rate of chronic disease so typical of older adults can be dramatically influenced by regular exercise. Evidence indicates that exercise can decrease the risk of developing disease and may even help to stop or reverse the progression of certain disease conditions (Blumberg, Kenney, Seals, & Spina, 1992). Physically active adults over age 65 are twice as likely to die without disability as are older sedentary adults (Ferrucci et al., 1999; Leveille, Guralnik, Ferrucci, & Langlois, 1999). These findings indicate higher quality of life in the years approaching death. In addition to the well-documented physical health benefits of regular exercise, physical activity is associated with a variety of psychological variables, including mood, stress reactivity, and cognitive functioning.

While exercise often leads to improvements in physical fitness, such changes are not prerequisites for improved psychological well-being. For instance, a meta-analysis of The Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT; Schechtman & Ory, 2001) found that increases in quality of life due to exercise among frail elderly individuals were independent of changes in physical functioning. McAuley and Rudolph (1995) observed that improvements in cardiorespiratory fitness, and improvements in psychological well-being, though both attributable to physical activity, were not necessarily correlated. Older adults may feel better and improve their sense of well-being, even in the absence of improved physical fitness.
Physical Activity and Psychological Functioning in Older Adults

In a meta-analysis of research investigating the impact of physical activity on psychological functioning in older adults, Netz, Wu, Becker, and Tenenbaum (2005) identified eleven categories of psychological effects. These are: anger, anxiety (including stress and tension), confusion, depression, positive affect, view of self, self-efficacy (including self-efficacy for exercise or physical tasks), physical symptoms, energy, overall well-being, and life-satisfaction. Weighted effect sizes for treatment (i.e., exercise) groups varied tremendously, based on the variable of interest, ranging from $ES = 0.08$ for life satisfaction to $ES = 0.63$ for physical symptoms. Weighted effect sizes for the remaining variables were: anger, $ES = 0.29$, anxiety, $ES = 0.23$, confusion, $ES = 0.15$, depression, $ES = 0.29$, energy, $ES = 0.18$, overall well-being, $ES = 0.37$, positive affect, $ES = 0.28$, self-efficacy, $ES = 0.38$, and view of self, $ES = 0.16$. It is evident from these results that the impact of exercise on psychological health in older adults is multifaceted and complex, and that certain components of psychological health demonstrate greater potential for change due to exercise intervention. This investigation will focus on those aspects of psychological health with higher likelihood of change due to physical activity; specifically, anger, anxiety, depression, well-being, physical symptoms, positive affect, and self-efficacy.

**Anger, Anxiety, and Depression**

Anger, anxiety, and depression may be particularly relevant to an older adult population, because researchers have identified the connection between these emotions and the experience of pain (Fernandez, 2002). Furthermore, anger has been related to chronic medical disorders of concern for an older adult population, such as hypertension (Spielberger, 1999). The potential of exercise to reduce the effects of depression is a particularly critical issue within the elderly population, because depression has been identified as one of the two most common psychological impairments of advanced age (along with cognitive impairment) (Hagestad, 1987). In fact, while the National Institute of Health reports that 6% of women and 3% of men suffer from depression, depressive symptoms are reported by approximately 15% of the older population (Koenig & Blazer, 1992). In addition, depression may be exacerbated by dementia, putting many elderly individuals at greater risk (DSM-IV-TR). Management of anxiety is especially important to an older adult population, because, according to Seaward (1997), between 70% - 80% of modern illnesses are stress-related. In fact, some research indicates that
90% of doctor’s visits are for stress-related ailments (Bried, 2004). Stress is often found to be related to common minor illnesses, such as colds, flu, and canker/cold sores (Cohen & Williamson, 1991). Extensive stress over long periods of time may lead to problems with major illnesses such as high blood pressure, coronary heart disease, and even vulnerability to cancer (Blascovich & Katkin, 1993; Seaward, Sternfeld, 1992). If physical activity reduces stress levels in older adults, then it may potentially reduce the impact of stress-related medical disorders.

Regular physical exercise reduces symptoms of anxiety and depression (Camacho et al., 1991; Ross & Hayes, 1988; Stephens & Craig, 1990). For instance, in one Finnish study, physically active individuals and lifelong exercisers over age 65 reported fewer depressive symptoms than sedentary individuals, over an 8-year period (Lampinen & Heikkinen, 2002). In clinical populations, exercise reduced state anxiety, trait anxiety, and physiological correlates of anxiety, including blood pressure (Martinsen, Hoffart, & Solberg, 1989; O’Connor, Raglin, & Martinsen, 2000; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). Non-clinical populations also benefit from anxiety reduction in response to exercise. Krause, Goldenhar, Liang, Jay, et al. (1993) surveyed 2,200 adults over age 60 in Japan, and reported that those who exercised frequently had lower levels of stress and psychological distress than non-exercisers. King, Taylor, and Haskell (1993) stated that exercise significantly reduced stress in older adults, especially in those who had smoking habits, regardless of changes in fitness or body weight.

Well-Being and Positive Affect

Netz and Jacob (1994) reported that elderly adults who became involved in physical activity improved in happiness and well-being. In one study, physically fit women with a mean age of 64.5 years showed immediate improvements in global mood after a 75-minute session of aerobic dance (Pierce & Pate, 1994). When Hills and Argyle (1998) asked 275 individuals between the ages of 18 and 82 to rate their happiness during four leisure tasks (sport/exercise, music, church and watching TV soaps), only sport/exercise was found to actually increase happiness levels. Therefore, physical activity has benefits beyond mere recreation, for increasing well-being and positive mood.

Physiological Arousal

Physical activity can impact many physical symptoms which are related to psychological condition; for instance, hypertension (U.S. Department of Health and Human Services, 1996), central nervous system functioning (Chodzko-Zajko & Moore, 1994; Taylor, 1992).
neurotransmitter functioning (Bauer, Rogers, Miller, Bove, & Tyce, 1989), and sleep disturbance (King, Oman, Brassington, Bliwise, & Haskell, 1997). For the purposes of this investigation, physical symptoms were assessed as physiological arousal, rather than the specific characteristics relevant to a particular disorder. While previous researchers have investigated the impact of yoga on physiological measures such as brain wave patterns (Corby, Roth, Zarcone, & Kopell, 1978; Dostálek, 1970, 1979; Elson, Hauri, & Cunis, 1977; Lou et al., 1999; Roldán & Dostálek, 1985; Roldán, Los, Dostálek, & Bohdanecký, 1983; Yamazaki, Mitsuhashi, & Yamada, 1987), body temperature (Benson et al., 1982), and sensory perceptions (Telles, Nagarathna, & Nagendra, 1995; Telles & Naveen, 2004), this has not been investigated with older adults.

**Self-Efficacy**

Exercise may improve self-efficacy due to its capacity to increase the individual’s sense of personal control. While many older adults feel a loss of control over their independence and functional ability, older adults who exercise on a regular basis may feel greater control over their physical bodies and abilities (see Berger, Pargman, & Weinberg, 2002 for a review). Older adults who exercise may also have greater control over their bodies, which can therefore help to maintain self-efficacy for activities of daily living. Unger, Johnson, and Marks (1997) found in a 6-year follow-up of 7,527 respondents over age 70 that physical activity had independent effects in protecting older adults from declines in functional ability, and was particularly effective in buffering the negative effects of widowhood on physical functioning. However, regardless of actual functioning, exercise can improve self-efficacy for movement tasks. Daltroy, Larson, Eaton, Phillips, and Liang (1999) assessed 289 community-dwelling elderly (aged 65 – 97) and compared self-reports of physical functioning with objective assessments of the performance and performance ability (made by trained observers). Controlling for actual physical capacity, lack of exercise contributed to self-reports of greater disability. Mihalko (1997) reported similar results. When older adults participated in a 12-week strength-training program, participants showed significant increases in muscular strength, efficacy perceptions relative to strength capabilities, and improvements in measures of activities of daily living. Perceptions of control and self-efficacy were significantly related to improved self-reports of activities of daily living, independent of strength or balance changes.

The meta-analysis by Netz et al. (2005) revealed benefits of exercise across exercise mode. They reported that “the studies published in the literature did not allow us to estimate
effects pertaining to the minimum time, intensity, and mode of exercise needed to achieve meaningful psychological effect for exercise engagement in the elderly” (p. 282). They concluded that there is a need for further research which investigates the impact of specific forms of exercise on psychological health in elderly individuals, especially “the ones which link psychological benefits to well-being in the absence of physical benefit, but gain in mental benefits (e.g., Feldenkrais, Yoga, or Pilates)” (p. 282).

Moving From Fitness to Mindful Fitness

While much exercise research involves aerobic forms of exercise – particularly noncompetitive, highly predictable, moderate intensity exercise performed for short periods of time – the beneficial effects of exercise are not restricted to aerobic forms (Berger & Owen, 1992). A limited body of research indicates that “mindful exercise,” including yoga, gentle martial arts (such as Tai Chi and Qi Gong), and Eastern-influenced modern exercise forms, such as Pilates, Feldenkrais, and the Alexander technique, improve both physical and psychological health. Research indicates that yoga may be an effective treatment for many normal and abnormal phenomena, including asthma (Nagendra & Nagarathna, 1986), obsessive-compulsive disorder (Shannahoff-Khalsa, 2003; Shannahoff-Khalsa & Beckett, 1996), heart attack prevention (Shannahoff-Khalsa, Sramek, Kennel, & Jamieson, 2004), healthy pregnancy (i.e., improving birth weight and decreasing preterm labor; Narendran, Nagarathna, Narendran, Gunashela, & Nagendra, 2005), irritable bowel syndrome (Taneja et al., 2004), and low back pain (Williams, Petronis, Smith, Goodrich, Wu, Ravi, Doyle, Juckett, Kolar, Gross, & Steinberg, 2005). Berger and Owen observed greater decreases in scores on anger, confusion, tension, and depression among swimming and yoga participants than among control subjects. For male subjects, yoga was even more effective than swimming in reducing anger, confusion, and tension. Netz and Lidor (2003) noted improvements in mood (state anxiety, depressive mood, and subjective well-being) after just one session of yoga, Feldenkrais, or swimming, when compared to an aerobics group and a computer (control) group.

Research with dance students found that yoga and meditation were associated with psychological benefits (Elkins, 2003; West, Otte, Geher, Johnson, & Mohr, 2004). Furthermore, when medical school students practiced mindfulness-based relaxation protocols during exam period, overall psychological distress decreased (Shapiro, Schwartz, & Bonner, 1998). Yoga improves mood and reduces depression (Woolery, Myers, Sternlieb, & Zeltzer, 2004). A meta-
analysis by Eppley, Abrams, and Shear (1989) found that relaxation techniques, including meditation, were effective in reducing anxiety. Particularly relevant to older individuals, psychiatrist Kabat-Zinn and colleagues found evidence that mindfulness techniques may work as pain management strategies (Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellers, 1987; Kabat-Zinn et al., 1992). Yoga practice may even have the capacity to extend the lifespan; in one study with elderly individuals, the 36 month survival rate for Transcendental Meditation (TM) and Mindfulness training participants was 100% and 87.5% respectively, as compared to 65% for a relaxation group, 77.3% for a no treatment group, and 62.6% for the remaining individuals in the senior living facilities (Alexander, Langer, Newman, Chandler, & Davies, 1989).

Although aerobic exercise improves psychological health (Martinsen et al., 1989; O’Connor et al., 2000; Petruzzello et al., 1991), yoga theory suggests that yoga, as an integrated program of mind and body fitness, holds an even greater potential for improving well-being. According to renowned yoga teacher Baron Baptiste (2002):

Yoga works for so many people where fitness and therapeutic methods have failed because the results from yoga are immediate, fueling your motivation to continue. You don’t need to wait weeks before seeing and feeling positive results. From your very first practice session, you experience shifts energetically, muscularly, mentally, and emotionally. Your muscles tingle from head to toe, your blood is flowing, your mind is clear, your spirit is revived, you are full of stamina and breath; you feel alive (p. 50). Baptiste indicates that yoga is inherently different than exercise, in that it is a comprehensive system, and that this integration is the source of the benefits of yoga:

In traditional fitness, we tend to break up the components of strength, flexibility, stamina, and cardiovascular training into their own levels of importance based on our goals, and put relaxation, meditation, and our psychology in some other category with the stuff in our lives that we would do if we had time. I liken this approach to baking a cake: You have all the ingredients you need – flour, sugar, eggs, milk, and so on – yet you never mix them. If you were a guest at my home, I wouldn’t serve you just a cup of flour! In yoga we blend all the key ingredients into what I call global training, which means to train the whole person (p. 49 – 50).

According to Walsh and Shapiro (2006), an attempt to understand mindful practices, such as
yoga, by placing them in conventional categories can be problematic and lead to simplistic and inaccurate explanations. Placing mindful practices in conventional Western categories such as relaxation or exercise “overlooks much of the richness and uniqueness of the meditative disciplines and the valuable complementary perspectives they offer” (p. 228). While many people utilize yoga for exercise purposes, and while yoga may provide some of the same benefits as other forms of physical activity and exercise, it is proposed that yoga is more than mere exercise. Therefore, further research is needed to determine whether an integrated yoga program has a greater (or different) impact on psychological health than exercise alone.

The Effects of Yoga on Psychological Health and Well-Being: A Comprehensive Literature Review

Data from a Harvard Medical School survey about the general health practices of Americans indicated “an estimated 15.0 million American adults had used yoga at least once in their lifetime, and 7.4 million during the previous year” (Saper et al., 2004, p.44). Saper et al. reported that most individuals used yoga for wellness and for specific health conditions, and that yoga was perceived as helpful. In spite of the fact that many individuals utilize yoga for health and wellness reasons, there is a lack of solid empirical support for the beneficial effects of yoga on physical and psychological health. A comprehensive literature search of the PsychINFO database (from 1887 to present) retrieved 363 articles, of which only 215 were from peer-reviewed journals. A comprehensive MEDLINE search (from 1965 to present) resulted in 274 articles (180 peer-reviewed), and a Physical Education Index search (from 1970 to present) found 206 articles (35 peer-reviewed). Many of the articles were either duplicates or irrelevant hits, and a final sort left 239 peer-reviewed articles, which addressed yoga in some way. However, many of these articles were theoretical, qualitative, or correlational in nature, and therefore claims of yoga’s potential effectiveness as an intervention must be interpreted cautiously.

National survey data indicates that a large portion of mind-body therapy users implement these practices, at least in part, for the management of disorders, which are either psychological or psychosomatic (Wolsko et al., 2004). For instance, 34% of respondents with anxiety spectrum disorders reported using mind-body therapies in the management of their condition. Similarly, mind-body therapies were used in the management of symptoms for 26.5% of respondents with depression; 19.5% of respondents with chronic pain unrelated to headaches, neck, back, or chest
pain; 18.5% of respondents with headaches; 18% of respondents with back or neck pain; 18% of respondents with heart problems or chest pain; 13.3% of respondents with insomnia; and 12.1% of respondents with fatigue. Other respondents indicated use of mind-body therapies in managing symptoms of dermatological conditions, weight problems, high blood pressure, and menstrual conditions, among other health problems. Wolsko et al. estimated that at least 6 million Americans use mind-body therapies for the management of anxiety symptoms, and that at least 11 million Americans use mind-body therapies for the management of chronic back or neck pain. Among yoga practitioners, 63.7% reported implementing yoga techniques for wellness and preventative benefits; 47.9% reported implementing yoga techniques for the management of specific health conditions (Saper et al., 2004).

Because of the increasing popularity of mindful exercise, its potential effectiveness, and the lack of solid empirical support, Netz and Lidor (2003) concluded that further research is needed to evaluate the “contribution of [mindful] activities to the body and mind” (p. 416). A few literature reviews have been conducted concerning the efficacy of yoga. For instance, see Jayasinghe’s review of yoga’s role in cardiac health (2004), Raub’s review of yoga’s effects on musculoskeletal and cardiopulmonary function (2002); Brown and Gerbarg’s (2005) two-part review of Sudarshan kriya yoga; or Bower, Woolery, Sternlieb, and Garet’s (2005) review of yoga for cancer patients. Yoga has also been included as a technique in reviews of treatment protocols for specific medical conditions (for instance, Elder’s 2004 review of Ayurvedic techniques for diabetes care; Frumkin, Nathan, Prout, & Cohen’s 1978 review of nonpharmacologic control of hypertension; and Gerritsen et al.’s 2002 review of carpal tunnel syndrome treatments). However, in spite of the prevalent usage of yoga as a tool for promoting wellness and psychological health, a comprehensive review of the research literature investigating yoga’s effectiveness has not been undertaken, nor has any review surveyed the body of research on yoga’s psychological effects. Therefore, the purpose of this work is (a) to review yoga history and theory, which may be used to explain the underlying mechanisms of physical and mental health in yoga practitioners; (b) to review the body of peer-reviewed yoga research; and then (c) to suggest future directions for the field of yoga research.

**Yoga History**

The practice of yoga originated in India over 5000 years ago; archeological excavations in the Indus valley yielded “stone seals showing figures in yogic postures” (Sivananda Yoga
Centre, p. 13), which were dated at 3000 BC. The first written mention of yoga comes from portions of the Hindu *Vedas* dated approximately 2500 BC (Sivananda Yoga Centre). *The Mahabharata*, a sixth century BC epic poem written by Vyasa, contains the *Bhagavad-Gita*. In this scripture, which is considered by many to be the authority on yoga philosophy (Iyengar, 1966), Lord Krishna instructs the warrior Arjuna in the practice of yoga – “how to achieve liberation by fulfilling one’s duties in life” (Sivananda Yoga Centre, p. 14 – 15).

Sometime between the sixth century BC and first century AD, Pantanjali penned the *Yoga Sutras*, 196 aphorisms which have defined the modern practice of yoga. Sources disagree as to exactly when Pantanjali produced this classical yoga text; Bower et al. (2005) indicate 2000 years ago; Sivananda Yoga Centre (1983) cites third century BC; MSI (1995) states fifth or sixth century BC. The physical discipline of yoga, which came to be called “Hatha Yoga” (literally “sun-moon” yoga), was outlined further by Swatmarama in the third century BC text, *Hatha Yoga Pradipika* (Iyengar, 1966; Sivananda Yoga Centre).

Yoga’s first influence on the western world was likely through the American transcendentalists, including Ralph Waldo Emerson and Henry David Thoreau (who kept a copy of the *Bhagavad-Gita* in his cabin on Walden Pond), although it is unlikely that they practiced physical yoga (Stearn, 1965). Swami Vivekananda brought the physical practice of yoga to the US in 1893 for the Parliament of Religions in Chicago, under the direction of his guru (teacher) Ramakrishna. In 1920, Paramahansa Yogananda came to Boston from India, and brought yoga to thousands of Americans (Yogananda, 1946). Other early yoga teachers came from India to the Western world to teach yoga, including Krishnamurti, who taught Jnana-Yoga, Maharishi Mahesh Yogi, who popularized Transcendental Meditation (TM), and Yogi Bhajan, who shared Kundalini Yoga. Indian Hatha yoga master Sri T. Krishnamacharya had three students who each developed their own styles of yoga, based on their experiences under and training by Krishnamacharya. These three styles (Iyengar yoga, from BKS Iyengar; Viniyoga, from TKV Desikachar; and Ashtanga yoga, from Pattabhi Jois) have since become standard and have influenced further new styles of yoga. Yoga reached the attention of the academic world quickly, and was the center of a series of lectures by Carl Jung in 1932. The practice of yoga became much more popular in the Western hemisphere during the 1960s, and current trends (including media focus and the use of yoga by celebrities such as Madonna, Sting, and the Philadelphia
Eagles National Football League team) have further spread its influence in the past 40 years (Saper, et al., 2004).

**Yoga Theory**

The Sanskrit word “yoga” comes from the root “yuj” and has been translated as “to bind, join, attach and yoke, to direct and concentrate one’s attention on, to use and apply” (Iyengar, 1966, p. 19), “joining” (Sivananda Yoga Centre, 1983 p. 15), “yoke,” “unity,” “discipline,” or “effort” (Payne & Usatine, 2002, p.5). The most common understanding of the word yoga is “union” (Raub, 2002, p.797) and at its core, the purpose of yoga, is to cultivate a sense of unity – both a “union of the mind with the divine intelligence of the universe” (Raub, p.797) and a sense of union within the individual. Yoga enables a holistic healing of the individual. The philosophy perceives the mind and body as an integrated unity, for which it is considered a mind-body science. “It teaches that, given the right tools and the right environment, the mind-body can find harmony and heal itself. … Yoga calms and relaxes the mind, strengthens and tunes the body, and brings them into harmony with one another” (Payne & Usatine, p. 4-5).

Historically, yoga teachers focused on theory rather than physical practice. Although seven of the *Bhagavad-Gita’s* eighteen chapters include “yoga” in the title, and the majority of the chapters discuss yoga in verse, the *Bhagavad-Gita* includes no mention of yoga as asana (physical postures; see the translation by Prabhavananda & Isherwood, 1944). It was in Pantanjali’s work that the first mention of asana (physical yoga) was made. As outlined by Pantanjali, yoga included eight limbs, or disciplines, including yamas (ethical disciplines), niyamas (individual observances), asana (postures), pranayama (breath control), pratyahara (withdrawal of senses), dharana (concentration) dhyana (meditation), and samadhi (self-realization or enlightenment). The eight limbs are “a progressive series of steps or disciplines which purify the body and mind, ultimately leading the yogi to enlightenment” (Sivananda Yoga Centre, p. 19). The focus on yoga theory required a physical yoga practice as a foundation. They “complement each other and form a single approach towards Liberation. As a mountaineer needs ladders, ropes, and crampons, as well as physical fitness and discipline to climb the icy peaks of the Himalayas, so does the Yoga aspirant need the knowledge and discipline of the Hatha yoga of Swatmarama to reach the heights of Raja yoga dealt with by Pantanjali” (Iyengar, 1966, p. 22-23).
Many yoga classes today currently focus on Hatha (physical) yoga to the exclusion of theory, but this need not be an obstacle for the modern yoga student. “[Asana] is a good place to start, and hopefully people will find a good teacher who can take them through the asanas and show them the more subtle aspects of awareness that relate to the postures. When that happens, yoga reveals itself to be a meditative discipline, and a way of gaining insight into the nature of the mind and reality” (Horrigan, 2004, p. 65). Many yoga master teachers believe that yoga practice must start with the physical postures, and that a student cannot build to the theory until the physical practice has been established.

K. Pattabhi Jois is fond of saying, ‘99% Practice and 1% Theory.’ I have grown to appreciate the depth of this simple statement. Only through practice may we taste the fruits of the yoga tree. Without it we are left to speculate or theorize. If one wants to know the qualities of any apple, it would do no good to draw diagrams and look at apples in a jar. But to bite into the fruit itself, one would gain an immediate experience of its essence” (Swenson, 1999, p. 6).

However, while yoga begins with physical practice, it is important that the yoga practitioner not stop with physical yoga. “Asanas are not the goal. They are a vehicle to access a deeper internal awareness” (Swenson, p. 7). The ultimate purpose of the physical yoga is to take the individual into the philosophy of yoga.

The essence of yoga is the development of awareness and self-control. A yoga practice ultimately teaches, through control of the body, that we have control of the mind. “As we improve our abilities of controlling the senses from wandering during practice, the subtle quality of concentration deepens. … In time, the practice moves further internally and refinement of concentration develops as our ability to remain present is enhanced” (Swenson, 1999, p.6). This development of self-control enables the individual to be freed from the pain and suffering inherent in life. “When the senses are stilled, when the mind is at rest, when the intellect wavers not – then, say the wise, is reached the highest stage. This steady control of the sense and mind has been defined as Yoga. He who attains it is free from delusion” (Iyengar, 1966, p. 20).

According to yoga philosophy, the delusion from which we suffer is “the illusion of time, space, and causation. It is only our own ignorance, our inability to discriminate between the real and unreal, that prevents us from realizing our true nature” (Sivananda Yoga Centre, 1983, p. 15). Through the development of yogic awareness, the yoga practitioner becomes more able to
separate reality from perception, truth from assumption. “Through regulation of practice, … personal insights begin to manifest. We become aware of what we put in our bodies, and how we interact with the world around us” (Swenson, p. 6). By becoming aware of how we interact with the world around us, the practice of yoga teaches us to improve upon those interactions. The individual learns to evaluate himself, rather than judge others, and to focus on self-growth, rather than attempts to change others. “The main focus is to look inward” (Swenson, p. 12). Through these shifts in awareness, the yoga practitioner gains both a greater perception of control and an ability to transform his life by transforming his self. “Yoga is a self-empowering process which instills within its practitioners a confidence and a deep internal knowledge of the subtle workings of our being, both subtle and gross” (Swenson, p. 14). Through this process, happiness and inner peace are ultimately cultivated.

While yoga has its roots in the Hindu religion, and while much of core yoga theory speaks to issues generally associated with religion (i.e., inner peace, understanding, awareness, union with self, union with a higher power), yoga is not a religion. “Nor even a philosophy – it is an extremely practical methodology for systematically expanding the conscious mind. … Yoga is the science for overcoming the self-destructive and limiting beliefs and internal programs that keep individual life bound to the experiences of the Waking State of Consciousness” (MSI, 1995, p. 2). Payne and Usatine (2002) consider yoga a “prescription for good health and stress management,” an art in which “the individual performer … breathes life into the form, making the expression his or her own and transforming the routine into an art,” and a science, “based on ancient observations, principles, and theories of the mind-body connection, many of which are now being discovered in medical research. Qualified teachers have passed down this precise knowledge to their students from one generation to the next” (p. 4). Iyengar (1966) considers yoga one of the “six orthodox systems of Indian philosophy” (p. 19). It is perhaps most accurate to say that yoga originated within the Hindu religion, became a philosophy and system all of its own, and now is a practice which is adaptable to the needs of the practitioner – yoga may be a religion, a philosophy, a science, a way of life, or simply a form of exercise.

Yoga Variations

While a traditional yoga practice would include a balance of all of the eight components as outlined by Pantanjali, modern yoga has evolved into different schools or styles. At present, the Yoga Alliance, a national organization of yoga teachers, lists 104 different styles of yoga,
each of which emphasizes different components or different combinations of the yoga disciplines. Generally, yoga in the United States focuses on asana, pranayama, dharana, and dhyana (respectively, physical postures, breath control, concentration, and meditation), and some U.S. yoga classes may focus entirely on asana, to the exclusion of all other components (Horrigan, 2004). As well, there are many variations within asana practice. More than 840,000 yoga postures have been identified, and of the 84 postures which are most common across schools of yoga, there are numerous variations (Raub 2002). Therefore, while all yoga practices are considered yoga, there are significant differences between the types. “Each of these approaches represents a distinct intervention, in the same way that psychodynamic, cognitive-behavioral, and interpersonal therapies each involve different approaches to psychotherapy” (Bower, et al., p. 166).

In addition to the differences across yoga styles, there are differences across yoga teachers. Although the Yoga Alliance is a national organization which upholds national training standards, and provides a registry of trained yoga instructors and yoga teacher training programs, there are currently no requirements for licensure as a yoga instructor at the state or national level. The 2002 report of the White House Commission on Complementary and Alternative Medicine (CAM; U.S. Department of Health and Human Services) included an investigation of yoga, its effectiveness, and the training standards proposed by Yoga Alliance. However, no national standards were established. Therefore, any individual may open a yoga studio or present oneself as a yoga teacher, even without training. The quality of yoga instruction may vary widely, from a self-proclaimed yoga teacher to a yoga teacher who has received training, undertaken supervised teaching experience, and achieved national certification and registration. These variations in instructional quality may impact the effectiveness of yoga interventions.

Finally, in addition to the differences in yoga style and quality of yoga instruction – yet related to each – is the location of the yoga intervention. There are marked differences in the yoga which is practiced at a yoga studio, a fitness center, and a medical center. Yoga teachers in each of these environments are likely to have undergone different levels and different types of training. Fitness center yoga teachers are often fitness instructors (aerobics, personal trainers, etc.) who have undergone specialty workshops in the yoga postures. These individuals may have little or no basis in yoga theory, meditation, or philosophy. Yoga studio teachers often have a strong basis in yoga theory and traditional yoga practice, but may have limited understanding of
physiology and anatomy, and therefore may not be qualified to work with many populations. Yoga instructors in medical settings may have special training in teaching yoga to individuals with particular conditions. As well, the location of the yoga class impacts variables such as the duration of each class (traditional studio-based yoga classes are often 90 minutes long, and include a 15 minute meditation; fitness center classes are often 50 or 60 minutes long, and include minimal or no meditation), the available equipment, presence or absence of background music, presence or absence of mirrors, even the apparel of the instructor and the participants. All of the variations could potentially affect the outcomes of a yoga intervention, and therefore, must be taken into account when comparing studies.

Yoga Research

A review of the scientific literature revealed that yoga research tends to predominantly focus on physical and psychological health. Only a small body of research has investigated the impact of yoga on cognitive capabilities, occupational performance, and criminal and deviant behaviors. A large portion of the yoga research has been conducted in India and only a few studies employed strict empirical methods. Therefore, any conclusions about yoga’s efficacy and effectiveness are tenuous at best. However, there still is a large body of research, which provides support for the use of yoga as a therapeutic treatment intervention for several conditions. A review of the literature follows, with a focus on yoga’s benefits for psychological health and well-being.

Physical health. The research literature indicates that yoga has the potential to improve health and functional capacity. At a basic level, yoga promotes physical fitness (Collins, 1998; Gharote, 1976; Telles, Hanumanthaiah, Nagarathna, & Nagendra, 1993) by promoting increased muscle strength (Raub, 2002), flexibility (Armstrong & Smedley, 2003; Ray et al., 2001), stability (Telles et al.), and even handgrip strength (Mandanmohan, Jatiya, Udupa, & Bhavanani, 2003). However, some research indicates that yoga may have limited impact on physical fitness; Smedley (2000) found no improvement in flexibility after a 10-week home yoga program for older women, and Boehde and Porcari (in Anders, 2005) found improvements in flexibility and balance, moderate improvements in strength, but no improvements in cardiovascular fitness, after an eight-week yoga intervention. Overall, a mindfulness practice, including yoga and meditation, may improve health quality, reduce chronic care visits (Roth & Stanley, 2002), reduce medication usage (Bonadies, 2004; Brownstein & Dembert 1989; Latha & Kaliappan,
Yoga has the capacity to improve cardiovascular health (for review see Jayasinghe, 2004 and Raub, 2002), and potentially reduce heart attack risk (Shannahoff-Khalsa et al., 2004) through the reduction of blood pressure (Brownstein & Dembert, 1989; Cusumano & Robinson, 1993; Haber, 1983; Latha & Kaliappan 1991; Patel, 1975) and cholesterol levels (Damodaran et al., 2002; Sachdeva, 1994). Yoga is effective for improving musculoskeletal health (Raub, 2002), even for the elderly (Luskin et al., 2000) and individuals with rheumatic diseases such as arthritis (Garfinkel & Schumacher, 2000), carpal tunnel syndrome (Goodyear-Smith & Arroll 2004; Michlovitz, 2004; Muller et al., 2004), and osteoarthritis of the knees (Kolasinski et al., 2005). Yoga may even improve postural health among older females with kyphosis (Greendale, McDivit, Carpenter, Seeger, & Huang, 2002). However, further research utilizing strong empirical methodology is needed to clearly capture the potential efficacy of yoga as a treatment protocol for musculoskeletal ailments (Hanada, 2003).

Scientific evidence supports the potential of yoga to promote respiratory health via increasing vital capacity (Birkel & Edgren, 2000) and improving oxygen consumption (Telles, Reddy, & Nagendra, 2000; Vempati & Telles, 2002). Yoga also shows promise as a treatment protocol for the management of asthma symptoms (Goyeche, Abo, & Ikemi, 1982; Nagendra & Nagarathna, 1986; Sathyaprabha, Murthy, & Murthy, 2001; Vedanthan et al., 1998; Vijayalakshmi, Satyanarayana, Krishna Rao, & Prakash, 1988; see Ram, Holloway, & Jones, 2003 for review), with the capacity to increase pulmonary function and exercise capacity (Jain, Rai, Valecha, & Jha, 1991), although some researchers hold that it is less effective then conventional pharmaceutical models of treatment (Lane, 1994). One blind, controlled experiment, which utilized random assignment, identified no benefits in asthma conditions due to yoga treatment (Sabina et al., 2005). It was observed that during meditation, breathing is predominantly diaphragmatic or abdominal, and the rate of breaths per minute (b/min) slows (Arambula, Peper, Kawakami, & Gibney, 2001). Arambula et al. identified a meditation-induced shift in breath rate from a mean baseline level of 11 b/min to a mean rate of 5 b/min. This shift in breathing rate during meditation was also identified by Bernardi et al. (2001), where recitation of
either the Ave Maria prayer or a yoga mantra slowed the breathing pattern to 6 b/min. Bernardi et al. noted that a 6 b/min breathing pattern has previously been associated with numerous health benefits, including improved cardiovascular health, increased oxygenation of the blood, and increased exercise tolerance. They argued that rhythmic prayers and mantras might therefore have not only religious and spiritual benefits, but also physical health benefits. Other studies have identified changes in mean breath rate after yoga interventions with both normal children (Tells, Narendran, Raghuraj, Nagarathna, & Nagendra, 1997) and visually impaired children (Telles & Srinivas, 1998).

While yoga appears to have an impact on respiratory condition, not all yoga practices share the same impact. Telles et al. (2000) compared a cycle of yoga practice (alternating active yoga postures with Shavasana, a supine relaxation pose) to a practice of Shavasana alone. Both practices decreased breath rate and oxygen consumption and increased breath volume, but the magnitude of change was larger for the cycle. The authors propose that “a combination of yoga postures interspersed with relaxation reduces arousal more than relaxation alone does” (p. 221).

Several works were aimed at investigating the impact of yoga practice on health and well-being for specific populations. Yoga has been indicated as potentially effective in promoting female reproductive health and improving pregnancy outcomes (Fields, 2005; Narendran et al., 2005; Rhodes, 1997), reducing menstrual symptoms (Sridevi & Krishna Rao, 1996), and preventing menopausal discomfort (Adams, 2003). Yoga was also found to help with management of symptoms in individuals with specific diseases and chronic conditions, such as epilepsy (Panjwani et al., 2000, Yardi, 2001), organ transplant acceptance (Kreitzer, Gross, Ye, Russas, & Treesak, 2005), chronic urologic disorders (Ripoll, & Mahowald, 2002), arthritis (Garfinkel & Schumacher, 2000) and even intractable hiccups (Naug, 1983). Taneja et al. (2004) indicated that yoga (asana and pranayama) is a beneficial treatment protocol for the management of Irritable Bowel Syndrome (IBS). Bonadies (2004) implemented an Iyengar yoga intervention with patients with either Human Immunodeficiency Virus (HIV) or Acquired Immune Deficiency Syndrome (AIDS), and found both quantitative (i.e., reduced usage of pain medication), and qualitative (i.e., patient perceptions of well-being and pain) improvements in symptoms. Some anecdotal evidence exists that yoga may be effective for the treatment of fatigue in individuals with Multiple Sclerosis (MS), but no empirical evidence currently exists to support this proposition (Branas, Jordan, Fry-Smith, Burls, & Hyde, 2000). Yoga has increased
self-care ability in post-polio patients (DeMayo, Singh, Duryea, & Riley, 2004) and improved balance and mobility in individuals suffering from post-stroke hemiparesis (Bastille & Gill-Body, 2004). However, yoga was found to be ineffective in the management of chronic tinnitus symptoms (Kröner-Herwig, Hebing, Van Rijn-Kalkmann, & Frenzel, 1995).

Yoga has also been investigated for its potential as a part of cancer treatment protocols. A review of the relevant literature (Bower et al., 2005) concluded that cancer patients and survivors could experience modest improvements in sleep quality, mood, stress, cancer-related distress, cancer-related symptoms, and overall quality of life, through the practice of yoga. Yoga and meditation effectively reduced stress levels and improved quality of life in breast and prostate cancer patients (Carlson, Speca, Patel, & Goodey, 2004) and may help cancer patients to feel less fear and isolation, as well as feel a greater sense of control over their treatment (Lerner & Remen, 1987).

*Psychological health.* A significant portion of the yoga research has focused on its impact on psychological health and well-being. While a great deal of evidence supports the beneficial effects of exercise on mood and psychological well-being, yoga (and other forms of mindful exercise) may have unique benefits. For instance, after exercising, yoga and tai chi participants reported lower levels of psychological distress, fatigue, and exhaustion, and higher levels of tranquility, than did participants in weight-training, aerobics, or martial arts (Szabo, Mesko, Caputo, & Gill, 1998). Szabo et al. concluded that further research is needed to investigate the influence of exercise expectations on post-exercise affect, especially because “in tai chi and yoga the mental benefits are emphasized while in the other modes of exercise, the physical aspects (i.e., body shaping in aerobic dance and weight-training or self-defense in martial arts) can carry a greater weight” (p. 383). While expectations may have an impact on treatment outcomes, it does not appear that a patient’s attitude toward yoga has any relationship with treatment acceptance or compliance, although patient frustration with the time requirements of a yoga treatment intervention may affect compliance and drop-out rates (Grover, Varma, Verma, & Pershad, 1987).

Yoga may have a positive impact on several capacities of psychological health, including the reduction of hostility (Bhushan & Sinha 2001), reduction of the fear of death (Leslie, 1976), and improved overall mood (Berger & Owen, 1992; Lavey et al., 2005; Netz & Lidor, 2003; Nowakowska, 1982; Watanabe, Fukuda, Hara, & Shirakawa, 2002). Specific areas of research
include the efficacy and effectiveness of yoga on stress, anxiety, depression, pain, fatigue and sleep conditions, drug and alcohol behaviors, clinical disorders, attention-deficit hyperactivity disorder, body image and disordered eating, perceptions of self, cognitive capabilities, occupational performance, and criminal behavior, as well as the physiological effects of yoga practices.

Stress. Several research studies support the potential of yoga as a stress reduction mechanism. For instance, yoga training may reduce participants’ perceptions of stress (Latha & Kaliappan, 1992) and reactivity to stress (Patel, 1975), including occupational stress (Gura, 2002; Heilbronn, 1992; Shapiro, Astin, Bishop, & Cordova, 2005), academic stress (Rubin & Feeney, 1986), the stress of chronic conditions, such as cancer (Bower et al., 2005; Carlson et al., 2004; Lerner, & Remen, 1987), post-traumatic stress disorder (PTSD; Brown & Gerbarg, 2005b), and even the stress of caring for an individual with a chronic condition (Waelde, Thompson, & Gallagher-Thompson, 2004). Yoga’s potential for reducing stress-related symptoms is so strong, and so well-established, that the National Institute of Health recommended meditation over prescription drugs as the preferred treatment for mild hypertension in 1984 (Ott, 2002). Further, regular yoga practitioners were found to have lower levels of the stress hormone cortisol in saliva samples (Watanabe et al., 2002). Long-term yoga participants indicated fewer stressful life events during the past year than did non-yoga practitioners (Venkatesh, Pal, Negi, & Varma, 1994), although this could be due either to differences in perception of stress, differences in lifestyle choices, or differences in another unidentified variable. Controlled long-term studies are needed to further understand this issue.

Brown and Gerbarg (2005b) reported that four unpublished pilot studies have indicated the effectiveness of yoga in managing PTSD in Vietnam era veterans, reducing symptoms of anxiety and depression, improving sleep quality, and helping to prevent flashbacks. However, Brown and Gerbarg indicated that while some benefit occurred after a physical yoga practice (asanas), the majority of benefits did not occur until a more integrated yoga practice – comprising asana, pranayama, and meditation – was introduced. “Using synergistic yoga practice is far more effective for the full range of PTSD symptoms than any single practice” (p. 713). Furthermore, the healing process is a “less stressful experience if they are told in advance about what occurs … and the possibility of physical or emotional reactions” (p. 713). This has implications for practice, in that explaining both the yoga techniques and the potential outcomes
of yoga techniques may increase effects, but also has implications for research, because telling participants about the possibility of effects may increase the potential for placebo effects. Brown and Gerbarg concluded that yoga can be a beneficial component of a PTSD treatment protocol, serving as a complement to psychotherapy and reducing the need for medication.

While some researchers may cluster relaxation techniques such as yoga, progressive relaxation, and biofeedback together, Smith (1986) argued that relaxation techniques vary according to the amount of required focus, passivity, and receptivity and must be individually assessed for proper use and effectiveness. He proposed that different types of relaxation require different amounts of these skills, and that certain relaxation forms are more appropriate for beginners, while others may provide different benefits for individuals more skilled in relaxation. His nine-level hierarchy specified the difficulty level of relaxation approaches; progressive relaxation was the easiest form of relaxation (level 1), with yoga stretching (asanas) at level 2, Kundalini yoga (which includes somatic focusing) placed at level 5, and mindfulness meditation techniques placed at level 9 (the most skillful type of relaxation). In a later study, Smith, Amutio, Anderson, and Aria (1996) used factor analysis procedure on data collected from 940 individuals to determine characteristics associated with different types of relaxation. Smith et al. concluded that while progressive muscle relaxation and massage were associated with feelings of being “distant” and “limp,” yoga stretching was associated with “aware” and “joyful,” and meditation was associated with “aware,” “prayerful,” and “joyful.” This supports Smith’s previous hypothesis that different forms of relaxation have unique inherent qualities. Austin (1982) further supports the idea that different forms of relaxation have different qualities and purposes. He supports the traditional yoga philosophy that the physical yoga, asanas, “are preparatory to meditation” (p. 195).

Austin (1982) proposed that the practice of yoga asanas might help with stress management as a way of teaching the individual to interpret situations more positively. Austin proposed that stress reactions are due to perceptions of the situation. When an individual experiences a painful psychological event, the body physically reacts to this emotional negativity with muscular contraction and physical tension (p. 194). Yoga can teach an individual to “relax into his or her experience” (p. 194), and therefore when the environment does not change, the experience of stress is reduced. In addition, through the practice of physical yoga postures, stretching leads to an increased power of bodily sensation, which yields both increased
awareness and neural integration (Austin). Management of stress-related physical ailments may also occur because yoga has the potential to teach individuals voluntary control of physiological mechanisms, such as heart rate (Telles & Vani, 2002), which may help them to better manage symptoms.

Brown and Gerbarg (2005a) have proposed a neurophysiological model of yoga and argued its mechanisms may include actions on the limbic system, thalamus, and cortex. Heilbronn (1992) proposes that there are three dominant mechanisms, which are responsible for yoga’s benefits. First, holding an asana controls the blood flow, and in the subsequent relaxation of the pose, enhanced blood flow flushes the surrounding organs and removes toxins. Second, asana practice stretches muscles, and then “their creative tension clears the meridians of restrictions and imbalances, thus permitting the free flow of energy around the body” (p. 134). Finally, vigorous yoga practice allows for the sublimation of the adrenaline, which is produced in response to stressful circumstances. La Forge (1997) suggested that at least part of the power of yoga’s effects is its ability to help participants cultivate better stress management skills.

According to the Bhagavad-Gita, the power of yoga to reduce stress is rooted in the process of detachment, which allows the mind to “de-link stress from action” (Roy, 2000). This sense of mental detachment does not change the environmental stressors which the individual experiences, but it relieves the individual of the perception of inner stressors and purifies the mind to help cultivate a psychological hardiness. Ultimately, through the purification of yoga, the individual experiences happiness in the same environment, which previously caused stress (Roy).

Austin (1982) reported that the significant benefits of a yoga practice can be experienced after about ten to twelve instructor-led sessions of 45 minutes. Brown and Gerbarg (2005b) indicated that initial training by a skilled teacher followed by a daily 30-minute practice yields beneficial effects. Similarly, Sahajpal and Ralte (2000) found stress reduction benefits for individuals who were taught yoga techniques, and then instructed to engage in 20-minutes of individual practice each day for a month. However, after only two-days of stress management training, male middle managers showed reduction in breath rate, which indicates that small changes in stress level may occur even after only brief yoga training (Vempati & Telles, 2000). West et al. (2004) demonstrated reductions in salivary cortisol levels after just one 90-minute yoga class.
Anxiety. Yoga theory and research support its potential for reducing anxiety, both clinical (Miller, Fletcher, & Kabat-Zinn, 1995) and specific (such as examination anxiety, Broota & Sanghvi, 1994; and Malathi & Damodaran, 1999). Long-term yoga practitioners were diagnosed as having lower levels of both state and trait anxiety than do non-yoga practitioners (Venkatesh et al., 1994). In one study, outpatients with anxiety neurosis, who were provided with yoga training five days per week for three months, showed significant improvement. After the training, 6.7% of yoga subjects were completely asymptomatic, as compared to 0% of the medication control group participants (Sahasi, Mohan, & Kacker, 1989). In another study, one hour of yoga practice for 15 days reduced anxiety levels in participants with hyper anxiety, although not in individuals with minimal initial anxiety (Bhushan & Sinha, 2001). In yet another study, an intensive 15-day yoga experience living in a yoga ashram reduced anxiety and depression levels for patients with gastrointestinal disturbances (Mishra & Sinha, 2001). Results may even be immediate, and after just one session of mindful exercise (including Feldenkrais and yoga), participants experienced improved mood, including reduced depressive mood and state anxiety (Netz & Lidor, 2003).

Yoga breathing may be useful for restoring a sense of control when an individual is confronted by an anxiety-inducing trigger (Brown and Gerbarg, 2005). Yoga’s effectiveness in reducing anxiety may be due to its capacity for lowering excitability and increasing concentration and self-control (Sharma, Yadava, & Hooda, 2005). Yoga is effective for reducing anxiety symptoms in specific populations, including the elderly (Allen & Steinkohl, 1987), AIDS and HIV patients (Bonadies, 2004), individuals with asthma (Goyche, Abo, & Ikemi, 1982), organ-transplant recipients (Kreitzer et al., 2005) psychiatric patients (Lavey et al., 2005), individuals with irritable bowel syndrome (Taneja et al., 2004), and children with ADHD (Harrison, Manocha, & Rubia, 2004). Sugiura (2004) reported that yoga meditation could benefit the prevention of daily anxieties and found a negative correlation between worry-proneness and the “detached objectivity” (p. 169), which is associated with mindfulness meditation.

While yoga does show potential for reducing anxiety symptoms, Brown and Gerbarg (2005b) indicated that anxious patients need preparation before beginning yoga training. Patients who have a history of hyperventilation and panic attacks may become fearful when asanas and breathing techniques increase breath rate, and should be informed that yoga is a controlled form of breathing, which will not trigger panic. As well, anxious patients should be taught how to
slow down breathing, to breathe gently, and “not to exhale too forcefully during cyclical
breathing, as they may exhale too much CO\textsubscript{2} and induce tingling or cramping in the extremities”
(p. 713). Furthermore, yoga’s potential for reducing clinical anxiety may be limited by patient
characteristics; Girodo (1974) suggested that yoga is useful for anxiety patients with a short
history of illness but not for patients with a long history. Finally, Norton and Johnson (1983)
reported that different relaxation methods might be more effective for different types of anxiety.
They compared the effects of progressive relaxation and Agni Yoga on somatic and cognitive
anxiety forms in 40 moderately snake phobic subjects. They concluded that progressive
relaxation was more effective at reducing somatic anxiety, and that the yoga intervention showed
slightly more effect in reducing cognitive anxiety. Norton and Johnson indicated that because
anxiety comprises cognitive, somatic, and behavioral components, “specifically tailoring a
treatment to a person’s type of anxiety may not only improve general treatment outcome, but
also produce more synchronous change in the three dimensions of anxiety” (p. 214). Further
research in this area is warranted.

\textit{Depression.} Yoga has the potential to reduce depression levels in both non-clinical
(Berger & Owen, 1992; Ray et al., 2001) and clinical (Broota & Dhir, 1990; Lavey et al., 2005)
populations, among elderly individuals (Kaye, 1985), and even for individuals in whom
depression is a co-morbid condition (for instance, organ transplant patients, Kreitzer et al., 2005;
and individuals with gastrointestinal disorders, Mishra & Sinha, 2001). According to Broota and
Dhir, after just three consecutive days of yoga therapy, depressed outpatients noted reductions in
symptoms. Among young adults with mild depression, twice-weekly yoga classes for five weeks
were found to decrease self-reported symptoms of depression, improve acute mood (decreasing
levels of negative mood and fatigue immediately after class), and improve morning cortisol
levels (Woolery et al., 2004). Yoga may even be an effective treatment protocol for individuals
with severe depression, with a four-week intervention producing improvements comparable to
imipramine treatment (Janakiramaiah et al., 2000). Furthermore, Waelde et al. (2004)
demonstrated that yoga was effective for reducing symptoms of anxiety among individuals who
were caregivers for family members suffering from dementia.

Even the simplest form of yoga practice may be beneficial for treating depressive
symptoms. Khumar, Kaur, and Kaur (1993) demonstrated that thirty 30-minute sessions of
Shavasana (a simple supine relaxation pose) reduced depression levels among female university
students, even in the absence of other yoga asanas or pranayamas. Treatment interventions of longer duration brought greater results. There is some evidence that yoga has independent antidepressant effects; when anxiety-related items were excluded from the Hamilton Rating Scale for Depression, participants still showed reductions in depression scores after one month of yoga treatment (Murthy, Janakiramaiah, Gangadhar, & Subbakkrisna, 1998). Yoga theory proposes that depression, and other psychological disorders, are caused by imbalances in the mind, and that the practice of yoga can help to restore balance (Saraswati, 2001).

It is important to assess the potential applications of yoga therapy for psychological disorders such as anxiety and depression, because individuals prefer to use self-help techniques than to seek professional treatments for dealing with these disorders (Jorm, Korten, & Jacomb, 1997). In one survey, 55% of respondents had used alcohol to relax, 55% had used pain relievers, and 50% had engaged in physical activities (including yoga), compared to only 35% who consulted a general practitioner or 4% who received psychotherapy (Jorm, Medway, & Christensen, 2000). However, although these complementary and self-help protocols are often utilized, in a review of treatment protocols for depression, Jorm, Christensen, Griffiths, and Rodgers (2002), concluded that none of the complementary and self-help techniques were as effective in relieving depression as standard medical treatments (antidepressants and cognitive behavior therapy). Currently, there is limited evidence of the effects of yoga and meditation on depression. However, Jorm, Christensen, et al. suggested that the potential use of yogic breathing for depression treatment might yield successful outcomes and warrants further investigation.

Brown and Gerbarg (2005b) reported that yoga techniques can be useful for both dysthymic disorders and clinical depression, but indicated that individuals with mild to moderate depression are more likely to respond to treatment quickly. Mild to moderately depressed individuals may experience reductions of symptoms after only five days of yoga practice, although more severely depressed individuals may show gradual improvement over a 3 – 9 month period (Brown & Gerbarg). Murthy et al. (1998) reported that Sudarshan Kriya Yoga (SKY), a specific form of yogic breathing practice, is effective in reducing depression after about one month of treatment; however, because one week of treatment is required to properly learn the techniques, they proposed that three weeks of active practice is required for yoga treatment to exert a measurable effect on depression levels. In addition to the duration of the treatment protocol, frequency of practice and patient compliance to practice schedules are both critical.
components of a yoga program for treating depression. Increased frequency of practice increases the potential for positive results, and severely depressed individuals may need to practice yoga 7 days per week, and even twice per day (Brown & Gerbarg), although each session need only include 30 minutes of yoga practice. Moreover, because individuals respond to treatment better with greater frequency of practice, compliance is important; in one study, individuals were asked to practice 6 days a week, but were only observed for practice 4 days per week (Brown & Gerbarg). On average, individuals had a mean practice rate of 5 days per week; Brown and Gerbarg hypothesized that for depressive clients, increased supervision of yogic practice would improve compliance, and therefore promote better outcomes. Finally, the components of yoga, which are practiced, may contribute to therapeutic outcomes. When Rohini, Pandey, Janakiramaiah, Gangadhar, and Vedamurthachar (2000) compared a full SKY yoga practice (including three types of pranayama and yoganidra, or “tranquil state”) with a partial SKY yoga practice (only two types of breathing and yoganidra), there was a trend, which indicated full SKY was more effective in reducing depressive symptoms. Although the difference was not significant, after four weeks of daily practice, 12 of the full SKY patients had improved, compared to 7 of the partial SKY group. Although these results were limited by many factors (small sample size, lack of control group, unequal duration of illness between patient groups), it is possible that certain components of a yoga practice are more potent for treating symptoms of depression.

Pain. Yoga reduced patients’ perceptions of pain and reduced patient usage of pain medication (Bonadies, 2004). It effectively reduced pain in individuals with osteoarthritis conditions and carpal tunnel syndrome, providing more symptom relief than control treatments (Garfinkel & Schumacher, 2000). Yoga is an effective method for reducing the muscular tension, which may precipitate pain (Gura, 2002). For some conditions, strong research evidence supports the use of yoga for pain management. In a randomized control trial of Iyengar yoga therapy versus an educational control group, yoga was found to be effective in managing symptoms of chronic low back pain. After 16 weeks of treatment, there were significant reductions in pain intensity (64%), functional disability (77%), and pain medication usage (88%) in the yoga group, both at the post, and 3-month follow-up assessments (Williams et al., 2005). Another study investigated the effects of modified Hatha yoga on chronic low back pain; findings revealed trends for yoga’s potential in improving balance and flexibility and decreasing disability and
depression in chronic pain sufferers (Galantino et al., 2004). At present, researchers and physicians conclude that yoga is likely to be effective in managing symptoms of chronic back pain, and no research reports show harm due to yoga treatment for back pain (Graves, Krepcho, Mayo, & Hill, 2004).

Research evidence is lacking for other potential applications of yoga for pain management. A review of CAM treatments concluded that CAM modalities, including relaxation techniques, might be effective for managing chronic facial pain, but no scientific inquiry has specifically assessed yoga’s impact on this condition (Myers, White, & Heft, 2002). Anecdotal evidence indicates that yoga may provide potential for helping patients to manage the pain associated with urological disorders (Ripoll & Mahowald, 2002).

Yoga may be useful for the management and prevention of headaches. In one study, individuals with tension headaches were instructed in 30 sessions of yogic meditation (Vasudevan, Kumaraiah, Mishra, & Balodhi, 1994). Physiological measurements showed no statistically significant changes in frontalis muscle tension or in skin conductance, but subjects did show decline in these measures and reported reductions in pain perception. Vasudevan et al. concluded that yogic meditation is an effective treatment protocol for tension headaches. In another study, 20 patients suffering from migraine and tension headaches were randomly assigned to either a four-month yoga treatment intervention or a no therapy control group. Yoga participants experienced significant reduction in headache activity, medication intake, symptoms, and stress perception, compared to controls (Latha & Kaliappan, 1992). In a similar study, yoga participants also experienced reductions in stress and improvements in coping behavior (Latha & Kaliappan, 1987). Further studies utilizing empirical research methods are necessary to evaluate yoga’s effects on pain and pain management (Hanada, 2003).

Fatigue and sleep conditions. Some research indicates that the practice of yoga and yoga meditation may improve sleep quality and reduce sleep disturbance (Bower et al., 2005; Harrison et al., 2004; Kaye, 1985; Sahajpal & Ralte, 2000). Yoga has also been identified as a potential treatment protocol for chronic insomnia (Khalsa, 2004). When elderly individuals were trained in yoga for six months, they showed a significant decrease in the time taken to fall asleep and a significant increase in the total number of hours of sleep, as compared to control groups (Manjunath & Telles, 2005). In fact, Brown and Gerbarg (2005b) report that insomnia may be one of the first symptoms to respond to daily yoga practice, through the ability of breath
techniques to “quiet the mind, reduce obsessive worry, and induce a state of physical and mental calmness conducive to sleep” (p. 712).

One potential explanation for the impact of yoga and meditation practices on sleep quality relates to yoga’s impact on melatonin levels. Tooley, Armstrong, Norman, and Sali (2000) measured melatonin levels in experienced meditators on two different occasions: on a night when they meditated under specific laboratory conditions, and on a night when they sat quietly with eyes open (control condition) under the same laboratory conditions. On the meditation nights, they had significantly higher plasma melatonin levels than on the control nights. It was proposed that “facilitation of higher physiological melatonin levels at appropriate times of day might be one avenue through which the claimed health promoting effects of meditation occur” (p. 69).

Drug, alcohol, and smoking behaviors. Yoga may have potential as an intervention in substance abuse treatment programs (Brown & Gerbarg, 2005b). Yoga techniques, specifically breath control, relaxation and meditation, postures, diet, and chanting, may help to produce positive motivational change toward rehabilitation and provide an effective and cost efficient method of detoxification (Lohman 1999). Lohman concluded that yoga might be especially useful when provided as a treatment for addiction in conjunction with counseling and group work. Calajoe (1986) suggested that yoga is effective in reducing substance abuse and addiction because it enables patients to regain energy, satisfaction, and stability while making positive changes in their lives. For instance, McIver, O’Halloran, and McGartland (2004) assessed twenty smokers for willingness to stop smoking, and then assigned them to five weeks of yoga practice (e.g., asana and pranayama). After the yoga intervention, a statistically significant shift towards intention to stop smoking was noted, and one subject had given up cigarettes. It was inferred that yoga be further studied as a mechanism in smoking cessation programs, and that “the power of this ancient practice might prove to be a strong and effective alternative to the pull of addiction” (p. 23). Yoga practice is also related to a decrease in alcohol consumption. Benson (1974) reported that 1,950 individuals who had practiced TM for at least three months reported less hard liquor consumption after beginning meditation practice. Prior to meditation, only 40.1% of the subject group was nonusers of hard liquor, and after 22 or more months of meditation, 75.1% of the sample avoided drinking hard liquor.
Swinyard, Chaube, and Sutton (1974) indicated that although much of the research investigating the effect of learning TM on drug and alcohol use was methodologically flawed (for instance, no random assignment, and TM subjects were often individuals who had chosen to train as TM instructors and therefore had different personality characteristics and motivation), there still is evidence that meditation may be related to lower levels of substance use and abuse. Individuals are less likely to use drugs and alcohol after beginning TM training than before, and even previous drug abusers are less likely to continue abuse after TM training. In a group of TM practitioners with a history of marijuana abuse, 69% completely stopping using drugs after 3 months of training, compared with 15% of subjects in a control group matched for subject characteristics (Shafi, Lavely, & Jaffe, as cited in Swinyard et al.). Swinyard et al. conclude that TM may be “a therapeutic adjunct to our multifaceted alcoholism programs” (p. 172). As well, providing yoga therapy as an optional component of drug and alcohol treatment interventions may help clinicians to identify patients with a higher probability of successful outcome.

Goldberg and Meltzer (1975) allowed heroin addicts to choose either yoga therapy or general therapy. They found no personality differences between addicts who chose yoga and those who chose general therapy; both groups showed equal levels of motivation in terms of program attendance over the 6-month intervention. However, 50% of yoga participants made requests for detoxification, in contrast to only 16.6% of general therapy participants. Goldberg and Meltzer concluded that the individuals who chose and experienced yoga therapy had a higher motivational level to succeed in overcoming their addictions.

Clinical disorders. Research evidence is still minimal, but yoga theory indicates that this practice may be effective for reducing symptoms and improving quality of life for individuals with clinical disorders (Balodhi & Mishra, 1983). The specific components of a yoga practice, which are important to psychiatric treatment, are asanas, pranayama, and dhyana (Pasek, 1982). Overall, it is proposed that yoga will both prevent mental illness and reduce symptoms in the mentally ill (Singh, 1986). Goyeche (1979) indicates that yoga’s effectiveness with psychosomatic and psychiatric conditions may be partially understood in terms of neurophysiological theory, through principles such as proprioceptive feedback. Van der Lans (1975) suggested that yoga’s impact on psychological health is mediated by the physiological counterpart of the fight/flight reaction, and that yoga therefore un-does the damage of stress. An evaluation of yoga’s effectiveness in treating clinical disorders is vital; a survey of 262
psychotherapy outpatients indicated that 64% had used some form of CAM, with 44% using mind-body techniques such as meditation and 21% using mind-body exercises such as yoga (Elkins, Marcus, Rajab, & Durgam, 2005).

The effects of yoga on specific psychological disorders were established. For instance, Shannahoff-Khalsa (2003) reported Kundalini yoga’s effectiveness as a treatment for Obsessive-Compulsive Disorder (OCD). Shannahoff-Khalsa and Beckett (1996) demonstrated that yoga training produced positive results in individuals with OCD patients who had been previously stabilized on fluoxetine (n=8). Subjects were tested at three-month intervals for twelve months, and showed progress on the Yale-Brown Obsessive-Compulsive Scale. In addition, three patients were able to completely discontinue the use of OCD medications and two more patients were able to reduce dosage. Furthermore, yoga has been used as one component of a treatment protocol for schizophrenia, which combined drug therapy, psychotherapy, and yoga practice (Dosajh, 1995). In two trials, six-months of yoga practice appeared to improve functioning and reduce symptoms in individuals with schizophrenia, although it appears that while the physical activity was beneficial, the emphasis on relaxation and internal awareness, which is a core component of yoga theory, may be contraindicated for schizophrenics (Naveen & Telles, 2003).

Yoga may also be useful for prevention and therapy of psychosomatic disorders (Dostálek, 1994), perhaps by helping the individual to restore optimal homeostasis (Goyeche, 1979), and by reducing sympathetic nervous system activity and increasing parasympathetic response (Ferrari & Roberti, 1981). Yoga has also been investigated as a possible treatment intervention for neurosis (Grover et al., 1987, 1989). Finally, Lavey et al. (2005) indicated that yoga may be a useful adjunct to therapy, to reduce stress during inpatient psychiatric treatment.

However, caution must be utilized when including yoga in treatment protocols for psychiatric disorders. Both the yoga techniques and the yoga teacher should be thoroughly assessed. Brown and Gerbarg (2005b) caution that bipolar patients, especially those with predominantly manic symptoms, may attempt to use certain breathing techniques for self-stimulation, and warn that only experienced yoga teachers, working in conjunction with a therapist, should work with bipolar II patients. In a few cases, the use of yoga and meditation techniques has precipitated delirious experiences (Barte, 1971), manic episodes, and other forms of psychotic illness (Yorston, 2001). Meditation has induced psychotic symptoms in both
previously asymptomatic individuals and individuals with histories of chronic mental conditions (Naveen & Telles, 2003).

**Attention-deficit hyperactivity disorder (ADHD).** CAM therapies have been suggested as possible treatments for ADHD, and many parents and practitioners already implement these practices in treating the disorder, using techniques as varied as elimination of sugar, artificial food additives, colors, and/or preservatives; essential fatty acid supplementation; homeopathy; and green outdoor spaces (Rojas & Chan, 2005). However, little research has been conducted to determine their effectiveness (Harrison et al., 2004). Harrison et al. assessed yoga’s potential to improve ADHD symptoms in a six-week Sahaja Yoga Meditation (SYM) program, which involved both clinic visits (2 per wk) and an at-home meditation practice. Both parents and children participated in the sessions, and results included both improved parent ratings of children's ADHD symptoms, self-esteem and child-parent relationship quality, and child ratings of improved sleep patterns, reduced anxiety, and a greater capacity to concentrate and avoid conflict at school. Harrison et al. conclude that SYM may be an effective family-oriented treatment program for ADHD children. In an empirical study utilizing random assignment and a control treatment group, ADHD diagnosed boys attended 20-sessions of either yoga or control treatment (Jensen & Kenny, 2004). Assessments on the Conners' Parent and Teacher Rating Scales-Revised: Long (CPTRS) revealed significant changes on five subscales for the yoga group, and only on three subscales for the control group. As well, positive change among yoga participants on the Teacher Rating Scale component was associated with treatment attendance. Jenson and Kenny conclude that yoga shows potential for ADHD treatment, but that further empirical investigation with larger samples is needed. Rojas and Chan concluded that yoga may be an effective CAM technique as part of an ADHD treatment plan, but that more empirical research is needed to determine yoga’s potential as a single therapy for ADHD.

**Body image and disordered eating.** Because yoga is a mind-body practice, which is intended to improve an individual’s self-concept and increase the strength of an individual’s self-esteem, some theorists have proposed a possible link between yoga practice and improved body image. Clance, Mitchell, and Engelman (1980) investigated the effects of yoga training on body image and self-esteem in children by randomly assigning twelve third-graders with low body image and poor physical coordination to either a control group or a yoga and awareness training group. Using Body Cathexis Scale and the Human Figures Drawing Test, Clance et al.
demonstrated that yoga participants improved their sense of body satisfaction, while no change was found in control subjects. Clance et al. concluded that yoga is an effective method of improving body image and consequently self-image.

In another study, women \((n=139)\) completed questionnaire measures concerning awareness of and responsiveness to bodily sensations, self-objectification, body satisfaction, and disordered eating attitudes (Daubenmier, 2005). Yoga practitioners \((n=43)\) had better results on all measures than did individuals who practice aerobics \((n=45)\) or women who abstained from exercise \((n=51)\). Body responsiveness, but not body awareness, was found to be a mediator, further explaining the relationship between exercise type and self-objectification and disordered eating attitudes. Daubenmier replicated the study and found supporting results in a sample of undergraduate females \((n=133)\).

Rani and Rao (1994) also demonstrated yoga’s effects on improving body awareness. They administered the Body Awareness Questionnaire to 17 individuals who had received three-months of yoga training and found that they reported significantly more body awareness than a group of individuals \((n=19)\) with no yoga training. Shannahoff-Khalsa (2003) reports the rapid effectiveness of a yoga treatment program in the case study of a young woman with co-morbid conditions including OCD, body dysmorphic disorder (BDD), and social anxiety disorder. Overall, yoga may have the potential for improving body concepts and behaviors (i.e., improving body awareness and body cathexis, and reducing self-objectification and disordered eating behaviors). However, controlled research is necessary to fully investigate the effects of this application of yoga as a treatment protocol.

*The self.* A small body of research indicates that the practice of yoga may alter an individual’s sense of self (Malathi, Damodaran, Shah, Patil, & Marathe, 1999). For instance, studies have revealed yoga’s capacity for increasing self-esteem (Cusumano, 1992; Cusumano & Robinson, 1993; Harrison et al., 2004; Roth & Creaser, 1997), improving self-concept (Sahajpal & Ralte, 2000), and fostering a sense of open-mindedness (Kolsawalla, 1978). Individuals may have greater congruence between self-concept and self-ideal after the completion of a yoga training program (Rani & Rao, 1992). Traditional yoga theory also indicates that yoga should be useful for improving an individual’s capacity for self-regulation (Balodhi & Mishra, 1983).

Malathi et al. (1999) measured self-actualization in 48 healthy adult volunteers, and then trained them in yoga for one hour per day, five days per week, for four months. At the end of the
yoga training, participants had significant moves overall toward self-actualization on the Personal Orientation Inventory, and especially on the Time Competence and Inner Directedness subscales. Malathi et al. concluded that yoga helps individuals grow toward a sense of self-actualization. Similarly, Stewart (1974) proposed that the essential aim of helping practices – including psychotherapy – is essentially to maximize human happiness, although different terminology may be used (self-realization, self-actualization, human fulfillment, etc). Stewart suggested that meditation practices, especially TM, may be useful in meeting this goal, and therefore aid the therapeutic process of improving self and functioning. Sageman (2004) suggested that spiritually-oriented forms of therapy (e.g., therapy which incorporates practices such as prayer, yoga, and spiritual readings) may be beneficial for improving sense of self and strengthening concept of personal value in individuals with severe mental illness.

However, Rosén and Nordquist (1980) assessed individuals who had lived in a yogic community for at least two years, and found that most individuals were at the conformist level of ego development (characterized by less differentiated perceptions of self and the social world and a need for group support to uphold one's own beliefs). Commitment and values were similar for the yogic individuals and for non-yoga groups comparable in age and education. This may indicate that yoga is less influential in changing broad personality traits and dimensions.

Cognitive capabilities. Yoga practice may improve cognitive capability and functioning, although research results in this area are mixed. For instance, yoga has been shown to improve creativity in children (Bhushan, 2003), but in a comparison of the effects of a single session of progressive muscle relaxation, yoga stretching, imagery, or a control task on creativity, no differences were found (Khasky & Smith, 1999). Naveen, Nagarathna, Nagendra, and Telles (1997) demonstrated that pranayama practice can increase memory. School children ages 10 through 17 (n=108) had a mean increase in spatial memory of 84% after 10 days of breathing practice, in comparison to no change in the control group. Furthermore, Vishal, Singh, and Madhu. (1987) showed that adult males increased in short-term memory after six months of yoga training. However, in a controlled experiment, which utilized random assignment and a pseudo-meditation control group, there was no systematic improvement in memory or cognitive functioning among adults (Yuille & Sereda, 1980). Yoga-based techniques may improve academic performance (Barnes & Nagarkar, 1989). Forty students participated in three hours of yoga each week for four months. Their scores on the Scholastic Aptitude Test and the Nonverbal
Test of Intelligence increased from pre to post testing. Barnes and Nagarkar hypothesized that yoga improved the students’ concentration, which in turn facilitated a more positive attitude toward scholastic achievement. It may also be the case that test scores improve because yoga helps students to reduce examination anxiety (Broota & Sanghvi, 1994).

Some researchers suggest that yoga has the potential to provide cognitive benefits for special populations. For instance, TM practice may improve cognitive functioning among elderly adults. In a controlled study of 73 residents (mean age = 81 years) of eight elderly living facilities, TM practitioners improved the most on paired associate learning and two measures of cognitive flexibility, when compared to mindfulness trained group, a relaxation group, and a no treatment control group (Alexander et al. 1989).

Yellin (1983) reported that yoga practice increases healthy circulation of blood and air through the body, and facilitates a relaxed state of mind, which can lead to improved cognitive performance and increased reading ability among learning disabled and mentally retarded children. Zipkin (1985) reported that yoga practice improves academic achievement, increases attention span, and enhances communication for handicapped students. Furthermore, Uma, Nagendra, Nagarathna, and Vaidehi (1989) demonstrated that even in subjects with limited cognitive capabilities, yoga might provide cognitive benefits. In a group of ninety children with mild, moderate, and severe mental retardation, half were randomly assigned to participate in yoga classes for one hour each school day (5 d/wk) for the entire school year (e.g., 10 months). IQ and social adaptation were assessed for both groups. Though some deterioration occurred for mild retardation control group participants, no deterioration occurred among yoga participants, and improvement was significant for moderate retardation individuals. Uma et al concluded that “yoga is a conscious process of gaining control over the mind, and thus the concentration and attention-span improve, and hence both IQ and memory power will enhance” (p. 420). Further research must determine the potential efficacy and effectiveness of yoga as a treatment protocol for mentally handicapped children.

Occupational performance. Yoga has been identified as a successful tool for managing work-related stress (Gura, 2002; Roy, 2000) by reducing physiological arousal (Vempati & Telles, 2000). Gura indicates that yoga is effective for increasing parasympathetic nervous system activity, which reduces the physiological consequences of work-related stress. As well, a yoga practice may increase body awareness, which can help to prevent work-related injuries.
caused due to stress. In one study, British Steel effectively utilized yoga as a part of a stress reduction program for management-level employees (Heilbronn, 1992). Yoga training has been shown to reduce workplace fatigue across career fields, reducing general fatigue in professionals, executives, academicians, and students (Latha, 2003). Yoga may also be a useful intervention for stress-related health conditions, such as hypertension; for individuals in occupations where conventional medication usage may be contraindicated (e.g., pilots; Brownstein & Dembert, 1989). It may also provide a means of preventing workplace injury (Gura). Gura suggests that workplace yoga classes can reduce employee absenteeism, enhance company morale, and improve workplace communication.

Additionally, yoga may improve occupational effectiveness for individuals in social service fields. Valente and Marotta (2005) assessed the impact of yoga practice on the professional and personal lives of psychotherapists. Results indicated that yoga practice increased the psychotherapists’ capacity for self-awareness, which “allowed them better control over their thoughts and abilities to direct their minds” (p. 73). Yoga also fostered a sense of mental and emotional balance, which helped therapists to prevent burnout. Additionally, the therapists indicated that yoga practice had increased their capacity to “accept their own limitations and emotions and those of their clients without judgment and attachment to outcome” (p. 75). The authors conclude that a yoga practice can help psychotherapists provide higher quality therapy with less risk of personal emotional cost. Shapiro et al. (2005) had similar findings, with an 8-week mindfulness-based stress reduction program (including meditation, asanas, and breathing techniques) reducing stress and increasing self-compassion in health care professionals (including physicians, nurses, social workers, physical therapists, and psychologists). The potential of yoga for reducing stress in the health care setting may also extend to family member caregivers (Waelde et al., 2004).

Criminal and deviant behavior. Although only two studies concerning the impact of yoga on crime were identified, they provide a rationale for greater research in the area. Derezotes (2000) implemented a pilot study teaching yoga practices to adolescent sex offenders. Juvenile delinquents and their families expressed positive perceptions of the program, and the participants improved academic performance and expressed a greater ability to control impulses. Derezotes proposes that yoga may be an effective behavior management program for teaching criminal offenders greater self-control. Brown and Gerbarg (2005b) report that the use of yoga techniques
in the Indian prison systems have “reduced violent behavior and improved quality of life for prison staff and prisoners” (p. 714). Further, a pilot study with juveniles convicted of violent crimes in Los Angeles County demonstrated that meditation and pranayama practice three times per week reduced anxiety, anger, reactive behavior, and fighting (Suarez, 2002, in Brown & Gerbarg).

The potential of yoga in reducing crime may even extend beyond the individual. Maharishi Mahesh Yogi proposed that if a small number of individuals – specifically, a sample which is larger than the square root of one percent of the population – participate in TM, it “will result in improved quality of life (e.g., reduced crime rate) throughout the entire society” (Dillbeck, Banus, Polanzi, & Landrith, 1988, p. 458). In the first study of the Maharishi effect, crime rate was assessed in all U.S. Cities larger than 25,000 populations that were not part of a larger metropolitan area, and in which 1% of the population had been instructed in the TM program by 1972. There were 11 such cities, and these cities showed a significant decrease in crime rate in 1973 in comparison to control cities matched for geographic region, population, college population, and prior crime rate.

More advanced methodologies were used in other studies, controlling for several intervening variables. In one study, a random sample of 40 U.S. cities was assessed using the Federal Bureau of Investigation (FBI) Uniform Crime Index. The percentage of the population instructed in TM was assessed, while controlling for each area’s median years of education, percentage unemployed, per capita income, percentage of families in poverty, and ratio of police per population. Differences were all found to be in the hypothesized direction, with higher population percentages of TM practitioners being correlated to lower crime. A second study, which randomly selected a sample of 80 U.S. metropolitan areas, provided similar results (Dillbeck et al., 1988). In a third study, participants were recruited in the Washington D.C. area to practice TM. Significant weekly relationships were observed between the number of TM practitioners in the DC area and the crime rate over the same period. They concluded that meditation has an overall effect on society (Dillbeck et al).

Physiological arousal. Several researchers have assessed the impact of yoga on basic physiological processes, such as brain wave patterns (Corby et al., 1978; Dostálek, 1970, 1979; Elson et al., 1977; Lou et al., 1999; Roldán & Dostálek, 1985; Roldán et al., 1983; Yamazaki et al., 1987), body temperature, and sensory perceptions. This research provides evidence that yoga
has an impact on physical health and well-being, although both the extent and the uniqueness of yoga’s effects vary across studies. For instance, Arambula et al. (2001) identified a shift in occipital parietal electroencephalograph (EEG) measures during meditation, with significantly more alpha EEG activity during meditation than pre or post meditation, and an increase in theta activity immediately following the period of meditation. Arambula et al. indicated that the shift in breathing patterns might have affected the brain activity. In support of this, Takahashi et al. (2005) evaluated psychophysiological parameters during Zen meditation in 20 normal adults, and reported that changes occurred in fast theta power and slow alpha power of EEG measures, predominantly in the frontal area. Takahashi et al. stated that changes in slow alpha EEG power in the frontal area reflect internalized attention, and changes in fast theta power in the frontal area reflect enhanced mindfulness. They suggested that internalized attention and mindfulness are “two major core factors of behaviors of mind during meditation” (p. 199).

Although Arambula et al. (2001) and Takahashi et al. (2005) reported similar effects on EEG patterns during yoga, Stewart (1974) claimed that there are pattern differences across types of meditation. When a stimulus, such as a loud click, is presented, Zen meditators react to every stimulus in an equal manner, indicating a constant alpha-blocking interval. This is in contrast to normal, non-meditating subjects, who show decreases in alpha production as the stimulus becomes more frequent, and also to practitioners of yoga meditation, who show no alpha blocking whatsoever. Stewart suggested that the philosophical tradition, upon which a meditation is based on, might alter its effects on the body. In a similar experiment, both experienced meditators and control subjects were exposed to high-pitched sounds. Control subjects eventually became habituated to the sounds as evidenced by lack of brain wave alteration on exposure. Meditators did not become habituated and continued to demonstrate brain wave alterations in response to the sounds (Dossey, 2004). However, a replication of this study compared non-meditators to experienced Zen, Raja yoga, and TM practitioners, and found no differences; meditation practitioners become habituated to the sound at about the same rate and time as non-meditators (Becker & Shapiro, 1981).

In a review and summary of the psychobiology of altered states of consciousness (ASC), Vaitl et al. (2005) stated that while EEG studies do show changes during meditation, such as increases in alpha activity, these changes “are nonspecific and do not support the notion of a unique state of consciousness” (p. 108). However, changes in EEG patterns may be based on
both the extent of experience, and the type of meditation utilized. Vaitl et al. identified the need for more scientific examination of meditation, and proposed that “a cognitive analysis of the meditation methods and the study of trained subjects within established and newly devised experimental paradigms will help to elucidate the psychophysiological bases of the human capability to enter into different ASC through the intentional self-regulation of attention” (p. 109).

In addition to its impact on brain wave activity, meditation may also have an impact on body temperature. While practicing G Tum-mo yoga (i.e., “heat” yoga) techniques, Tibetan Buddhist monks were measured for temperature at the navel, lumbar region, chest, left forearm, left fifth finger nail bed, left calf, left fifth toe nail bed, forehead, and rectum; air temperature was also measured (Benson et al., 1982) Participants altered finger and toe temperature as much as 8.3° C and two participants altered air temperature as much as 3.2° C. Benson et al. concluded that the changes were due to vasodilation. Yoga practice may affect an individual’s sensory perception, including visual and auditory capabilities. For instance, after yoga training, experimental subjects demonstrate significantly more field independence and perceptual sensitivity than do control subjects (Sridevi, Sitamma, & Rao, 1995). Furthermore, yoga training increased visual perception, and thus trained individuals were more able to detect the flickering of a stimulus than before training, and demonstrated more perceptual ability than control subjects (Telles et al., 1995).

Meditation practices may also affect auditory ability. Telles and Naveen (2004) reported that during meditation, but not during non-meditation random thinking, experienced meditators have a decrease in the peak latency of the Na wave (a negative wave between 14 and 19 milliseconds). They conclude that these results imply a decrease in conduction time at the midbrain-thalamic level, either through reduction of time for conduction or through the recruitment of additional neurons for conduction. Telles, Joseph, Venkatesh, and Desiraju (1993) had previously demonstrated increases in Na-wave amplitude and decreases in latency, after three months of pranayama training in healthy young adult subjects. Wave changes did not occur among control subjects who focused their attention on nasal air flow.

Limitations of the Research on Yoga

While the results of the research on yoga are promising, they must be interpreted with caution. According to Walsh and Shapiro (2006), research on meditative practices (including
yoga, Zen, and other forms of mindfulness), has “suffered from significant methodological and conceptual limitations” (p. 230). Walsh and Shapiro identify three broad categories of methodological limitations for meditation research: design, assessment, and subjects. According to Canter and Ernst (2003), research studies in this domain may remain questionable in terms of both subject selection bias and expectancy effects. Many studies consisted of small sample sizes, and either suboptimal or completely lacking controls (Walsh & Shapiro). Further, many studies may not provide details of the type of yoga utilized, which prevents replication and therefore reduces legitimacy of any significant results. Additionally problematic is the high drop-out rate which many studies experience; however, a review of 13 studies by Baer (2003) indicated an 85% mean completion rate, indicating that drop-out may be less problematic across the body of research than it appears to be within individual studies. Overall, research results concerning the impact of yoga on physical and psychological health offer potential and suggest future directions, but well-designed empirical research is needed.

Conclusions

While yoga proponents’ broad sweeping generalizations of effectiveness are likely exaggeration, research does indicate that yoga may be beneficial in a wide variety of applications. Overall, research indicates that yoga may be an effective method of promoting positive health of the individual in both his/her personal and professional life, and potentially of society in general. It may be useful as a preventative method, requiring only minimal expenses to provide yoga interventions to large groups of people. Yoga may save health insurance companies substantial financial expenditures on health treatment costs (Damodara et al., 2002), and could also save the corporate infrastructure financial expenditures on employee turnover and work-related injury. Yoga may even be capable of reducing government expenditures on crime prevention and investigation (Dillbeck et al., 1988).

Specifically, it is clear from the research that yoga has the potential to positively impact physical and psychological health. The potential effects of yoga for physical health are numerous, including improved physical fitness (Armstrong & Smedley, 2003; Collins, 1998; Gharote, 1976; Mandanmohan et al., 2003; Raub, 2002; Ray et al., 2001; Telles et al., 1993), and improved cardiovascular health (Brownstein & Dembert, 1989; Jayasinghe, 2004; Raub; Shannahoff-Khalsa et al., 2004). Scientific evidence indicates that yoga may be useful for musculoskeletal health, including conditions, such as arthritis (Garfinkel & Schumacher, 2000;
Goodyear-Smith & Arroll 2004; Greendale et al., 2002; Kolasinski et al., 2005; Luskin et al., 2000; Michlovitz, 2004; Muller et al., 2004; Raub), although stronger empirical support is needed to further understand this possibility (Hanada, 2003). Evidence also supports yoga’s usage for respiratory conditions (Birkel & Edgren, 2000; Telles et al., 2000; Vempati & Telles, 2002), including asthma (Goyeche et al., 1982; Nagendra & Nagarathna, 1986; Ram et al., 2003; Sathyaprabha et al., 2001; Vedanthan et al., 1998; Vijayalakshmi et al., 1988). Finally, yoga has been identified as useful for a wide variety of clinical populations, including cancer (Bower et al., 2005), epilepsy (Panjwani et al., 2000, Yardi, 2001), and HIV (Bonadies, 2004).

Psychologically, yoga may reduce hostility (Bhushan & Sinha 2001), improve mood (Berger & Owen, 1992; Lavey et al., 2005; Netz & Lidor, 2003), and reduce stress (Bower et al., 2005; Brown & Gerbarg, 2005b; Carlson et al., 2004; Gura, 2002; Heilbronn, 1992; Latha & Kaliappan, 1992; Lerner & Remen, 1987; Patel, 1975; Rubin & Feeney, 1986; Shapiro et al., 2005). Yoga has demonstrated potential as both a clinical treatment, and a self-help technique for symptoms of anxiety (Broota & Sanghvi, 1994; Malathi & Damodaran, 1999; Miller et al., 1995; Venkatesh et al., 1994) and depression (Berger & Owen, 1992; Broota & Dhir, 1990; Janakiramaiah et al., 2000; Kaye, 1985; Lavey et al., 2005; Ray et al., 2001). Several controlled studies have concluded that yoga can be effective in the management of chronic pain, both through increased flexibility and mobility, and also through reduced sensation and awareness of pain (Galantino et al., 2004; Graves et al., 2004; Williams et al., 2005). Yoga may also improve sleep quality and reduce symptoms of insomnia (Khalsa, 2004), potentially through its impact on melatonin levels (Tooley et al., 2000). Smaller bodies of research indicate that yoga offers potential benefits as part of substance abuse and treatment programs (Benson, 1974; McIver et al., 2004; Swinyard et al., 1974), ADHD treatment (Harrison et al., 2004) and as an intervention for clinical disorders such as OCD (Shannahoff-Khalsa, 2003), and schizophrenia (Dosajh, 1995). Yoga training may also lead to improved body awareness (Rani & Rao, 1994), and increased self-esteem (Cusumano, 1992; Cusumano & Robinson, 1993; Harrison et al.; Roth & Creaser, 1997).

Overall, yoga offers individual practitioners the promise of health and well-being, which may help to explain its current surge in popularity. Still, claims of yoga as a cure-all are not entirely supported by the research; many claims are only minimally supported by empirical evidence, and some studies have even found minimal or non-significant changes (Kröner-Herwig
Further regulation of the yoga industry is warranted, as some applications of yoga may actually be harmful (for instance, with bipolar patients, Brown & Gerbarg, 2005b, or other cases of psychosis, Yorston, 2001). Currently, there are no governmental regulations of yoga teachers or yoga studios, which may be problematic for the 63.7% of yoga practitioners (Saper et al., 2004) who practice yoga for its proposed preventative health benefits.

Mechanisms of Yoga in Psychological Health

Various underlying mechanisms for the effect of yoga on psychological health have been proposed. The impact of yoga on psychological health may be due to its capacity for lowering excitability and increasing concentration and self-control (Sharma et al., 2005). Physiological explanations have also been identified. It may be that yoga improves psychological well-being by altering blood chemistry (Kolsawalla, 1978; Wallace). Brown and Gerbarg (2005a) proposed a neurophysiologic model of yoga effects, which indicated, “mechanisms contributing to a state of calm alertness include increased parasympathetic drive, calming of stress response systems, neuroendocrine release of hormones, and thalamic generators” (p. 189). Meditation may even alter the structure of the brain, with experienced meditators having thicker layers in their cerebral cortices (Kaufman, 2005). Additional studies have attempted to understand yoga’s impact by investigating physiological effects, including brain wave patterns (Corby et al., 1978; Dostálek, 1970, 1979; Elson et al., 1977; Lou et al., 1999; Roldán & Dostálek, 1985; Roldán et al., 1983; Yamazaki et al., 1987), body temperature (Benson et al., 1982), and sensory perceptions (Telles et al., 1995; Telles and Naveen 2004). Of particular importance for further understanding is the identification of the underlying psychological mechanisms of yoga’s effects.

Traditional yoga theory indicates that the effects of yoga are due to its combined impact on the mind and body. Yoga practice teaches an individual new behaviors – physical activities (exercises and breathing practices), which can be implemented in order to manage responses and reactions. These altered responses and reactions facilitate improved outcomes. Moreover, yoga practice teaches an individual new cognitions – new ways of perceiving, judging, and assessing their circumstances. The alteration of thoughts and actions helps the yoga practitioner to achieve psychological balance in the present moment, which leads to health and well-being. Cognitive behavioral therapies hold that psychological distress is caused by disturbances in the cognitive processes, and that a psycho-educational approach designed to teach new cognitions and more
productive behaviors can eliminate psychological distress (Corey, 2005). Yoga may, therefore, be viewed as an ancient form of cognitive behavioral therapy.

Cognitive-Behavioral Theory as an Explanation for the Impact of Yoga

Research has previously indicated that yoga’s benefits may be due to changes in blood chemistry (Wallace, 1970), neurophysiological effects (Brown and Gerbarg, 2005a), or even alteration of brain structure due to yoga (Kaufman, 2005). While all of these physiological mechanisms are likely to be an important part of yoga’s impact, classical yoga philosophy holds that its power is in altering an individual’s psychological functioning. Yoga helps the individual to overcome the use of defense mechanisms, and to understand reality based on sensory input, as opposed to interpreting reality based on potentially flawed cognitive patterns (Kolsawalla, 1978).

According to yoga theory, a main purpose of yoga practice is the cultivation of greater self-control. “If you study one of the major treatises on yoga, the Yoga Sutras of Pantanjali, in the very first sutra it has been stated that yoga is a form of discipline – anushasana. Shasan means to govern, to rule, and anu means the subtle aspect, the subtle dimensions. Therefore, the meaning of anushasana is governing the subtle aspect of human personality” (Saraswati, 2001, p. 20). Through practicing yoga, the individual cultivates an ability to control the mind (Kolsawalla), and learns to manage his emotional reactions to environmental stimuli. Yoga also helps the individual to lower excitability levels and increase concentration (Sharma et al., 2005).

According to Balodhi and Mishra (1983) the disciplines of yoga as outlined by Pantanjali are techniques, like behavior therapy techniques, which teach greater cognitive control, and therefore help the individual to control, modify, or eliminate “pathological states and reactions” (p. 197). Baer (2003) has likewise suggested that the results of mindfulness practices occur in response to cognitive mechanisms such as insight, self-monitoring, self-control, self-acceptance, and self-understanding. Kolsawalla proposed that yoga and meditation are best suited to management of the thoughts. Yoga has not previously been investigated through the theoretical perspective of self-control as proposed by Rosenbaum (1980), and this variable warrants consideration as a foundation for yoga research.

Self-control. Kanfer (1977) proposed that self-management techniques are directed at helping the individual to learn independence of the environment, and therefore to be in control of his/her behavior, regardless of external stimuli. According to Rosenbaum (1980), self-control is a learned ability, which varies across individuals, based on their learning histories. Rosenbaum
suggested that self-controlling responses were “cued by any internal event such as anxiety, pain, or thought that disrupts the effective performance of a target behavior. Self-controlling responses are then directed at reducing the interference caused by such events” (p. 110). The concept of self-controlling behavior includes four components: (1) use of cognitions to control emotional/physiological responses, (2) application of problem-solving strategies, (3) ability to delay immediate gratification, and (4) perceived self-efficacy. Rosenbaum indicated that self-efficacy is a necessary component of self-control, because an individual “must believe that he can control his own behavior without outside help” (p. 111) in order to utilize self-control mechanisms.

Self-management techniques are a mechanism for teaching individuals a greater sense of self-control (Goldfried & Merbaum, 1973; Kanfer, 1977; Mahoney & Thoresen, 1974; Thoresen & Mahoney, 1974). According to Balodhi and Mishra (1983), yoga and behavior therapy have similar frameworks, with both theories proposing that the individual can learn to transform his reactions by modifying his interpretations of stimuli. In fact, the concept of teaching self-control is so integrated in the theory and practice of yoga that the word pranayama, which refers to yoga breathing techniques, literally translates as “control of energy” (Brown & Gerbarg, 2005a). Central to the practice of yoga are pranayama and asanas, or physical exercises. In asanas, the body is held in stillness in a physical posture for a specific length of time (at least for five full breaths, as long as 5 minutes in some yoga classes, and sometimes even for one hour in certain yoga traditions). The physical holding of the body is meant to teach muscular control, but even more importantly mental control, because yoga theory proposes that pain and discomfort are due more to perceptions than to physical realities. As originally outlined by Pantanjali, yoga is a practice of discipline, which ultimately leads to a “steady control of the sense and mind” (Iyengar, 1966, p. 20). Yoga, therefore, is an intervention whose primary purpose and effect is the cultivation of self-control, and it is proposed that this may be the mechanism through which yoga improves psychological health and well-being. Previous researchers have discussed yoga’s role in improving self-control (Kolsawalla, 1978; Murray, 1982; Sharma et al., 2005), but this has not been empirically investigated. A model of the effects of yoga through the perspective of Cognitive Behavioral Theory may provide a theoretical structure for future yoga research, and an investigation of yoga implementing Rosenbaum’s (1980) concept of self-control could provide additional understanding to the body of yoga knowledge. It is proposed that the increased levels
of self-control, which result from a yoga practice, lead to enhanced psychological health and functioning.

Purpose of the Study

Yoga is an integrated practice of mental and physical fitness, which offers the potential to improve health (Bower et al., 2005; Jayasinghe, 2004; Nagendra & Nagarathna, 1986; Raub, 2002; Williams et al., 2005) and psychological well-being (Brown & Gerbarg, 2005a; Brown & Gerbarg, 2005b; Netz & Lidor, 2003; Shannahoff-Khalsa, 2003; Shannahoff-Khalsa & Beckett, 1996). However, although 16.5% of yoga practitioners are age 54 or older (Saper et al., 2004), only a few studies have investigated the impact of yoga on older adults (Alexander et al., 1989; Allen & Steinkohl, 1987; Haber, 1988). Yoga could offer a low-cost, and minimally invasive treatment protocol, which is easy to deliver to older adults in group format. Therefore, the purpose of this study was to examine the effects of yoga on psychological health in older adults. The investigation focuses on psychological components previously identified as subject to change in older adults, due to exercise intervention, specifically anger, anxiety, depression, overall well-being, physical symptoms, positive affect, and self-efficacy (Netz et al., 2005). Physical symptoms are assessed in terms of physiological arousal. Previous studies’ findings indicated the impact of yoga on physiological measures such as brain wave patterns (Corby et al., 1978; Dostálek, 1970, 1979; Elson et al., 1977; Lou et al., 1999; Roldán & Dostálek, 1985; Roldán et al., 1983; Yamazaki et al., 1987), body temperature (Benson et al., 1982), and sensory perceptions (Telles et al., 1995; Telles & Naveen, 2004), but the impact of yoga on physiological measures has not been investigated with older adults. It is proposed that yoga practice would lead to reduced physiological arousal. Self-control is proposed as the psychological mechanism underlying the benefits of yoga. Yoga practice is expected to increase reported self-control. A relationship between reported level of self-control and other measures of psychological health is anticipated.

Of interest is whether the benefits of yoga are due merely to physical exercise, or rather due to the unique characteristics of yoga. A yoga intervention, which provides the essential components of traditional Hatha yoga – encompassing pranayama (yogic breathing exercises), asana (yogic physical exercises), and meditation, was implemented, in order to preserve the holistic qualities of the yoga format. The intervention was an adapted form of Hatha Yoga in
which asanas have been modified according to the physical constraints of older adults (Christensen, 1995).

The following hypotheses were proposed:

(1) Participants in a chair yoga group will report improved psychological health, in comparison to participants in chair exercise or wait-list (control) groups, as indicated by:
   a. Decreased state and trait anger.
   b. Decreased state and trait anxiety.
   c. Decreased depression.
   d. Increased overall well-being.
   e. Increased general self-efficacy.
   f. Increased self-efficacy for activities of daily living.

(2) Participants in a chair yoga group will demonstrate lower heart rate levels than participants in the chair exercise group, as indicated by comparison of heart rate between yoga meditation sessions and exercise stretching/relaxation sessions. Differences in heart rate are not anticipated between the chair yoga asana and chair exercise strengthening/balancing portions of the class.

(3) Self-control is the underlying mechanism of the psychological benefits of yoga. Therefore:
   a. Yoga participants will report increased levels of self-control due to the intervention; and
   b. Improvements in psychological health will be correlated with increased perceptions of self-control.
CHAPTER 2

METHOD

Participants

Participants were recruited from two North Florida facilities. Facility A was a North Florida community activities facility for older adults. Users of the facility were predominantly female, retired, and married or widowed. Participants used the facility on a daily basis for low-cost and free activities, including: exercise classes, library and computer services, lunch program, and social events such as card playing and lectures. Facility B was a North Florida senior living community (non-assisted living). Residents of the facility were predominantly female, retired, and widowed. Residents of the facility lived in independent apartments and were self-sufficient for personal care, but received assistance from facility management and staff for transportation, cleaning, and cooking. As well, free activities were provided at the facility for residents, including bingo, arts and craft activities, library and computer services, and excursions to community events.

In their meta-analysis of physical activity and psychological well-being in advanced age, Netz et al. (2005) used an age inclusion criterion of a mean age of 54 years or older. Previously, however, McAuley and Rudolph (1995) included studies with participants as young as age 45, in a narrative review of physical activity, aging, and well-being. As Netz et al. indicated “any definition of ‘old’ is arbitrary” (p. 274). Netz et al. classified older adults participant groups as late middle age (54 – 64 years), young-old (65 – 74 years), and old-old (age 75 and over). This study focused on young-old and old-old participants, and recruited subjects had a minimum age of 65.

In a meta-analysis of yoga (Bonura, Aloe, Tenenbaum, & Becker, 2006), the unweighted effect size across all treatment and control groups was $ES = 0.65$. However, the unweighted effect size for yoga groups in studies meeting EBI standards was $ES = 0.48$. Using this more conservative estimate, in order to achieve a minimum power of .80, with $\alpha = 0.05$, for three groups, a minimum number of 21 subjects per group was required (Cohen, 1977). In order to protect against the effects of attrition on power, a minimum number of 75 subjects was established ($N = 75; n = 25$). Across both locations, 98 individuals (ages 65 to 92; $M = 77.04$, $SD$
were recruited to participate in the study. Participant demographic information is presented in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Females</td>
<td>74</td>
<td>75.50</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>24</td>
<td>24.50</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Married</td>
<td>34</td>
<td>34.70</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>7</td>
<td>7.10</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>40</td>
<td>40.80</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>17</td>
<td>17.30</td>
</tr>
<tr>
<td>Occupational Status</td>
<td>Full-time Work</td>
<td>5</td>
<td>5.10</td>
</tr>
<tr>
<td></td>
<td>Part-time Work</td>
<td>3</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td>Disabled</td>
<td>13</td>
<td>13.30</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>76</td>
<td>76.00</td>
</tr>
<tr>
<td></td>
<td>Never worked</td>
<td>1</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Participants were physically active; 91 (92.90%) of them indicating that they exercised regularly, on average 3.95 days per week for 41.58 minutes. Table 2 presents participant pre-intervention exercise practices.

Table 2

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days exercising per week</td>
<td>3.95</td>
<td>2.15</td>
</tr>
<tr>
<td>Minutes per exercise session</td>
<td>41.58</td>
<td>18.86</td>
</tr>
</tbody>
</table>

Instrumentation

Two forms were administered to the participants at baseline data collection: a medical history form and a demographic questionnaire. Netz et al. (2005) identified seven psychological components, which were most sensitive to change in older adults, due to exercise intervention, specifically, anger, anxiety, depression, positive affect, overall well-being, self-efficacy, and physical symptoms. Changes in these dimensions were assessed by the State-Trait Anger Expression Inventory, the State-Trait Anxiety Inventory, the Geriatric Depression Scale, Lawton’s PGC Morale Scale, the General Self-Efficacy Scale, the Chronic Disease Self-Efficacy Scales, and physiological arousal. In addition, the Self-Control Schedule measured changes in
participant perceptions of self-control.

Medical history form (Appendix A). The medical history form was provided by the Florida State University Office of Research. Participants were asked to provide information about current or chronic medical conditions and prescription drug usage, as well as to indicate their primary care physician. This information allowed the instructor to adapt exercise programming as needed to accommodate all participants. The medical history form served as a screening tool for individuals for whom exercise was contraindicated, due to pre-existing health conditions. No individuals were prevented from entering the program due to the medical history form, however, modifications of exercises were provided based on participant characteristics (for instance, modified postures due to hip and knee injuries or replacements).

Demographic questionnaire (Appendix B). The demographic questionnaire included age, gender, marital status, occupational status, and baseline level of physical activity.

State-Trait Anger Expression Inventory. (STAXI, Spielberger, 1999; Appendix C). The STAXI is a 57-item inventory, which measures both intensity of anger as an emotional state and disposition to experience angry feelings as a personality trait. Additional sub-scales on the inventory assess anger expression and anger control. The STAXI is designed to assess anger in both abnormal and normal personality, and to evaluate the “contributions of components of anger to the etiology and progression of medical conditions” (Suris et al., 2004). The STAXI is considered “the most thorough instrument of its kind” (Clark, 2003).

The trait scale contains 10 items that assess the tendency to experience and express anger. Participants score items using a four-point response scale from 1 (not at all) to 4 (very much so). Questions include “I have a bad temper,” “I get angry when I’m told I’m wrong in front of others,” and “I feel infuriated when I do a good job and get a poor evaluation.” The state scale contains twelve items, also scored on the four-point scale, which include “I feel like kicking someone,” “I feel angry,” and “I feel like swearing.”

Evidence of concurrent, convergent, divergent, and predictive validity for the STAXI-2 have all been established (Suris, et al., 2004). Trait anger scores were significantly correlated with hostility score on the Minnesota Multiphasic Personality Inventory (MMPI) ($p < .01$) in both college students and Navy recruits (Spielberger, 1999). Evidence of convergent validity for the STAXI-2 includes moderately high correlations between the anger expression scale and the trait anger scale (.47 to .58, $p < .001$; Spielberger). STAXI Anger Expression scales did not
correlate with the State–Trait Personality Inventory (STPI) T-Curiosity scale, providing evidence of divergent validity (Spielberger). Furthermore, trait anger scores predicted elevations in blood pressure, even after controlling for traditional risk factors (Markovitz, Matthews, Wing, Kuller, & Meilahn, 1991). Internal consistency for the total scale ranges from .73 to .95, and internal consistencies for subscales range from .73 to .93.

State-Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; Appendix D). The STAI is a 40-item inventory, which assesses both state (e.g., how an individual feels at a particular moment in time) and trait (e.g., how an individual generally feels) anxiety. Both the 20-item A-Trait scale and the 20-item A-State scale were utilized. The exercise literature indicates that the STAI is one of the most frequently used instruments for assessing the psychological benefits of exercise, although certain cautions are warranted, because the STAI has not been validated for exercise purposes (Gauvin & Spence, 1998). The STAI has been established as a valid and reliable tool for assessing anxiety in research and in clinical populations (Gauvin & Spence).

The A-Trait scale includes 20 items, which direct the individual “to indicate how you generally feel.” Individuals are asked to rate these items from 1 (not at all) to 4 (very much so). Items include non-anxious statements, such as, “I feel pleasant,” “I feel secure,” and “I feel rested,” as well as anxious comments such as, “I have disturbing thoughts,” “I feel inadequate,” and “I take disappointments so keenly that I can’t put them out of my mind.” To calculate the STAI score: (1) reverse scores for the anxiety-absent items (i.e., for items such as “I am happy,” responses marked by the subject as 1, 2, 3, or 4 are scored 4, 3, 2, or 1, respectively), (2) then sum the weighted scores for all items. Mean A-Trait scores range from 34.79 (working adult females) to 53.43 (depressive reaction psychiatric patients) (Spielberger et al., 1983).

Test-retest of A-Trait is reasonably high (ranging from .73 to .86), indicating stability of psychological trait (Spielberger et al., 1983). Internal consistency for the trait dimension was uniformly high, with a median alpha coefficient of .90 (Spielberger et al.). Concurrent validity of the STAI was established with the IPAT Anxiety Scale, the Taylor Manifest Anxiety Scale, and the Zuckerman Affect Adjective Checklist. Correlations of the STAI with the IPAT and the TMAS were moderate to high (.73 to .85) for samples of college students and clinical patients (Spielberger et al.). Construct validity of the STAI was assessed by contrasting scores between groups low and high in anxiety (for instance, neuropsychiatric patients versus normal subjects;
military recruits versus college students in non-stressful conditions; Spielberger et al.). Construct validity was further established through correlations with other personality inventories, and through comparisons between scores of college students placed in high stress and low stress conditions (Spielberger et al.).

The A-State scale includes 20 items, which direct the individual “to indicate how you feel right now, that is, at this moment.” Individuals are asked to rate these items from 1 (not at all) to 4 (very much so). Items include non-anxious statements, such as, “I feel calm,” “I feel secure,” and “I feel joyful,” as well as anxious comments such as, “I am worried,” “I am jittery,” and “I feel high strung.” Test-retest of A-State is low (ranging from .16 to .54), indicating alterations in psychological state (Spielberger, Gorsuch, & Lushene, 1970). Internal consistency for the state dimension was reported to be .82 (Gauvin & Spence, 1998). Overall, results indicate that the STAI adequately measures both trait and state anxiety.

Geriatric Depression Scale (GDS, Yesavage & Brink, 1983, Appendix E). The GDS is a 30-item inventory, which was designed specifically for rating depression in the elderly. According to Yesavage and Brink, commonly used depression inventories (such as the Beck Depression Inventory or the Hamilton Rating Scale for Depression) may be inadequate in assessing depression in an elderly population. Somatic conditions, which may indicate depression in the young, may be associated with age-related changes experienced by many adults (for instance, sleep disturbances and diminished sexual function), and may therefore fail to discriminate between depressed and non-depressed older adults (Yesavage & Brink, 1983). Questions intended to assess suicidal ideation (e.g., statements about whether life is worth living, whether one has hope for the future, and whether one has contemplated death) may have different meanings for an older population “reaching the end of their lifespan” (Yesavage & Brink, p. 38). Therefore, the GDS is designed to provide a simple, easy to understand depression inventory, which is appropriate for an older adult population.

The scale instructions state “choose the best answer for how you felt over the past week.” Individuals are asked to answer each question “yes” or “no.” Twenty items, when answered positively, indicate the presence of depression. These items include: “Have you dropped many of your activities and interests?” “Do you think that most people are better off than you are?” “Do you prefer to avoid social gatherings?” and “Do you often feel helpless?”. Ten additional questions, when answered negatively, indicate depression. These include: “Are you basically
satisfied with your life?” “Do you find life very exciting?” and “Is it easy for you to make decisions?” After reversing the 10 negative items, each “yes” (i.e., indication of depressive symptom) is counted as one point. The total score is the sum of all points, and the total possible score is 30. GDS cutoff ranges are normal, 0-9; mild depressives, 10-19; and severe depressives, 20-30. Exploratory factor analysis suggested a two-factor structure for the GDS, with component subscales indicating depression and positive affect (Friedman, Heisel, & Delevan, 2005).

Several researchers have reported that the GDS has high levels of both internal consistency and test-retest reliability (i.e., temporal stability). Lesher (1986) tested the GDS with nursing home resident (n = 51), reporting a mean age of 82.73. Coefficient alpha was .99, and test-retest was .94, for two test administrations, which were one month apart. Parmelee, Lawton, and Katz (1989) administered the GDS to 806 elderly individuals in nursing homes and senior citizen apartment communities (with a mean age of 84). The GDS had high internal consistency (Cronbach’s alpha = .91). Iwamasa, Hilliard, and Kost (1998) reported that the GDS was both reliable and internally consistent in assessing older ethnic minority American adults. Wynkoop, Mothersead, Fredericks, and Barstow (1999) reported an internal consistency of .86, when the GDS was administered to post-acute hospitalized stroke patients. Peach, Koob, and Kraus (2001) concluded that the GDS demonstrated a “respectable level” (p. 62) of reliability.

Lesher (1986) assessed the GDS for validity by comparing a group of non-depressed subjects with subjects who had been diagnosed with either mild or major depression. He reported that the GDS was a valid measure for screening depression in nursing home residents. Other researchers have assessed validity of the GDS by comparing GDS scores with staff ratings of depression, symptom checklists, and clinical diagnosis (Parmelee et al, 1989), by correlating GDS scores with other depression instruments, including measures of global psychological distress and functioning (Rapp, Parisi, Walsh, & Wallace, 1988), and by assessing depressive symptoms of hospitalized elderly (Lyons, Strain, Hammer, Ackerman, & Fulop, 1989). Peach et al. (2001) report that the GDS has suitable validity and is appropriate for measuring depressive symptoms in older adults.

Lawton’s PGC Morale Scale (PGC, Lawton, 2003; Appendix F). The Philadelphia Geriatric Center (PGC) morale scale was designed to assess morale in a simple format, which is easily accessible by older adults. With the 17-item revised version of the PGC, respondents answer “yes” or “no” to questions. Each high-morale response is scored as 1 and each low-
morale response is scored as 0. The score sheet indicates which response (i.e., yes or no) is high morale for each question; total scores range from 0 – 17, with higher scores indicating greater morale. Items include, “I have as much pep as I had last year” (“yes” indicates high morale), “I sometimes worry so much that I can’t sleep” (“no” indicates high morale), “I am as happy now as I was when I was younger” (“yes” reflects high morale), and “Life is hard for me much of the time” (“no” reflects high morale). No performance norms were established for the PGC, however, as general guidelines, scores at 13 - 17 are considered high scores on the scale, 10 - 12 fall within the mid range, and scores under 9 are at the low end of the scale (Lawton).

Lawton (1975) developed the PGC to provide a multidimensional approach to assessing the psychological state of older people. The scale uses simple wording and less complex responses in order to make it accessible to older adults with visual, auditory, or cognitive impairments. Lawton proposed that the global psychological concept of morale was composed of three specific dimensions, namely agitation, attitude toward one’s own aging, and lonely dissatisfaction. Lawton proposed that anxiety as experienced by older adults was “restless” (Lawton, 2003, p. 3), and he assessed this as agitation. Attitude toward one’s own aging encompassed both the individuals’ perception of the aging process and his/her evaluation of the impact of experienced changes. Lonely dissatisfaction sought to quantify not the quantity or quality of older adults’ social relationships and interactions, but rather the level of satisfaction or acceptance, which older adults expressed with regards to social interactions. Factor analysis has confirmed item loadings on the three dimensions, and a larger set of initial items was reduced to the 17-item PGC scale format based on factor analysis results (Lawton, 1972). Overall reliability for the PGC scale and its components has been established (Morris & Sherwood, 1975); reported Cronbach’s alpha range from 0.72 (Gerritsen, 2004) to 0.84 (Jongenelis, 2004).

General Self-Efficacy Scale (GSE, Schwarzer & Jerusalem, 1995, Appendix G). The GSE, originally developed in German in 1979 and translated into 26 other languages (including English in 1993), is designed to assess general perceived self-efficacy. The GSE is intended to predict coping with daily hassles, as well as, adaptation after experiencing all kinds of stressful life events (Jerusalem & Schwarzer, 2006). Respondents complete ten items with answers ranging from 1 (not at all true) to 4 (exactly true). Items include: “I can always manage to solve difficult problems if I try hard enough,” “I am confident that I could deal efficiently with unexpected events,” “If I am in trouble, I can usually think of a solution,” and “can usually
handle whatever comes my way.” No recoding is necessary and final scores range from 10 (low perceived self-efficacy) to 40 (very high perceived self-efficacy).

According to Schwarzer (1992), perceived self-efficacy is a construct which reflects optimistic self-belief, which is “the belief that one can perform a novel or difficult tasks, or cope with adversity -- in various domains of human functioning.” (Schwarzer & Jerusalem, 2006, Description section, para 1). They report that “perceived self-efficacy is an operative construct … related to subsequent behavior and, therefore, is relevant for clinical practice and behavior change” (Schwarzer & Jerusalem, Description section, para 1) and indicate that increased levels of perceived self-efficacy facilitate goal-setting, effort investment, persistence, and recovery. Clinical applications have included assessment of patients before and after surgery, to determine the psychological impacts of the surgery and recovery process, as part of rehabilitation, and to assess the psychological impacts of chronic pain (Schwarzer & Jerusalem, Coverage section, para 1).

According to Schwarzer and Jerusalem (2006), reliability tests in 23 nations have yielded Cronbach’s alphas ranging from .76 - .90, with the majority in the high .80s. Retest reliability reports include $r = .67$ after six months, $r = .75$ after one year, and $r = .63$ after two years (Schwarzer & Scholz, 2000). Principal component analysis confirmed the unidimensionality of the scale (Schwarzer & Scholz); a unidimensional structure was also identified by Schwarzer and Born (1997), with data from 13 other samples. Criterion-related validity has been demonstrated in numerous correlational studies. GSE results have been positively correlated with positive emotions, such as optimism and work satisfaction, and that negative correlations have been identified with constructs such as anxiety, depression, stress, burnout, and health complaints (i.e., with higher GSE scores being related to lower levels of anxiety, depression, etc., and vice versa). In one study with cardiac patients, pre-surgery self-efficacy effectively predicted recovery over a six-month period (Schwarzer & Jerusalem). Overall, Schwarzer and Jerusalem report two decades of research and application across cultures and languages, and a broad base of applicability. Although the GSE does not assess specific behavior changes, it can be used to assess both general quality of life and adaptability to change in general.

Chronic Disease Self-Efficacy Scales (CDSES, Lorig et al., 1996; Appendix H). The Chronic Disease Self-Efficacy Scales were developed and tested for the Chronic Disease Self-Management study. The CDSES measures self-efficacy for areas of daily living, which are
relevant to an older population, including the capacity for self-care, social activities, and health management.

The CDSES includes 33 items, which measure an individual’s self-efficacy in 10 domains. Individuals are asked to report confidence in their ability to complete a task for each item from 1 (not at all confident) to 10 (totally confident). The 10 domains, and examples of representative questions, are: (1) Exercise regularly (“How confident are you that you can do aerobic exercise such as walking, swimming, or bicycling three to four times each week?”), (2) Get information about disease (“How confident are you that you can get information about your condition from community resources?”), (3) Obtain help from community, family, friends (“How confident are you that you can get emotional support from friends and family, such as listening or talking over your problems?”), (4) Communicate with physician (“How confident are you that you can work out differences with your doctor when they arise?”), (5) Manage disease in general (“How confident are you that you can do things other than just taking medication to reduce how much illness affects your everyday life?”), (6) Do chores (“How confident are you that you can get your errands done?”), (7) Social/Recreational activities (“How confident are you that you can continue to do your hobbies and recreation?”), (8) Manage symptoms (“How confident are you that you can reduce your physical discomfort or pain?”), (9) Manage shortness of breath (“How confident are you that you can keep your shortness of breath from interfering with what you want to do?”), and (10) Control/Manage depression (“How confident are you that you can keep yourself from feeling lonely?”). The score for each item is the number reported; if a subject circles two numbers, the lower number (less self-efficacy) is the score for that item. The score for each domain scale is the mean of the items.

The CDSES was tested with 478 subjects. Observed scores ranged from 1 – 10, and domain means ranged from 5.87 (self-efficacy for managing shortness of breath) to 7.37 (self-efficacy for getting information on disease). Internal consistency reliability was adequate, ranging from .82 to .92. Test-retest reliability was also acceptable, ranging from a low of .72 (self-efficacy for getting information on disease) to .89 (self-efficacy for managing symptoms).

Measure of physiological arousal. Polar 610i Series Heart Rate Monitors (Lake Success, New York) were used to measure heart rate during sessions. The monitor strap was dampened with water and positioned snugly around the participant’s chest; with the sensor centered in the middle of the chest (female participants were asked to adjust the sensor directly between their
breasts). The participant wore the watch monitor to facilitate clear and accurate readings, throughout the exercise session. A Polar IR interface was used to upload data through infrared connection and into Polar Precision software. Data was then transferred into Microsoft Excel and SPSS for analysis.

*Self-Control Schedule (SCS, Rosenbaum, 1980, Appendix I).* The SCS is a 36-item inventory, which assesses an individual’s self-control behaviors, including (1) use of cognitions and self-statements to control emotional and physiological resources, (2) the application of problem solving strategies (such as planning or anticipation of consequences), (3) the ability to delay gratification, and (4) perceived self-efficacy. The scale directs the individual to “indicate how characteristic or descriptive each of the following statements is of you” Individuals are asked to rate these items from +3 (*very characteristic of me, extremely descriptive*) to -3 (*very uncharacteristic of me, extremely nondescriptive*). In a pilot test of this scale for the current project, some elderly individuals indicated confusion concerning the negative and positive items. Therefore, for the purpose of this project, participants were asked to score from 0 (*very uncharacteristic of me, extremely nondescriptive*) to 6 (*very characteristic of me, extremely descriptive*), and scores were transformed to the correct score during analysis.

Items include positively scored items such as “When I do a boring job, I think about the less boring parts of the job and the reward that I will receive once I am finished,” “When I am feeling depressed I try to think about pleasant events,” and “When I feel pain in a certain part of my body, I try not to think about it,” as well as reversed scored responses such as “I cannot avoid thinking about mistakes I have made in the past,” “I need outside help to get rid of some of my bad habits,” and “If I had the pills with me, I would take a tranquilizer whenever I felt tense and nervous.” A subject’s score on the SCS is the sum of all his/her responses.

Rosenbaum (1980) administered the SCS to six groups of subjects in order to obtain reliability and normative data; five samples were of undergraduate students, and the sixth sample was a group of 105 men with mean age 50.5 years (age range of 24 to 62 years). Test-retest reliability over a four-week period was .86 (*p* < .01), which indicates fairly high stability of the measure. The internal consistency alpha coefficients ranged between .78 and .84. For the older men, mean SCS score was 31.3, with a standard deviation of 23.2. Rosenbaum indicated, “the fairly high standard deviations obtained in all the samples reflect the existence of large individual differences in self-control behaviors” (p. 115).
To assess validity, Rosenbaum (1980) compared SCS scores with conceptually related measures, including Rotter’s Internal-External Locus of Control scale (1966), and the Irrational Beliefs Test (Jones, 1968). The Pearson correlation between Rotter’s I-E Scale and the SCS was $r = -.40$ ($p < .01$), indicating that the more individuals reported use of self-control behaviors, the less they believed in external control of their behavior. Individuals who reported use of self-control behaviors were less likely to hold irrational beliefs; the IBT was negatively correlated with the SCS on all 10 subscores; correlations ranged from -.07 to -.38, and all but one were significant. The total IBT score was significantly correlated with the SCS ($r = -.48$, $p < .001$). This indicates that individuals who expressed higher levels of self-control were less likely to express irrational beliefs.

Qualitative interviews. A short semi-structured interview was conducted post-intervention with each of the treatment (i.e., yoga) group participants to assess perceptions of the yoga program. A non-participatory individual was trained in the format of the interview and asked each participant:

- How did you feel about the program?
- What did you enjoy most about the program?
- What did you enjoy least about the program?
- Was there anything missing from the program that you wished you’d seen?
- How significantly do you feel the program affected your physical well-being?
- How significantly do you feel the program affected your psychological well-being?
- How significantly do you feel the program affected your spiritual well-being?
- If the program helped you, what characteristics of the program made it helpful?
- If the program didn’t help you, what characteristics of the program prevented it from being helpful?

Interventions

Of interest was whether the benefits of yoga are due merely to physical exercise, or rather due to the unique characteristics of yoga. A yoga intervention, which provided the essential components of traditional Hatha yoga – encompassing pranayama (yogic breathing exercises), asana (yogic physical exercises), and meditation, was implemented, in order to preserve the holistic qualities of the yoga format. The intervention was an adapted form of Hatha Yoga in which asanas were modified according to the physical constraints of older adults (Christensen,
As the beneficial effects of physical activity on psychological health have been identified, a chair fitness class served as a comparison group, in order to determine whether the beneficial effects of yoga on psychological health were merely due to the effects of physical activity, or whether a yoga protocol had unique properties which made it more effective than mere physical activity. Primary differences were the instructions for breathing and focusing, which are inherent in asana instruction, and the specific concentration directions provided during meditation. A third group of participants was assigned to a waiting list control group. Control group members had the opportunity to try both yoga and chair fitness after the intervention and all data collection was completed.

**Chair yoga group.** The yoga program was based on the *Easy Does It Yoga Trainer’s Guide* (Christensen, 1995), a safe and effective yoga program specifically developed for senior citizens. It was based on traditional Hatha Yoga, and has been modified for practice in a chair. Each session began with 5 minutes of meditation, continued with 30 minutes of asana, and concluded with 10 minutes of pranayama and meditation. Instructions for each exercise (pranayama and asana) included physical technique, breathing technique, and concentration and awareness. Meditation practice included specific instructions for posture and technique (such as, “sit with a straight posture, the knees directly above the ankles, feet pressing into the floor. Shoulders rolled back and down, while you lift the chest. Eyes are closed. Begin to focus on your breath, counting the exhalations”). The asanas which were utilized in the intervention were selected based on the American College of Sports Medicine Position Stand for Exercise and Physical Activity in Older Adults (Mazzeo et al., 1998). The ACSM Position Stand indicates that elderly individuals gain the most benefits from an exercise program which begins with strength and balance activities. This allows the elderly to develop the requisite abilities for participating in activities promoting cardiovascular endurance (Mazzeo et al.). Therefore, asanas focused on the development of muscular strength and physical balance. The class was conducted using both seated and standing postures. When standing asanas were performed, the chair back was accessible for stability. An example of a class lesson plan is provided in Appendix J.

**Chair exercise group.** The exercises selected for the chair fitness sessions paralleled the physical movements of the asanas selected for the chair yoga sessions as closely as possible, in order to determine if benefits of yoga were due to physical exercise or whether the unique combination of meditation and mindful movement in yoga practice provided additional benefits.
beyond exercise. The first five minutes included gentle stretching as warm-up exercises, as did the last ten minutes of cool down exercises. The middle 30 minutes of each session included more challenging strength and balance exercises, which were comparable to the asanas practiced in the yoga session.

Comparison of chair yoga and chair exercise groups. Each chair yoga session began with 5 minutes of meditation, continued with 30 minutes of asana, and concluded with 10 minutes of pranayama and meditation. The 30 minutes of asana included specific instructions for breathing and concentration technique. Each chair exercise session consisted of 5 minutes of stretching, 30 minutes of strength and balance work, and 10 minutes of stretching. The physical exercises paralleled the physical movements of the yoga sessions. Figure 1 presents a comparison of the class timelines for a single session of chair yoga and chair exercise.

Figure 1. Comparison of class timelines for a chair yoga and a chair exercise session.

No treatment control group. A third group of participants was randomly assigned to a wait-list condition, in order to control for changes in psychological variables, which may occur merely due to the passage of time. Individuals in the no treatment control group received attention from the instructor/researcher during three sessions of data collection.

Design and Procedure

Florida State University Human Subjects Committee approval for this research project was obtained (Appendix K). Potential participants were informed that they had the opportunity to
participate in free fitness classes with a trained instructor. They were informed that their participation with research questionnaires would contribute to the general body of knowledge about exercise. Confidentiality of subjects was maintained. To protect the privacy of participants, the locations of the facilities also remained confidential.

Two locations were used to increase the number of participants, and therefore achieve desired experimental power. Two orientation sessions were held at each location. At orientation sessions, recruited individuals filled out consent forms (Appendix L) and health history forms, as well as the demographic survey, and baseline trait data (STAXI, STAI, GDS, PGC, GSE, CDSES, and SCS). All forms were provided in 14-point Times New Roman font, to facilitate reading, and subjects with visual impairment received assistance. After baseline data collection, recruited participants were randomly assigned to one of three groups (chair yoga, chair fitness, or wait list) at their location.

Classes met once per week for 45 minutes each session, over a six-week period. Six week interventions were previously implemented by Brownstein and Dembert (1989), Galantino et al. (2004), Harrison et al., 2004; Waelde et al., (2004). Murthy et al. (1998) reported that “[yoga] exerts its effect in about 3 weeks.” Brown and Gerbarg (2005b) reported that mood and affect might respond to yoga training very quickly, even within 5 days. Khalsa (2000) indicated that “real change” would result from yoga after 40 days (i.e., approximately 6 weeks) of practice. Participants were instructed to attend all exercise sessions and attendance was taken at each session.

Participants were given simple instructions to practice specific exercises on their own for 15 minutes during each non-class day. Brown and Gerbarg (2005b) reported that frequency of practice is a major factor in the response to yoga training, and therefore daily practice is suggested. According to Anderson and Sovik (2000), “it is better to be regular with a 15-minute session than sporadic with a longer practice” (p. 15). Iyengar (1966) also recommended practicing 15 minutes a day (p. 432). A protocol, which combines weekly class sessions with instructions for at-home individual practice, has previously been implemented by Carlson et al. (2004), Cohen, Warneke, Fouladi, Rodriguez, and Chaoul-Reich (2004), De Mayo et al. (2004), Galantino et al. (2004), and Harrison et al. (2004). The purpose of this format of instruction was to provide guided training in the exercises during weekly class sessions, and to help students
develop individual responsibility for incorporating exercise into their daily routine through home practice.

The exercise instructions for at-home practice were similar for both groups, except that yoga participants received instructions about specific breathing patterns to utilize during the physical exercises. A sample instruction sheet for at-home practice is presented in Appendix M. At each class session, participants were asked to indicate how many practice sessions they completed over the past week.

In each class session, half of the subjects in the class participated in assessments of physiological arousal throughout the class period. Heart rate measured changes in physiological arousal during yoga/exercise training, and each yoga/exercise subject was assessed three times over the course of the intervention (i.e., either first, third, and fifth session; or second, fourth, and sixth session). Mean heart rate for each five-minute period was recorded. Comparisons between the chair yoga group and the chair fitness group were made for the first five minutes (yoga meditation versus fitness warm-up), each five minute increment of the middle 30 minutes (yoga exercise versus parallel exercise), and five minute increments during the last ten minutes (yoga meditation and pranayama versus stretching and cool-down period). HR data was not collected for no-treatment control group subjects.

Yoga and exercise subjects completed the state scales of the STAI and the STAXI before and after the first, middle, and last session, and wait-list individuals completed the state scales on the same measurement days during similar timeframes. Participants completed the trait scales of the STAI and STAXI, and all other self-report measures, before the beginning of the intervention (before random assignment to groups), after the last session, and one month post-intervention. All data collection was done at the class location. Post intervention, each subject in the yoga treatment group was interviewed in a private 30-minute session, using the semi-structured qualitative format presented previously. After all measurements were completed, wait-listed individuals had the opportunity to participate in both types of exercise programming at their location.

Data Analysis

The first hypothesis, stating that a yoga intervention would lead to improvements in psychological health, was tested using a Repeated Measures Multivariate Analysis of Variance (RM MANOVA); anger, anxiety, depression, well-being, general self-efficacy, and self-efficacy
for daily living were dependent variables; time (i.e., pre, end, and one-month follow-up) was considered the within repeated factor, and treatment (i.e., chair yoga, chair exercise, and wait-list control) was used as the between-subjects factor. Significant ($p < .05$) main and interaction effects emerged, and Repeated Measures Analysis of Variance (RM ANOVA) was performed for each dependent variable separately, followed by LSD post hoc multiple mean comparisons. Standardized effect sizes were computed to assess differences among the three groups’ mean, as indicated by the main or interaction effects. The first hypothesis also stated that a yoga intervention would lead to greater reductions in state anxiety and state anger, than would exercise or waiting list conditions. State anger and anxiety, which were measured before and after 3 sessions (i.e., at the outset, middle, and end of the study), were subjected to similar analyses, but with two within repeated measures: time (3 levels) and pre-post (2 levels). Thus more interactions with treatment level emerged.

The second hypothesis, which stated that yoga participants were expected to demonstrate different patterns of physiological arousal, as measured by heart rate during the practice sessions, was tested using RM ANOVA with 9 time intervals (45 minute class session / 5 minute increments) and class sessions (3 class sessions) as within repeated factors and treatment (chair yoga and chair exercise) as a between subjects factor.

The third hypothesis, where yoga participants were expected to increase in self-control more than their counterparts, was tested using a RM ANOVA with time as a within repeated factor (pre/post/follow-up) and treatment (3 groups) as a between-subjects factor. The third hypothesis also stated that increases in self-control would be related to improvements in psychological health. Psychological health changes at the middle, end, and follow-up were correlated to self-control changes for each intervention group separately using Pearson Product-Moment Correlation (PPMC).
CHAPTER 3
RESULTS

Preliminary Results

Of the 106 individuals who began the study, 8 were dropped from the analysis due to missing data. The yoga group and exercise group each began with 35 individuals; 36 participants were assigned to the control group. Data was collected across all three data points for 33 individuals in the yoga and exercise groups, and for 32 control participants.

Equivalence of groups at baseline. Equality of groups at baseline was tested using a multivariate analysis of variance (MANOVA) for trait anger, trait anxiety, depression, well-being, general self-efficacy, and self-efficacy for daily living at baseline. Levene’s test of equality of variances showed non-significant (p > .05) differences among the three groups’ variances on each of the pretest measures, indicating equal variances. Initial screening of the data indicated no significant outliers and data appeared to meet the assumptions for multivariate analysis. Overall, Wilk’s $\lambda = .82$, $F(12,180) = 1.53$, $p = .12$, indicated non-significant differences among groups at pretest on the six variables. Between-subject effects for each of the dependent variables were also tested. Differences across groups were non-significant (p > .05) for all measures. Randomization resulted in equality of means across groups at baseline.

Class Attendance and Frequency of Practice

Chair yoga and chair exercise classes were each held for 45 minutes, once per week, for six weeks. All participants in both groups attended at least 4 of the 6 sessions. However, ANOVA revealed statistically significant differences in attendance, $F(1, 64) = 19.61$, $p < .001$. Yoga participants attended a mean of 5.70 classes ($SD = 0.64$) while chair exercise participants attended a mean of 5.03 classes ($SD = 0.59$).

Chair yoga and chair exercise participants were given simple instruction handouts and asked to maintain a daily 15-minute home practice of the exercise program. Group differences emerged, with yoga participants engaging in at home practice 2.37 times per week ($SD = 2.09$) and chair exercise participants practicing 1.42 days per week ($SD = 1.64$). These differences were statistically significant, $F(1, 64) = 4.25$, $p = .04$. Pretest, posttest, and follow-up values for psychological health were correlated to frequency of practice, using Pearson Product-Moment
Correlation (PPMC), while controlling for group assignment. Frequency of practice was significantly correlated with trait anger at pretest ($r = .27, p = .03, df = 63$), posttest ($r = .31, p = .01$), and follow-up ($r = .32, p = .01$). Frequency of practice was not significantly correlated with any other measures of psychological health.

**Main Analysis**

The first hypothesis, stating that a yoga intervention would lead to improvements in psychological health, was tested using a Repeated Measures Multivariate Analysis of Variance (RM MANOVA); trait anger, trait anxiety, depression, well-being, general self-efficacy, and self-efficacy for daily living were considered dependent variables; time (i.e., pre, end, and one-month follow-up) was the within repeated factor, and treatment (i.e., chair yoga, chair exercise, and wait list control) was the between-subjects factor. The means and standard deviations for the pretest, posttest, and follow-up values for the six variables for the Yoga, Exercise, and Control groups are summarized in Table 3.

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<th>Follow-up</th>
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<td>98</td>
<td>9.11</td>
<td>5.67</td>
</tr>
<tr>
<td><strong>Well-being</strong></td>
<td></td>
<td></td>
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<tr>
<td>Yoga</td>
<td>33</td>
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</tr>
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<td>33</td>
<td>10.94</td>
<td>2.86</td>
</tr>
<tr>
<td>Control</td>
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<td>10.66</td>
<td>4.34</td>
</tr>
<tr>
<td>Overall</td>
<td>98</td>
<td>10.24</td>
<td>3.62</td>
</tr>
<tr>
<td><strong>Gen Self-Efficacy</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>33</td>
<td>27.82</td>
<td>5.61</td>
</tr>
</tbody>
</table>
Table 3 Continued

<table>
<thead>
<tr>
<th></th>
<th>Exercise</th>
<th>Control</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga</td>
<td>33</td>
<td>32</td>
<td>98</td>
</tr>
<tr>
<td>Exercise</td>
<td>7.23</td>
<td>7.38</td>
<td>7.48</td>
</tr>
<tr>
<td>Group</td>
<td>1.23</td>
<td>1.22</td>
<td>1.19</td>
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<tr>
<td>Time by group</td>
<td>8.27</td>
<td>7.46</td>
<td>8.00</td>
</tr>
<tr>
<td>Group</td>
<td>1.21</td>
<td>1.16</td>
<td>1.26</td>
</tr>
<tr>
<td>Time by group</td>
<td>7.84</td>
<td>7.49</td>
<td>7.82</td>
</tr>
<tr>
<td>Overall</td>
<td>1.31</td>
<td>1.08</td>
<td>1.18</td>
</tr>
</tbody>
</table>

Self-Efficacy DL

a – Lower scores indicate greater psychological health.

b – Higher scores indicate greater psychological health.

**Multivariate effects.** Multivariate group effects were non-significant \((p > .05)\), while multivariate time effects and time by group interaction effects were both significant \((p < .05)\). The multivariate null hypothesis of equality of the means across time for all variables was rejected at the 0.05 level, Wilk’s \(\lambda = 0.46, F (12, 84) = 8.23, p < 0.001\). The Wilk’s multivariate effect size was 0.54. The multivariate null hypothesis for time by group interaction effects was also rejected at the 0.05 level, Wilk’s \(\lambda = 0.36, F (24, 168) = 4.63, p < 0.001\).

**Univariate effects.** To identify dependent variables, which contributed to the rejection of the multivariate null hypothesis for time and time by group interaction effects, univariate RM ANOVA’s were conducted for each of the psychological well-being dependent variables. These analyses are summarized in Table 4.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect</th>
<th>Wilk’s (\lambda)</th>
<th>(F)</th>
<th>(df)</th>
<th>(p)</th>
<th>(\eta^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>Time</td>
<td>.68</td>
<td>22.20</td>
<td>2, 94</td>
<td>.001</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>.34</td>
<td>2.95</td>
<td>.71</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time by group</td>
<td>.65</td>
<td>11.11</td>
<td>4, 188</td>
<td>.001</td>
<td>.19</td>
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<tr>
<td>Anxiety</td>
<td>Time</td>
<td>.60</td>
<td>31.52</td>
<td>2, 94</td>
<td>.001</td>
<td>.40</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>3.54</td>
<td>2, 95</td>
<td>.03*</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time by group</td>
<td>.84</td>
<td>4.29</td>
<td>4, 188</td>
<td>.002</td>
<td>.08</td>
</tr>
<tr>
<td>Depression</td>
<td>Time</td>
<td>.72</td>
<td>18.02</td>
<td>2, 94</td>
<td>.001</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>.71</td>
<td>2, 95</td>
<td>.49</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time by group</td>
<td>.69</td>
<td>9.51</td>
<td>4, 188</td>
<td>.001</td>
<td>.17</td>
</tr>
<tr>
<td>Well-being</td>
<td>Time</td>
<td>.66</td>
<td>24.39</td>
<td>2, 94</td>
<td>.001</td>
<td>.34</td>
</tr>
</tbody>
</table>
The analyses revealed that all time by group intervention interactions were statistically significant ($p < .001$ for all, except for anxiety where $p < .002$). Also the time univariate effects were statistically significant at the $p < .001$ level, but their relevance is of less importance. The time by group interaction effects are shown in Figure 2.

* Although the $p$-value for the anxiety group effect does achieve significance (0.03), the overall multivariate group effect was non-significant; therefore, according to principles of protected testing, this is not a significant result.

![Figure 2. Mean ratings for well-being variables by 3 groups and 3 time periods.](image-url)
To capture the significant group by time interaction, Table 5 presents standardized effect changes, which reflect the mean change by group, in pooled pretest standard deviation units. Effect sizes are presented so that positive values indicate improved psychological health (i.e., increased self-efficacy or reduced anxiety), while negative values represent reduced psychological health (i.e. reduced self-efficacy or increased anxiety).

Yoga participants experienced the greatest change from pretest to posttest, and from pretest to follow-up in all dependent variables (ES = 1.01 and 0.89 for anger, ES = 0.58 and 0.89 for anxiety, ES = 0.53 and 0.54 for depression, ES = 0.49 and 0.53 for well-being, ES = 0.98 and 0.73 for general self-efficacy, and ES = 0.87 and 0.51 for self-efficacy for daily living). Chair exercise participants showed greater improvements than control participants from pretest to posttest in anger (ES = 0.12) and depression (ES = 0.07), and from pretest to posttest and pretest to follow-up contrasts in anxiety (ES = 0.31 and 0.28), well-being (ES = 0.36 and 0.28), general self-efficacy (ES = .035 and 0.43), and self-efficacy for daily living (ES = 0.35 and 0.24). Control participants demonstrated some improvements in anger, anxiety, depression, and self-efficacy for daily living but experienced reduced well-being at follow-up, in comparison to pretest values, and reduced general self-efficacy at both posttest and follow-up, as compared to pretest.

Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre to Posta</th>
<th>Pre to Follow-up</th>
<th>Post to Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>1.01</td>
<td>0.89</td>
<td>-0.12</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.12</td>
<td>-0.01</td>
<td>-0.13</td>
</tr>
<tr>
<td>Control</td>
<td>0.11</td>
<td>0.17</td>
<td>0.06</td>
</tr>
<tr>
<td>Overall</td>
<td>0.42</td>
<td>0.36</td>
<td>-0.06</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>0.58</td>
<td>0.89</td>
<td>0.32</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.31</td>
<td>0.28</td>
<td>-0.03</td>
</tr>
<tr>
<td>Control</td>
<td>0.18</td>
<td>0.27</td>
<td>0.09</td>
</tr>
<tr>
<td>Overall</td>
<td>0.36</td>
<td>0.48</td>
<td>0.13</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>0.53</td>
<td>0.54</td>
<td>0.01</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.07</td>
<td>0.01</td>
<td>-0.05</td>
</tr>
<tr>
<td>Control</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.01</td>
</tr>
<tr>
<td>Overall</td>
<td>0.22</td>
<td>0.20</td>
<td>-0.02</td>
</tr>
</tbody>
</table>
Comparisons of change across groups indicate that the yoga group showed greater improvement from pretest to posttest and from pretest to follow-up than the exercise or control groups for all variables. The exercise group showed greater improvement from pretest to posttest than the control group for all variables, and greater improvements in anxiety, well-being, general self-efficacy, and self-efficacy for daily living from pretest to follow-up. Table 6 presents the standard effect size between groups for each variable at pretest, posttest, and follow-up.

### Table 5 Continued

<table>
<thead>
<tr>
<th>Well-being</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga</td>
<td>0.49</td>
<td>0.53</td>
<td>0.03</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.36</td>
<td>0.28</td>
<td>-0.08</td>
</tr>
<tr>
<td>Control</td>
<td>0.01</td>
<td>-0.08</td>
<td>-0.09</td>
</tr>
<tr>
<td>Overall</td>
<td>0.29</td>
<td>0.25</td>
<td>-0.05</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>General Self-Efficacy</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga</td>
<td>0.98</td>
<td>0.73</td>
<td>-0.25</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.35</td>
<td>0.43</td>
<td>0.09</td>
</tr>
<tr>
<td>Control</td>
<td>-0.12</td>
<td>-0.12</td>
<td>-0.00</td>
</tr>
<tr>
<td>Overall</td>
<td>0.41</td>
<td>0.35</td>
<td>-0.05</td>
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</table>

<table>
<thead>
<tr>
<th>Self-Efficacy for DL</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga</td>
<td>0.87</td>
<td>0.51</td>
<td>-0.36</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.35</td>
<td>0.24</td>
<td>-0.11</td>
</tr>
<tr>
<td>Control</td>
<td>0.07</td>
<td>0.09</td>
<td>0.03</td>
</tr>
<tr>
<td>Overall</td>
<td>0.44</td>
<td>0.29</td>
<td>-0.15</td>
</tr>
</tbody>
</table>

*a ES is computed as the change from one measurement point to another, in pretest standard deviation units for the overall group. For instance, for the pretest to posttest change for the yoga group, \((X_{\text{post}} - X_{\text{pre}}) / SD_{\text{pre pooled}}\). Positive values reflect improved psychological health.

### Table 6

**Comparison of Change (in Standardized Units) between Groups over Time**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pretest vs. Posttest</th>
<th>Pretest vs. Follow-up</th>
<th>Posttest vs. Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.89</td>
<td>0.90</td>
<td>0.01</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.90</td>
<td>0.72</td>
<td>-0.18</td>
</tr>
<tr>
<td>Exercise vs. Control</td>
<td>0.01</td>
<td>-0.17</td>
<td>-0.19</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.27</td>
<td>0.62</td>
<td>0.35</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.39</td>
<td>0.63</td>
<td>0.23</td>
</tr>
<tr>
<td>Exercise vs. Control</td>
<td>0.13</td>
<td>0.01</td>
<td>-0.12</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.47</td>
<td>0.53</td>
<td>0.07</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.49</td>
<td>0.51</td>
<td>0.02</td>
</tr>
<tr>
<td>Exercise vs. Control</td>
<td>0.02</td>
<td>-0.03</td>
<td>-0.04</td>
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</tbody>
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### Table 6 Continued

<table>
<thead>
<tr>
<th></th>
<th>Yoga vs. Exercise</th>
<th>Yoga vs. Control</th>
<th>Exercise vs. Control</th>
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<tbody>
<tr>
<td>Well-being</td>
<td>0.14</td>
<td>0.25</td>
<td>0.12</td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.49</td>
<td>0.61</td>
<td>0.12</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.35</td>
<td>0.36</td>
<td>0.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yoga vs. Exercise</th>
<th>Yoga vs. Control</th>
<th>Exercise vs. Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Self-Efficacy</td>
<td>0.63</td>
<td>0.30</td>
<td>-0.33</td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>1.10</td>
<td>0.85</td>
<td>-0.25</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.46</td>
<td>0.55</td>
<td>0.09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yoga vs. Exercise</th>
<th>Yoga vs. Control</th>
<th>Exercise vs. Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy for Daily Living</td>
<td>0.52</td>
<td>0.27</td>
<td>-0.25</td>
</tr>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.81</td>
<td>0.42</td>
<td>-0.39</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.29</td>
<td>0.15</td>
<td>-0.13</td>
</tr>
</tbody>
</table>

* $ES$ is computed as the difference between groups over time, in pretest standard deviation units for the overall group. For instance, for the pretest-posttest difference between the yoga group and the exercise group: $(X_{ypost} - X_{ypre}) - (X_{epost} - X_{epre}) / SD_{pooled}$. Positive numbers indicate that the first group demonstrated greater improvements in psychological health; negative numbers indicate that the second group reported greater improvements in psychological health.

Interaction effects were significant for all variables; yoga resulted in a substantially greater impact on psychological health than either exercise or no treatment. The most substantial impact was observed on anger. Standardized contrasts yielded $ES = 0.89$ for the yoga versus exercise comparison and $ES = 0.9$ for the yoga versus control comparison. The second most substantial contrasts were observed in general self-efficacy, with standardized $ES = 0.63$ for the yoga versus exercise comparison and $ES = 1.10$ for the yoga versus control comparison. Self-efficacy for daily living also was more significantly changed by the yoga intervention, with a standardized $ES$ for the yoga versus exercise contrast of $ES = 0.52$, and a yoga versus control contrast of $ES = 0.81$.

Exercise has previously been established as an effective intervention for reducing anxiety and depression, but the current results indicate that yoga led to greater improvements in these areas. For anxiety, the exercise versus control contrast was $ES = 0.13$, whereas the yoga versus control contrast $ES = 0.39$ (yoga vs. exercise $ES = 0.27$). Likewise, while exercise participants reduced depression, yoga participants reported greater reductions—standardized contrasts against the control group yielded $ES = 0.02$ for exercise and $ES = 0.49$ for yoga. Both exercise and yoga participants experienced improved well-being; standardized contrasts with the control group were $ES = 0.49$ for yoga and $ES = 0.35$ for exercise.

In sum, standardized contrasts indicate that exercise made a substantial impact on
psychological health, in comparison to a no treatment control group, with regards to anxiety, well-being, general self-efficacy, and self-efficacy for daily living ($ES = 0.13, 0.35, 0.46, \text{ and } 0.29$, respectively). A sustained impact due to exercise was observed at follow-up with regards to well-being ($ES = 0.36$), general self-efficacy ($ES = 0.55$), and self-efficacy for daily living ($ES = 0.15$). There was no impact of exercise on anger and depression (i.e., $ES = 0.01$ and $ES = 0.02$, respectively). Standardized contrasts indicate that yoga was substantially more effective than no treatment at posttest (with effects ranging from $ES = 0.39$ for anxiety to $ES = 1.10$ for general self-efficacy) and at follow-up (effects ranging from $ES = 0.42$ for self-efficacy for daily living to $ES = 0.85$ for general self-efficacy). Yoga was also effective in contrast to exercise, with contrasts of posttest results ranging from $ES = 0.14$ (for well-being) to $ES = 0.89$ (anger) and contrasts at follow-up ranging from $ES = 0.25$ (well-being) to $ES = 0.90$ (anger).

Analysis of Covariance (ANCOVA). Although MANOVA results for baseline measures indicated no significant differences between groups at baseline, differences in specific variables were observed at baseline. Furthermore, differences emerged between Chair Yoga and Chair Exercise participants, with regards to both class attendance and adherence to home practice instructions. Therefore, in order to confirm results, additional testing of the main hypothesis was conducted using an ANCOVA for each dependent variable (i.e., anger, anxiety, depression, well-being, self-efficacy, and self-efficacy of daily living), at both posttest and follow-up. Covariates were baseline measures of each variable, number of classes attended over the course of the intervention, and number of days per week of personal practice, and treatment (3 groups) was the between-subjects factor. Results are presented in Table 7.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect</th>
<th>$F$</th>
<th>$df$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>Posttest</td>
<td>11.26</td>
<td>2.92</td>
<td>.001</td>
<td>.197</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>6.36</td>
<td>2.92</td>
<td>.003</td>
<td>.121</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Posttest</td>
<td>6.28</td>
<td>2.92</td>
<td>.003</td>
<td>.120</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>5.83</td>
<td>2.92</td>
<td>.004</td>
<td>.113</td>
</tr>
<tr>
<td>Depression</td>
<td>Posttest</td>
<td>12.18</td>
<td>2.92</td>
<td>.001</td>
<td>.209</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>9.24</td>
<td>2.92</td>
<td>.001</td>
<td>.167</td>
</tr>
</tbody>
</table>
Overall, ANCOVA results supported RM MANOVA and RM ANOVA results, with significant group differences \((p < .01)\) observed at both posttest and follow-up for anger, anxiety, depression, and well-being, and at posttest for self-efficacy and self-efficacy for daily living. Group differences in self-efficacy at follow-up were significant at the \(p < .05\) level. However, group differences at follow-up were not significant for self-efficacy for daily living \((p = .134)\).

**State Measures**

The first hypothesis also stated that the yoga intervention would lead to greater reductions in state anxiety and state anger than would the exercise intervention. State anger and anxiety were measured before and after 3 yoga/exercise sessions (at the outset, middle, and end of the study). Control group participants were measured before and after a 1-hour period of normal activity, on the same days as the yoga and exercise participants were assessed. Participants who missed a class during which state assessments were conducted were dropped from state analysis due to missing data; 30 participants in both the yoga and the exercise group completed all three data points, and 25 control group participants completed all three data points. The means and standard deviations for the pretest and posttest values at each measurement point are presented in Table 8.

Data was tested using RM MANOVA; state anger and state anxiety were the dependent variables; treatment (i.e., chair yoga or chair exercise) was the between-subjects factor and there were two within repeated measures: time (3 levels, i.e., pre, end, and follow-up) and pre-post (2 levels) at each measurement period. Multivariate effects for group, time, pre-post, and all interactions were significant \((p < .05)\). To identify dependent variables, which contributed to the rejection of the multivariate null hypotheses, univariate RM ANOVA’s were conducted for state anger and state anxiety. The results of the MANOVA and ANOVA analyses are summarized in

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<table>
<thead>
<tr>
<th>Table 7 Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Well-being</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Posttest</td>
</tr>
<tr>
<td>Follow-up</td>
</tr>
<tr>
<td><strong>Self-Efficacy</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Posttest</td>
</tr>
<tr>
<td>Follow-up</td>
</tr>
<tr>
<td><strong>Self-Efficacy for Daily Living</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Posttest</td>
</tr>
<tr>
<td>Follow-up</td>
</tr>
</tbody>
</table>
Table 9 and Tables 10 and 11 present standardized effect sizes for the state effects by group across time within each session and between sessions. The analyses revealed that all time effects, pre-post effects, and time by pre-post by group interaction effects were statistically significant ($p < .001$ for all, except for the interaction effect for anger where $p < .003$). Times by pre-post by group interaction effects are shown in Figure 3.

Yoga participants showed greater improvement both from pretest to posttest in each single session, and across the measurement period, although exercise participants also experienced improved psychological state. For instance, yoga participants showed a reduction in anger from pretest to posttest in session one ($ES = 0.90$), as well as in sessions three and six ($ES = 0.67$ and $ES = 0.46$, respectively). Exercise participants also reported reductions of anger, $ES = 0.66$ for session one, $ES = 0.69$ for session three, and $ES = 0.72$ for session six. In contrast, control participants experienced lesser reductions ($ES = 0.17$, $ES = 0.18$, and $ES = 0.34$, for session 1, 3, and 6, respectively). Similarly, yoga participants experienced the greatest reductions in anxiety ($ES = 1.35$ for sessions one, $ES = 1.21$ for session three, and $ES = 1.09$ for session six), with exercise participants also reporting reduced anxiety ($ES = 0.49$, $ES = 0.49$, and $ES = 0.48$), and control participants experiencing only small improvements in this psychological state ($ES = 0.15$, 0.11, and 0.18).

While yoga and exercise both immediately improved state anger and state anxiety (as reflected through reduced reports of anger and anxiety after each single session), it appears that the effects are cumulative and enduring. Pretest values (i.e., self-report immediately before a single session) showed improved psychological states over the duration of the intervention, with both yoga and exercise participants showing reduced state anger and state anxiety before session six as compared to before session one ($ES = 0.85$ for anger and $ES = 0.86$ for anxiety, for yoga participants; parallel values for exercise participants are $ES = 0.35$ and $ES = 0.34$). A cumulative effect is also demonstrated by the magnitude of change between pretest at session one and posttest at session six. Standardized comparisons for these contrasts yield $ES = 1.15$ for the reduction in state anger experienced by yoga participants and $ES = 1.66$ for their reduction in state anxiety; parallel contrasts for the exercise participants produce $ES = 0.81$ and $ES = 0.69$, respectively.
Table 8
Descriptive Statistics at each Time Point for State Anger and State Anxiety by Group

<table>
<thead>
<tr>
<th>Variable/Group</th>
<th>Session 1</th>
<th></th>
<th></th>
<th>Session 3</th>
<th></th>
<th></th>
<th>Session 6</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Anger</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>30</td>
<td>24.50</td>
<td>9.28</td>
<td>15.50</td>
<td>5.24</td>
<td>20.33</td>
<td>6.06</td>
<td>14.67</td>
<td>3.84</td>
</tr>
<tr>
<td>Exercise</td>
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<td>17.33</td>
<td>6.15</td>
<td>22.50</td>
<td>9.64</td>
<td>16.67</td>
<td>5.24</td>
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<tr>
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<td>10.20</td>
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<td>7.40</td>
<td>24.30</td>
<td>9.80</td>
<td>22.80</td>
<td>6.80</td>
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<tr>
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<td>18.50</td>
<td>6.20</td>
<td>22.26</td>
<td>8.42</td>
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<tr>
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<td>12.60</td>
<td>25.17</td>
<td>7.67</td>
<td>37.50</td>
<td>9.63</td>
<td>23.33</td>
<td>4.79</td>
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<td>14.22</td>
<td>33.67</td>
<td>7.87</td>
<td>38.17</td>
<td>12.84</td>
<td>32.50</td>
<td>6.56</td>
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<tr>
<td>Control</td>
<td>25</td>
<td>44.20</td>
<td>13.20</td>
<td>42.15</td>
<td>11.50</td>
<td>42.80</td>
<td>12.70</td>
<td>41.55</td>
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<td>33.16</td>
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<td>11.67</td>
<td>31.93</td>
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### Table 9
**MANOVA and ANOVA Results for State Anger and State Anxiety**

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<tr>
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<tr>
<td>Time</td>
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<td>30.29</td>
<td>4,79</td>
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<tr>
<td>Pre-Post</td>
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<td>37.69</td>
<td>2,81</td>
<td>.001</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Group</td>
<td>.89</td>
<td>2.25</td>
<td>4,162</td>
<td>.06</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Time by group</td>
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<td>3.93</td>
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<td>.001</td>
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<td>-</td>
</tr>
<tr>
<td>Pre-post by group</td>
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<td>10.57</td>
<td>4,162</td>
<td>.001</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Time by pre-post by group</td>
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<td>3.35</td>
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<td>.001</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>ANOVA: Anger</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Time</td>
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<td>2,81</td>
<td>.001</td>
<td>.56</td>
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<tr>
<td>Pre-Post</td>
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<tr>
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<td>.03</td>
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<td>.00</td>
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</tr>
<tr>
<td>Time by pre-post by group</td>
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<td>2.97</td>
<td>4,162</td>
<td>.02</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td><strong>ANOVA: Anxiety</strong></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Time</td>
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<td>46.21</td>
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<tr>
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<td>2,82</td>
<td>.04</td>
<td>.07</td>
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<td>4,162</td>
<td>.04</td>
<td>.06</td>
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</tr>
<tr>
<td>Pre-post by group</td>
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<td>.008</td>
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</tr>
<tr>
<td>Time by pre-post by group</td>
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### Table 10
**Standardized Changes by Group across Time within each Session for State Anger and Anxiety**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Session 1</th>
<th>Session 3</th>
<th>Session 6</th>
</tr>
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<tbody>
<tr>
<td><strong>Anger</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>0.90</td>
<td>0.67</td>
<td>0.46</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.66</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td>Control</td>
<td>0.17</td>
<td>0.18</td>
<td>0.34</td>
</tr>
<tr>
<td>Overall</td>
<td>0.60</td>
<td>0.53</td>
<td>0.52</td>
</tr>
<tr>
<td><strong>Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>1.35</td>
<td>1.21</td>
<td>1.09</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.49</td>
<td>0.49</td>
<td>0.48</td>
</tr>
<tr>
<td>Control</td>
<td>0.15</td>
<td>0.11</td>
<td>0.18</td>
</tr>
<tr>
<td>Overall</td>
<td>0.69</td>
<td>0.63</td>
<td>0.61</td>
</tr>
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</table>
Table 11
Standardized Changes by Group between Sessions for State Anger and State Anxiety

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Session State Values</th>
<th>Post-Session State Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Session 1 vs. 3</td>
<td>Session 1 vs. 6</td>
</tr>
<tr>
<td>Anger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>0.42</td>
<td>0.85</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>Control</td>
<td>0.09</td>
<td>-0.12*</td>
</tr>
<tr>
<td>Overall</td>
<td>0.23</td>
<td>0.39</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoga</td>
<td>0.42</td>
<td>0.86</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.15</td>
<td>0.34</td>
</tr>
<tr>
<td>Control</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Overall</td>
<td>0.23</td>
<td>0.45</td>
</tr>
</tbody>
</table>

* Negative ES indicate reduced psychological status in comparison to pretest values at the first measurement session.

Figure 3. Means for state anger and anxiety by time and by pre-post for the 2 experimental groups.
Self-Control as a Moderator of Psychological Health

Changes in self-control. The third hypothesis stated that yoga participants would demonstrate greater increases in self-control over the duration of the intervention than their counterparts. Equality of groups at baseline was tested using an analysis of variance (ANOVA) for baseline values. Levene’s test of equality of variances showed non-significant ($p > .05$) differences among the three groups’ variances at pretest and initial screening of the data indicated no significant outliers. Differences between groups at pretest were non-significant ($p > .05$) indicating that randomization resulted in equality of means across groups at baseline.

Changes in self-control over time were tested using a RM ANOVA with time as a within repeated factor (pre/post/follow-up) and treatment (3 groups) as a between-subjects factor. The null hypothesis for the time by group interaction effect was rejected at the 0.05 level, Wilk’s $\lambda = 0.75$, $F(4,188) = 7.18$, $p < .001$. Pillai’s statistic (0.25) and Hotellings test statistics (0.33) also yielded $p < 0.001$. The null hypothesis for the time effect was also rejected at the 0.05 level, Wilk’s $\lambda = 0.74$, $F(2,94) = 16.92$, $p < .001$, Pillai = 0.27, Hotelling = 0.36. The group effect was non-significant ($p > .05$). The means and standard deviations for the pretest, posttest, and follow-up values for self-control for the Yoga, Exercise, and Control groups are summarized in Table 12, and the standardized effects within groups are presented in Table 13. Differences between groups at each measurement point are presented in Table 14. The time by group interaction effect is shown in Figure 4.

The significant interaction effect indicates that yoga had a more substantial impact on self-control than did exercise or no treatment, over the duration of the intervention. Small changes merely due to the passage of time were experienced by control participants ($ES = 0.02$ for the change from pretest to posttest, and $ES = 0.10$ for pretest to follow-up). Exercise participants experienced a moderate increase in self-control during the intervention itself ($ES = 0.21$ for pretest to posttest), but a smaller increase from pretest to follow-up ($ES = 0.13$). In contrast, the yoga participants experienced an increase in self-control from pretest to posttest with $ES = 0.61$, and a sustained increase (from pretest to follow-up) with $ES = 0.46$. In a standardized contrast with the control group, yoga had $ES = 0.59$ (the parallel contrast for the exercise group was $ES = 0.20$; the yoga vs. exercise contrast was $ES = 0.39$). As hypothesized, yoga led to significantly greater self-control among participants, and at least some of this change was sustained after the cessation of the intervention.
Table 12
Pretest, Posttest, and Follow-Up Descriptive Statistics for Self-Control by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Pretest</th>
<th></th>
<th>Posttest</th>
<th></th>
<th>Follow-up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Yoga</td>
<td>33</td>
<td>33.18</td>
<td>22.09</td>
<td>48.85</td>
<td>26.89</td>
<td>45.00</td>
<td>21.08</td>
</tr>
<tr>
<td>Exercise</td>
<td>33</td>
<td>38.67</td>
<td>31.04</td>
<td>44.18</td>
<td>27.08</td>
<td>42.05</td>
<td>24.72</td>
</tr>
<tr>
<td>Control</td>
<td>32</td>
<td>33.09</td>
<td>23.78</td>
<td>33.56</td>
<td>14.27</td>
<td>35.66</td>
<td>6.67</td>
</tr>
<tr>
<td>Overall</td>
<td>98</td>
<td>35.00</td>
<td>25.82</td>
<td>42.29</td>
<td>24.22</td>
<td>40.95</td>
<td>19.43</td>
</tr>
</tbody>
</table>

* Higher scores reflect greater self-control.

Table 13
Change for Self-Control within Groups by Time Frame

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest vs. Posttest</th>
<th>Pretest vs. Follow-up</th>
<th>Posttest vs. Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga</td>
<td>0.61</td>
<td>0.46</td>
<td>-0.15</td>
</tr>
<tr>
<td>Exercise</td>
<td>0.21</td>
<td>0.13</td>
<td>-0.08</td>
</tr>
<tr>
<td>Control</td>
<td>0.02</td>
<td>0.10</td>
<td>0.08</td>
</tr>
<tr>
<td>Overall</td>
<td>0.28</td>
<td>0.23</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

* ES is computed as the change from one measurement point to another, in pretest standard deviation units for the overall group. For instance, for the pretest to posttest change for the yoga group, \((X_{\text{post}} - X_{\text{pre}})/SD_{\text{pre pooled}}\). Positive numbers reflect greater self-control.

Table 14
Group Comparison in Standardized Units for Self-Control between Groups over Time

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest vs. Posttest*</th>
<th>Pretest vs. Follow-up</th>
<th>Posttest vs. Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga vs. Exercise</td>
<td>0.39</td>
<td>0.33</td>
<td>-0.07</td>
</tr>
<tr>
<td>Yoga vs. Control</td>
<td>0.59</td>
<td>0.36</td>
<td>-0.23</td>
</tr>
<tr>
<td>Exercise vs. Control</td>
<td>0.20</td>
<td>0.03</td>
<td>-0.16</td>
</tr>
</tbody>
</table>

* ES is computed as the difference between groups over time, in pretest standard deviation units for the overall group. For instance, for the pretest-posttest difference between the yoga group and the exercise group: \((X_{\text{Ypost}} - X_{\text{Epost}})-(X_{\text{Ypre}} - X_{\text{Epre}})/SD_{\text{pre pooled}}\). Positive numbers indicate that the first group demonstrated greater improvements in self-control; negative numbers indicate that the second group reported greater improvements in self-control.
Figure 4. Mean of self-control at pretest, posttest, and follow-up in the study’ groups.

Correlations between self-control and psychological health. The third hypothesis assumed that increases in self-control would be related to improvements in psychological health. Psychological health was correlated to self-control at pretest, posttest, and follow-up, using PPMC while controlling for group assignment. Self-control was significantly correlated with general self-efficacy and trait anxiety at pretest, posttest, and follow-up. Self-control had a low positive correlation with general self-efficacy (i.e., increased self-control was related to increased self-efficacy), and a low negative correlation with trait anxiety (i.e., increased self-control was related to decreased trait anxiety). Self-control also had a low positive correlation with well-being at pretest ($r = .22, p = .03$), with increased self-control being related to increased well-being, but this relationship was not observed at posttest or follow-up. All other correlations were non-significant. Correlations, significance levels, and degrees of freedom for all relationships at pretest, posttest, and follow-up are presented in Table 15.

Table 15
Correlations between Self-Control and Psychological Health (df = 95)

<table>
<thead>
<tr>
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<th>Posttest</th>
<th></th>
<th>Follow-up</th>
<th></th>
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<td>$p$</td>
<td>$r$</td>
<td>$p$</td>
<td>$r$</td>
<td>$p$</td>
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<td>.41</td>
<td>-.12</td>
<td>.26</td>
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<td>.001</td>
<td>-.27*</td>
<td>.01</td>
<td>-.34*</td>
<td>.001</td>
</tr>
<tr>
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<td>.35</td>
<td>.03</td>
<td>.78</td>
<td>.02</td>
<td>.84</td>
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<td>-.01</td>
<td>.99</td>
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<td>.47</td>
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<td>.001</td>
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<td>.06</td>
<td>.14</td>
<td>.16</td>
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</tbody>
</table>

* Indicates significant relationship.

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In order to better understand the relationship between changes in self-control, as a result of yoga training, and changes in psychological health, additional analysis was conducted to determine whether changes in self-control were predictive of changes in the other psychological variables. A regression model assessed whether changes in self-control from pretest to posttest (and from pretest to follow-up) predicted parallel changes in trait anger, trait anxiety, depression, well-being, general self-efficacy, and self-efficacy for daily living, while controlling for baseline levels of self-control, group assignment, class attendance, and daily practice. Multivariate results were significant for changes from pretest to posttest, $F(168,361) = 5.36$, $p = .001$. Multivariate results were also significant from pretest to follow-up, $F(210, 322) = 17.90$, $p = .001$. Univariate results for each variable are presented in Table 16. Significant multivariate and univariate results indicate that changes in self-control were predictive of changes in all psychological variables.

Table 16

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect</th>
<th>$F$</th>
<th>$df$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>Posttest</td>
<td>92.27</td>
<td>1,96</td>
<td>-.70$^a$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>5.07</td>
<td>1,96</td>
<td>-.22$^a$</td>
<td>.027</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Posttest</td>
<td>40.52</td>
<td>1,96</td>
<td>-.55$^a$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>18.19</td>
<td>1,96</td>
<td>-.39$^a$</td>
<td>.001</td>
</tr>
<tr>
<td>Depression</td>
<td>Posttest</td>
<td>43.87</td>
<td>1,96</td>
<td>-.56$^a$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>16.43</td>
<td>1,96</td>
<td>-.38$^a$</td>
<td>.001</td>
</tr>
<tr>
<td>Well-being</td>
<td>Posttest</td>
<td>16.31</td>
<td>1,96</td>
<td>.38$^b$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>9.83</td>
<td>1,96</td>
<td>.31$^b$</td>
<td>.001</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>Posttest</td>
<td>104.98</td>
<td>1,96</td>
<td>.72$^b$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Follow-up</td>
<td>26.33</td>
<td>1,96</td>
<td>.46$^b$</td>
<td>.001</td>
</tr>
<tr>
<td>Self-Efficacy for Daily</td>
<td>Posttest</td>
<td>61.44</td>
<td>1,96</td>
<td>.63$^b$</td>
<td>.001</td>
</tr>
<tr>
<td>Living</td>
<td>Follow-up</td>
<td>15.77</td>
<td>1,96</td>
<td>.38$^b$</td>
<td>.001</td>
</tr>
</tbody>
</table>

$a$ Indicates that increased self-control was predictive of decreased value, i.e. improved psychological health.

$b$ Indicates that increased self-control was predictive of increased value, i.e. improved psychological health.
Physiological Arousal

Each subject in the chair yoga and chair fitness groups was assessed for physiological arousal three times over the course of the intervention. During each class session, half of the participants wore HR monitors throughout the class period. HR was collected across all three measurement points for 28 yoga participants and 27 exercise participants; the remaining participants were dropped from analysis due to missing data (either due to missed class sessions or to equipment failure during measurement). Mean HR was recorded for each five-minute period; after baseline HR was measured, the first five minutes represent yoga meditation versus fitness warm-up. Each five minute increment of the middle 30 minutes represent yoga exercise versus parallel exercise, and the five minute increments during the last ten minutes represent yoga meditation and pranayama versus stretching and cool-down period. HR values were tested using RM ANOVA with 10 time intervals (45 minute class session / 5 minute increments, plus baseline HR) and class sessions (3 class sessions per subject) as within repeated factors and treatment (chair yoga and chair exercise) as a between subjects factor. ANOVA results are presented in Table 17. Significant differences were obtained among sessions, minutes within each session, and between groups ($p < .001$). The sessions by minutes by group interaction effect was also significant ($p < .001$). Mean values are presented in Table 18 and the interaction effects are shown in Figure 5.

As anticipated, differences in HR were obtained between groups during the first five minutes when yoga participants were engaged in meditation and aerobics participants were engaged in warm-up stretching exercises, and during the last 10 minutes when yoga participants were practicing meditation and pranayama, and chair exercise participants were engaged in stretching and cool-down exercises. Exercise participants experienced increased HR during the first 5 minutes, due to beginning physical activity. In contrast, yoga participants experienced decreased HR during the first five minutes, likely due to the reduced arousal resulting from meditation practice. The immediate reduction in HR due to yoga practice increased over the duration of the intervention, with participants reducing HR by 9.3 beats per minute (b/min) in the first measurement (session 1 or 2), 12.1 b/min in the second measurement (session 3 or 4), and 13.85 b/min in the third measurement (session 5 or 6). During minutes 5 – 10, yoga participants experienced increased HR, as they moved from meditation to more active yoga practice; as hypothesized, during the central portion of the sessions, yoga and exercise participants
experienced relatively similar profiles of elevated HR due to physical activity. Group differences emerged again during the final 10 minutes; while both exercise and yoga participants experienced decreases in HR during the final portion of each session, yoga participants showed both larger and quicker reductions in HR. From minute 30 – 35 (activity) to the final five minutes (meditation), yoga participants reduced HR by 29.59 b/min during the first measurement session, and 31.48 b/min and 31.99 b/min in the second and third measurements, respectively. Furthermore, the immediate decrease (i.e., the decrease in mean HR experienced between the final 5 minutes of activity, minutes 30 – 35, and the first five minutes of meditation and pranayama, minutes 35 – 40) progressively increased from 25.75 b/min in the first measurement to 26.16 b/min and 28.59 b/min in the second and third measurement periods. Yoga participants became increasingly adept at reducing arousal quickly. In contrast, during the cool-down period, aerobic participants only reduced HR by 6.54 b/min, 6.15 b/min, and 6.49 b/min in the first, second, and third measurement periods, demonstrating no increase in capacity to reduce arousal either from the end of the fitness or in comparison to pretest levels. Overall, yoga participants experienced reduced arousal at the end of each yoga session, in comparison to pretest HR (reductions of 12.07 b/min, 13.73 b/min, and 12.78 b/min, for the first, second, and third measurements), reflecting the capacity for yoga to train older adults to manage physiological arousal and reduce physiological stress.

Table 17
ANOVA Results for Physiological Arousal

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect</th>
<th>Wilk’s λ</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sessions</td>
<td>.39</td>
<td>41.09</td>
<td>2.52</td>
<td>.001</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>Minutes</td>
<td>.03</td>
<td>144.32</td>
<td>9.45</td>
<td>.001</td>
<td>.97</td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td></td>
<td>40.85</td>
<td>1.53</td>
<td>.001</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>Sessions by group</td>
<td>.90</td>
<td>2.94</td>
<td>2.52</td>
<td>.06</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Minutes by group</td>
<td>.06</td>
<td>74.63</td>
<td>9.45</td>
<td>.001</td>
<td>.94</td>
<td></td>
</tr>
<tr>
<td>Sessions by minutes</td>
<td>.01</td>
<td>233.27</td>
<td>14.40</td>
<td>.001</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Sessions by minutes by group</td>
<td>.012</td>
<td>229.61</td>
<td>14.40</td>
<td>.001</td>
<td>.99</td>
<td></td>
</tr>
</tbody>
</table>
Table 18

*HR Values across Three Measurement Sessions*

<table>
<thead>
<tr>
<th>Time Span</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; Measurement</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Measurement</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yoga</td>
<td>Exercise</td>
<td>Yoga</td>
</tr>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Pretest</td>
<td>76.14</td>
<td>10.71</td>
<td>76.78</td>
</tr>
<tr>
<td>Min 5 – 10</td>
<td>66.84</td>
<td>9.46</td>
<td>96.27</td>
</tr>
<tr>
<td>Meditation &amp; Warm-up</td>
<td>86.11</td>
<td>11.50</td>
<td>99.29</td>
</tr>
<tr>
<td>Min 10 – 15</td>
<td>94.13</td>
<td>13.04</td>
<td>95.27</td>
</tr>
<tr>
<td>Min 15 – 20</td>
<td>99.92</td>
<td>11.70</td>
<td>88.40</td>
</tr>
<tr>
<td>Min 20 – 25</td>
<td>98.64</td>
<td>14.31</td>
<td>103.84</td>
</tr>
<tr>
<td>Min 25 – 30</td>
<td>96.63</td>
<td>14.38</td>
<td>101.81</td>
</tr>
<tr>
<td>Min 30 – 35</td>
<td>93.66</td>
<td>12.38</td>
<td>101.93</td>
</tr>
<tr>
<td>Meditation &amp; Cooldown</td>
<td>67.91</td>
<td>8.87</td>
<td>98.19</td>
</tr>
<tr>
<td>Meditation &amp; Cooldown</td>
<td>64.07</td>
<td>9.02</td>
<td>95.39</td>
</tr>
</tbody>
</table>

* For the yoga group, $n = 28$; for the exercise group, $n = 27$. 

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Heart Rate (1st) indicates mean scores for the first measurement period, HR (2nd) and HR (3rd) represent mean HR values for the 2nd and 3rd measurement periods, respectively. Time period 1 represents baseline HR data; 2 is mean value for minutes 1 – 5 (meditation or warm-up), 3 is minutes 5 – 10, 4 is minutes 10 – 15, 5 is minutes 15 – 20, 6 is minutes 20 – 25, 7 is minutes 25 – 30, 8 is minutes 30 – 35, 9 is minutes 35 – 40 (meditation/pranayama or cool-down) and 10 is minutes 40 – 45 (meditation/pranayama or cool-down).

Figure 5. Time by group mean values for physiological arousal (HR) in the Yoga and exercise groups.

Participant Perceptions

In order to gain a better understanding of the yoga intervention, short structured interviews were conducted with all yoga participants at the end of the intervention. Only yoga participants were interviewed, and this data was collected to identify characteristics of the yoga experience and provide direction for future research into yoga participation as experienced by older adults. Interview responses provided 639 raw items. The researcher and a research assistant each analyzed data independently, and a hierarchy of categories and subcategories were generated by each from trends observed during data analysis. Category reliability, the percentage

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of agreement of generated categories before resolution of issues, was 100% for main categories and 89.5% for subcategories; discrepancies were resolved before raw items were assigned into categories. After consensus was reached concerning appropriate categories, items were independently coded. Coding reliability, the percentage of agreement of coded items before resolution of issues, was 97.3% for overall categories and 93.5% for subcategories; again, discrepancies between reviewers were resolved before final analysis of data. Some items were assigned multiple codes as appropriate, resulting in 813 item assignments in the final data set.

Three major response themes emerged: (a) participant perceptions of the benefits of the yoga program, (b) participant attributions for causation of benefits, and (c) participant statements about the program (complaints and specific statements that there were no complaints). Participant perceptions of the benefits of the yoga intervention comprised the majority of the total responses (47.97% – 24.60% were physical benefits, 15.74% were mental benefits, and 7.63% were spiritual/emotional benefits), attributions were 34.56% of responses, and participant statements about the program were 17.47% of coded items. Table 19 lists all categories and subcategories and presents the number and percentage of responses for each type.

Table 19
Categories of Participant Perceptions and Percentage of Responses by Type

<table>
<thead>
<tr>
<th>Category</th>
<th># of Responses</th>
<th>% Total Responses</th>
<th>% Category Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributions of Benefits</td>
<td>281</td>
<td>34.56%</td>
<td>46.62%</td>
</tr>
<tr>
<td>Instructor</td>
<td>131</td>
<td>16.11%</td>
<td></td>
</tr>
<tr>
<td>Program Characteristics</td>
<td>85</td>
<td>10.46%</td>
<td>30.25%</td>
</tr>
<tr>
<td>Social interaction</td>
<td>41</td>
<td>5.04%</td>
<td>14.59%</td>
</tr>
<tr>
<td>Increased motivation</td>
<td>24</td>
<td>2.95%</td>
<td>8.54%</td>
</tr>
<tr>
<td>Physical Benefits</td>
<td>200</td>
<td>24.60%</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>92</td>
<td>11.32%</td>
<td>46.00%</td>
</tr>
<tr>
<td>Flexibility</td>
<td>42</td>
<td>5.17%</td>
<td>21.00%</td>
</tr>
<tr>
<td>Specific health problems</td>
<td>20</td>
<td>2.46%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Energy / invigorating</td>
<td>10</td>
<td>1.23%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Balance</td>
<td>9</td>
<td>1.11%</td>
<td>4.50%</td>
</tr>
<tr>
<td>Breathing</td>
<td>8</td>
<td>0.98%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Stamina</td>
<td>7</td>
<td>0.86%</td>
<td>3.50%</td>
</tr>
<tr>
<td>Strength</td>
<td>6</td>
<td>0.74%</td>
<td>3.00%</td>
</tr>
<tr>
<td>Physical awareness</td>
<td>6</td>
<td>0.74%</td>
<td>3.00%</td>
</tr>
</tbody>
</table>
Table 19 Continued

<table>
<thead>
<tr>
<th>Program Statements</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>State no problems</td>
<td>83</td>
<td>10.21%</td>
</tr>
<tr>
<td>Logistics</td>
<td>24</td>
<td>2.95%</td>
</tr>
<tr>
<td>Physical</td>
<td>14</td>
<td>1.72%</td>
</tr>
<tr>
<td>Specific suggestions</td>
<td>13</td>
<td>1.60%</td>
</tr>
<tr>
<td>Program ending</td>
<td>8</td>
<td>0.98%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mental Benefits</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mental health</td>
<td>71</td>
<td>8.73%</td>
</tr>
<tr>
<td>Relaxation</td>
<td>30</td>
<td>3.69%</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>13</td>
<td>1.60%</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>5</td>
<td>0.62%</td>
</tr>
<tr>
<td>Confidence</td>
<td>9</td>
<td>1.11%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emotional/Spiritual Benefits</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiritual</td>
<td>54</td>
<td>6.64%</td>
</tr>
<tr>
<td>Joy</td>
<td>6</td>
<td>0.74%</td>
</tr>
<tr>
<td>Emotional</td>
<td>2</td>
<td>0.25%</td>
</tr>
</tbody>
</table>

Participant perceptions of benefits of the yoga intervention. Participant perceptions of benefits comprised the largest percentage of coded items (47.97% of total responses; 390 items). Participants expressed a wide-range of positive effects, which they experienced as a result of the yoga intervention. Some statements were general expressions of benefits (for instance, “I don’t separate spiritual, psychological, and physical. I believe the program contributes significantly to my well-being.”). Other participants were more specific about their experiences. Physical benefits were the most cited outcomes of the intervention (200 items and 24.6% of total responses). Physical benefits included general statements of improvement, such as “I feel it is all inclusive as far as exercising the whole body.” Other statements pointed out increased strength and flexibility (i.e., “The expert use of body muscles and resultant relaxation and strength;” “consistent stretching and bending instructions, breathing, and use of as many muscles and joints as possible, keeping them in good working order;” and “the exercise gives my body more movement and flexibility.”). Increased energy was another benefit cited by yoga participants (“I enjoy feeling my muscles wake up.”). Other participants focused on the improvement of specific health issues. For instance, one participant commented, “after each session, my whole body moves better, as some of the muscles’ stiffness and pain are gone.” Another stated, “Strength and balance exercises help with my disability.” Other comments about improvement of specific physical conditions included, “it helps me very much. I have been able to cut chiropractor visits...
more or less by half,” and “I generally feel so much better. The pain between my shoulders at night is gone.”

Mental and psychological benefits were also frequently cited by participants (128 coded items, or 15.74% of total responses). Participants cited improved general mental health (such as, “the feeling that something is positive to my well-being,” “I feel much better on all areas of my life. My attitude and outlook on life is much improved when I do yoga,” “it impacts my psychological health as much as it does my physical well-being. It makes me feel good psychologically, and this is what makes me attend regularly,” and “I would rate the program as significant for my psychological well-being.”). Participants also indicated specific mental benefits, such as increased relaxation (i.e., “it relaxes my mind and body to let good thoughts come in,” “I feel optimism, attitude, meditation, concentration powers, are all training in how to relax mind and muscle,” and “it calms my thoughts. I feel I’ve accomplished much when I complete the program.”), and greater self-esteem (“It does help to some degree to affect my self-esteem and confidence that I am healthy enough to accomplish these exercises.”), self-efficacy (“Just the feeling that I can do most of the work-out makes me feel really good.”), and general confidence (“The program uplifts my confidence.”). For instance, participants stated, “I most enjoy the feeling of accomplishment. I can do it!” and “By following the exercise instructions, I feel a sense of confidence and enthusiasm in the fact that I’m able to do it.”

Participants also cited spiritual and emotional benefits (62 items, 7.63%). For instance, one participant stated, “it makes me feel very peaceful, and the serenity afterward makes me think more spiritually.” Spiritual benefits were cited by individuals who indicated that they had spiritual but non-religious beliefs (“I am intentional about my spiritual journey and have several disciplines I practice daily. Yoga adds to my awareness of well-being, both spiritually and emotionally.”), and also by those who indicated more traditional Judeo-Christian religious orientation (“My power of focusing and concentration are better controlled so when I talk to God my mind does not wander.”). One participant indicated that yoga helped her in ways her religious practice did not (“It helps a lot and I feel peace. Sometimes our church is not peaceful, and yoga is my only escape.”). Most statements indicated that participants felt spiritual benefits immediately (“I feel centered, peaceful, and compassionate when I finish a session.”), and that benefits remained after class (“I feel a sense of tranquility after class that seems to carry over into the next day.”). These benefits had an impact both on increasing well-being (“My spiritual
life consists mainly of a feeling of gratitude for blessings, which is intensified by these sessions.”) and in overcoming distress (“I think the spiritual is tied in with the meditation and the positive attitudes. The spiritual eliminates fears.”). Some participants credited “a spiritual atmosphere” for leading to a sense of spiritual development, while others indicated the instructor was responsible for creating that feeling. “I feel the instructor is spiritually connected with us as individuals and genuinely interested in each of us.” Other participants specifically cited joy and happiness as the spiritual and emotional benefits, which they experienced, both during the sessions (“There is no doubt I am very happy. Happy to move freely and feel younger after a session.”), and after (“The effects are quite significant. I feel peaceful, and frequently joyful at the end of a session and throughout the rest of the day.”).

Participant attributions for causation of benefits. Participant attributions about the causation of benefits were 34.56% of total responses (281 items) and included the instructor (131 items; 46.62% of attributions), program characteristics (85 items; 30.25% of attributions), social interaction with other participants (41 items; 14.59% of attributions), and increased personal motivation (24 items; 8.54% of attributions). Instructor characteristics, which were cited as critical to the success of the program and its impact on well-being, included subject-area expertise (“the teacher is qualified and knowledgeable”) presentation (“the instructor’s voice and approach”), the creation of an “atmosphere which is calm and unhurried,” and the student-teacher relationship (“the genuine interest shown by the instructor. She never is rushed to leave and makes us feel that there is a real friendship.”). Participants stated that instructor characteristics were important because “having an instructor who is so well-qualified, appealing, personable, and alert matters a lot in setting the stage for us wanting to come.” Instructor characteristics were also cited as having an impact on the experience during each class session (“the instructor is so humble and sane that she makes us feel at ease,” “I like the inclusiveness and the acceptance of each person, where they are, and the encouragement to reach a little further and believe in the possibility,” and “she is unhurried and gives us confidence that we can do it”), and after the session (“The calm and relaxed manner is very conducive to feelings of well-being at the end of the program.”). Finally, participants cited that the instructor modeled the behaviors and feelings, which they could expect to experience from the program. One participant stated that “most of all, I enjoy experiencing the instructor lead us in the quiet where we may know peace and even joy” and another said “ease of availability, inclusiveness, respect, and
consideration for all participants give a subtle message of the importance of being and becoming a peaceful presence.”

Additional support for program participation and benefits came from interaction with fellow classmates. One participant stated, “I enjoy seeing people from all walks of life join together in a life-giving program that enhances their quality of life through fun and laughter, exercise, and opportunities for connectedness.” For individuals with health problems, the group support was particularly important. “I appreciate the opportunity to be part of a group effort to improve our health and well-being. I could not do it alone because it hurts badly to move, osteoporosis and osteoarthritis plague me, but I can stand it when I’m in a group.” Another participant stated a similar belief: “I can’t achieve this by myself, as it hurts too much, but in a group I can do it anyway.” For others, interaction with friends was one of the benefits of the program (“I like the enjoyment I get from regular meetings with friends for the purpose of our mutual improvement.”).

Characteristics of the program were also attributed as impacting outcomes. The exercises themselves made participants feel that the program was accessible, even if they previously had not felt comfortable exercising, and participants cited the modifications presented for each exercise and the chairs as providing confidence in their ability to participate. Participants also stated that the program had pleasant effects after class: “the exercise is never jerky nor too straining, so that I’ve never had sore muscles afterward, although I am pleasantly tired.” Participants cited that the instructor, the program characteristics, and the social support of co-participants helped them to develop greater personal motivation to participate. One individual stated, “because I am already in good health and feel well, when I come to class, the program helps to carry that health status forward. I believe in exercise and this program is a strong influence to emphasize and strengthen that motivation and health existence.” Likewise, another individual said “the program has helped me one-hundred-percent. Without it I lack incentive to move my aching body beyond where it wants to go.”

Participant statements about the program. One-hundred and forty-two items (17.47% of total responses) were participant statements about the program itself. The vast majority of these (83 items; 58.45% of responses in the category) were specific statements that there were no problems with the program (i.e., “I can’t think of anything I would change.”). Other statements focused on logistical issues (“I love the program but don’t like where it is held. It is too
disruptive” and “I wish we had quieter surroundings.”) and specific suggestions for improving the program (“I wish we had classes more often and that they were longer.”). One individual’s suggestion reflected a lack of consistency in the at-home practice routine: “I don’t like that it is only held once a week. I would like it to be three times a week. I can hold myself responsible – I need to work on discipline to practice on my own.” Some individuals expressed sadness over missed classes (“The only thing I don’t like is when something happens and I have to miss yoga.”) and the program ending (“I am sorry that the program is over.”). Other participants indicated personal complaints related to the program, such as physical limitations (“My balance is a problem for me, but I do what I can, and the chair works for me” and “The program does help. Only my own physical inadequacies keep it from helping more.”).
CHAPTER 4
DISCUSSION

The current study examined the effect of chaired Yoga and Aerobic exercise on psychological health of senior citizens. The number of people who practice yoga at least twice a week increased by 133% between 2001 and 2006 (e.g., from 1.3 to 3 million; Moran, 2006). Furthermore, a 2004 Harris study commissioned by Yoga Journal predicted that 25 million Americans would try yoga within the following year (Rosin, 2006), and over 16,000 yoga teachers are registered between partner organizations The Yoga Alliance (YA) and The International Association of Yoga Therapists (IAYT; Zador, 2006). According to the New York Times, Americans spent $2.95 billion on yoga classes and products in 2004 (Moran). Clearly, the “ancient field of Yoga has been plunged into a dynamic time of rapid growth” (Zador, p. 3).

Advocates of yoga believe that yoga improves both physical and mental health and well-being. For instance, yoga practitioners cite benefits such as improved physical and psychological health, weight loss, improved relationships with romantic partners and family members, and treatment of clinical disorders like ADD and depression (Rosin, 2006). Yoga instructors advocate the benefits of yoga practice and describe outcomes related to specific postures during instruction (Shapiro, 2006). Celebrity yoga instructor Baron Baptiste shares stories of dramatic life improvements at his yoga retreats, and informs participants that they have begun a new life through yoga practice (Rosin). Further, the practice of “Yoga Therapy” is an “emerging discipline” (Weeks, 2006, p. 16) whose practitioners focus on yoga, which “goes beyond fitness and general wellness to working with individuals and specific populations with focused health issues,” (Weeks, p.16).

In spite of the increasing numbers of individuals who practice and teach yoga and their beliefs about yoga’s benefits, there is a paucity of yoga research to validate these claims. “Clear and reproducible evidence supporting efficacy from large, methodologically sound studies is lacking” (Arias, Steinberg, Banga, & Trestman, 2006, p. 817). Common methodological limitations include small sample size and suboptimal control groups, lack of long-term investigation, and problems of adherence among participants (Walsh & Shapiro, 2006). Kirkwood, Rampes, Tuffrey, Richardson, and Pilkington (2005) stated that additional research problems occur because studies may focus on a diversity of conditions, and they indicated the need for research, which focuses on specific disorders. Empirically sound research into the
underlying mechanisms of yoga and its consequences, effects, and contraindications is vital in order to insure that the continued growth of yoga is both safe and useful for the growing body of devotees who trust it as medical treatment.

**Yoga for Older Adults**

Older adults comprise a substantial portion of the yoga market; 17% of individuals over age 50, and 6% of individuals over age 65, have tried mind-body therapies (Wolsko et al., 2004), and 16.5% of yoga practitioners are age 54 or older (Saper et al., 2004). The U.S. Census Bureau predicts that a full quarter of the US population will be over 65 by 2050 (Winerman, 2006). Baby Boomers have already demonstrated a propensity for yoga; substantial portions of the demographic turned to yoga to resolve midlife psychological crises and relieve physical aches and pains (Rosin, 2006), and the numbers of older adults who practice yoga are expected to increase as the baby boom generation moves into older adulthood. There is a demonstrated trend for increased use of CAM therapies by individuals as they age; in the Zurich study (a twenty-year study of 591 participants), only 21.9% of participants used CAM therapies in 1993, but 29.5% indicated use of CAM therapies in 1999 (Rossler et al., 2007). This trend has been noted across cultures; Fukuda, Watanabe, Ono, Taubouchi, and Shirakawa (2006) report that CAM use by Japanese individuals increases with age, and conclude that “the impact of CAM on health promotion policy is not inconsequential” (p. 293). Because anecdotal evidence and initial research indicates that yoga is effective for managing chronic conditions such as pain, insomnia, hypertension, and other stress related conditions (which are not often successfully managed by modern medical protocols), Boomers are likely to increasingly turn to yoga for these conditions as they age.

Although more individuals continue to turn to yoga and other CAM therapies, and an initial body of research indicates that yoga may be effective as both preventative and restorative therapy, substantially more research is needed in order to accurately understand “the full range of benefits from Yoga” (Sherman, 2006, p. 10). There is minimal research, which investigates the mechanisms and impact of yoga in the increasing population of older adult yoga practitioners. As further complication, individuals who report either physical or psychological problems are twice as likely to use CAM techniques as individuals without reported medical problems (Rossler et al., 2007). Dham, Shah, Hirsch, and Banerji (2006) reported that ethnic individuals with chronic conditions such as diabetes may rely on CAM techniques, including yoga, for treatment. For
older adults with health conditions, unsupervised use of CAM techniques, including yoga, could be contraindicated. While “several CAM practices … are promising for … treatment, further rigorous study is needed in order to establish safety, efficacy, and mechanism of action” (Dham et al., p. 251). It is vitally important to better understand how yoga impacts the older adult population and to establish safe guidelines for implementation for older adults in general and for older adults with chronic health conditions (especially since individuals with health conditions are more likely to utilize CAM techniques such as yoga). Needed are treatment protocols for the type and dose of yoga treatment (i.e., what style and components of yoga are more effective for which conditions, how often and how long yoga must be practiced to experience benefits, whether yoga is more effective practiced with an instructor or individually, etc) (Sherman, 2006).

The present study aimed at investigating the impact of yoga on psychological health of senior citizens. As hypothesized, yoga led to improved psychological health, in comparison to exercise and wait-list, as indicated by decreased state and trait anger, state and trait anxiety, and depression, and increased overall well-being, positive affect, general self-efficacy, and self-efficacy for activities of daily living. It was also hypothesized that the practice of yoga would lead to increased capacity for self-regulation of physiological arousal, whereas exercise would not impact the capacity for self-regulation. Finally, self-control was proposed as the underlying mechanism of the psychological benefits of yoga.

The impact of yoga on psychological health. Both exercise and yoga led to improved psychological health, although changes due to yoga were generally larger than were changes due to exercise. Standardized improvements, which resulted from exercise (in comparison to waitlist) ranged from $ES = 0.01$ for anger to $ES = 0.46$ for general self-efficacy, and sustained effects ranged from $ES = -0.17$ for anger (i.e., a decrement in psychological function or increased anger) to $ES = 0.55$ for general self-efficacy. Standardized effects for the impact of yoga (in comparison to waitlist) ranged from $ES = 0.39$ for trait anxiety to $ES = 1.10$ for general self-efficacy, and sustained impact produced effects ranging from $ES = 0.42$ for self-efficacy for daily living to $ES = 0.85$ for general self-efficacy. The mean effect size for change due to exercise across all psychological variables was $ES = 0.26$ in a pre-post analysis (immediate effect; $ES = 0.21$ for sustained effect), and $ES = 0.21$ in a treatment versus control analysis (immediate effect; $ES = 0.15$ sustained effect). The pre-post mean effect size for yoga was $ES = 0.74$ (immediate effect; $ES = 0.68$ sustained effect) and in the treatment versus control, yoga’s mean immediate effect
was $ES = 0.70$ in comparison to waitlist, and $ES = 0.49$ in comparison to exercise ($ES = 0.62$ and $ES = 0.48$, respectively, for mean sustained effect).

Improved psychological status due to both exercise and yoga was anticipated. The meta-analysis of Netz et al (2005) identified the significant impact of exercise on psychological health in older adults, and previous research has indicated the potential for yoga and meditation interventions to reduce anger (Bhushan & Sinha 2001), anxiety (Eppley et al., 1989) and depression (Krishnamurthy & Telles, 2007; Woolery et al., 2004), and increase well-being (Netz & Lidor, 2003). The potential for yoga to increase psychological well-being, including improved energy and overall quality of life, has been demonstrated with older adults (Moolasarn et al., 2006). The benefits of yoga may apply both to healthy older adults, and potentially to older adults with mood disturbances and psychological disorders. Initial reviews indicate the potential application of yoga for this purpose. A 2005 review of eight studies investigating the effectiveness of yoga for the treatment of anxiety and anxiety disorders reported encouraging results, particularly with obsessive-compulsive disorders (Kirkwood et al., 2005). A similar review of five studies, which focused on depression, suggested the potential of yoga as a therapeutic intervention for depression (Pilkington, Kirkwood, Rampes, & Richardson, 2006). Results support the safety and potential efficacy of meditative practices for treating non-psychotic mood and anxiety disorders (Arias et al., 2006). Some unconventional treatments, like yoga, show promise as alternative or complementary treatments for depression and its long-term management (Mazure & Keita, 2006).

Krishnamurthy and Telles (2007) concluded that an integrated approach of yoga including the mental and philosophical aspects in addition to the physical practices is useful for improving psychological status in older adults. A yoga program has the potential to bring both the benefits of physical exercise and training, and also the benefits of increased mental concentration and focus. Older adults who practice yoga may increase strength, flexibility, and balance, and this may lead to increased self-efficacy for accomplishing the tasks of daily living. Further, meditation training may lead to increased concentration skills; this improved concentration may lead to more successful outcomes in regular tasks, which could therefore increase general self-efficacy. Because yoga provides training in relaxation skills, yoga training would help older adults to cope more effectively with stressors (and therefore potentially reduce anger and anxiety). Depression, anxiety, personality traits, social support, and spirituality have
all been associated with disease incidence and outcome, which is evidence that the mind has a meaningful role in health maintenance and disease recovery (Yuen & Baime, 2006). Yoga training impacts not only the body but also the mind, and therefore productively channels the power of the mind over the body to facilitate greater well-being. Overall, yoga training provides a unique experience, which improves both physical and psychological health, therefore increasing the outcomes, which could be expected from only physical or psychological training.

**Improving daily life: Immediate benefits of yoga.** Yoga teachers indicate that improved mood is the immediate response to yoga. Yoga practitioners often report that the combination of yoga postures (asanas) followed by relaxation (Shavasana) creates a deep sense of peace and freedom they have never before experienced (Boudette, 2006). In the present study, exercise and yoga both resulted in immediately improved mood, both in terms of reduced trait anxiety and reduced trait anger. After the first session, yoga decreased state anger ($ES = 0.90$) and state anxiety ($ES = 1.35$); chair exercise also led to decreased anger ($ES = 0.66$) and anxiety ($ES = 0.49$). These findings provide support to previous findings where a single session of yoga or mindfulness exercise activity impacted psychological health immediately, increasing one’s sense of tranquility (Szabo et al., 1998), and reducing depressive mood and state anxiety (Netz & Lidor, 2003). The single session impact of both exercise and yoga reduced over the course of the intervention (i.e., with a smaller improvement occurring in response to a single session), but state psychological health improved over the duration of the intervention. Before session six, state anger was lower than state anger before session one, with yoga participants experiencing greater change than exercise participants, ($ES = 0.85$ and $ES = 0.35$, respectively); likewise, state anxiety was lower among yoga participants than among exercise participants ($ES = 0.86$ and $ES = 0.34$).

Therefore, while the immediate impact of yoga and exercise on psychological state appeared to reduce over time, it had a cumulative effect leading to long-term improvements in psychological state. As with psychological traits, both yoga and exercise led to improved status and well-being, but yoga appears to have a larger impact and lead to larger effects (an overall reduction from before session 1 to after session 6 of $ES=1.15$ for state anger and $ES = 1.66$ for state anxiety, in comparison to $ES = 0.81$ and $ES = 0.69$). The immediate impact of yoga may make it a useful technique for implementation during difficult transitions in older age. For instance, if older adults were offered yoga classes during a transition to a new living community (e.g., from private home to community living, from community living to assisted living, or from assisted
living to nursing home care), the immediate impacts on psychological health could improve quality of living during the transition, while the long-term changes could lead to an enduring change.

More than exercise? Of particular interest in this study was whether the impact of chair yoga would be similar to that of chair exercise. In other words, whether the impact of yoga on psychological well-being parallels or is different from that of physical exercise. While the yoga classes did provide physical activity and physical exercise, it appears that yoga has a greater impact on psychological health than a comparable fitness program, which is non-mindful. The mean effect size for change across all psychological variables due to exercise was $ES = 0.26$ in a pre-post analysis (immediate effect; $ES = 0.21$ for sustained effect), and $ES = 0.21$ in a treatment versus control analysis (immediate effect; $ES = 0.15$ sustained effect). These values are very close to Netz et al.’s (2005) finding of $ES = 0.19$ mean effect-size for the impact of exercise on psychological health in older adults. In comparison, the pre-post mean effect size for yoga was $ES = 0.74$ (immediate effect; $ES = 0.68$ sustained effect). In treatment versus control analysis, yoga’s mean immediate effect in comparison to attention control was $ES = 0.70$, and $ES = 0.49$ in comparison to exercise ($ES = 0.62$ and $ES = 0.48$, respectively, for mean sustained effect). In a pre-post meta-analysis of yoga intervention studies (reflecting the comparison of pre-test and post-test values for each individual group and computed in a similar format to the Netz et al. meta-analysis), the mean effect-size for the impact of yoga on psychological health was $ES = 0.46$ (Bonura, Aloe, Tenenbaum & Becker, 2007). A more stringent treatment versus control meta-analytical procedure (reflecting the impact of yoga in comparison to the control group implemented in each study) resulted in a mean effect-size of $ES = 0.17$; a meta-analysis which only included those interventions in which treatment groups performed exercise resulted in a mean effect size of $ES = 0.13$ (Bonura et al.). Therefore, although the results of the current study reflect a larger effect size than meta-analytical results, overall results do indicate that yoga has an impact, which is greater than the impact of physical exercise. Results indicated that yoga is more than just physical exercise – in this study, the parallel comparisons of the impact of exercise and yoga in contrast to waitlist resulted in mean effects of $ES = 0.21$ and $ES = 0.70$, respectively. Although the Netz et al. and Bonura et al. findings resulted in smaller mean effect sizes (i.e., a comparison of $ES = 0.19$ for exercise and $ES = 0.46$ for yoga) this is to be expected, as meta-analytic effect sizes are usually smaller than the results of any one study. These smaller effect-
sizes in meta-analysis are more reflective of real effects – and the real effects of the Netz et al. and Bonura et al. meta-analyses indicate that yoga has a stronger impact on psychological health than does exercise. Yoga has an impact on psychological well-being above and beyond that of exercise. Therefore, although yoga includes physical exercise components and provides physical exercise benefits, it clearly is more than just an alternate format of physical exercise. The question, then, is if yoga is more than physical exercise, how can it best be understood?

*Mechanisms of Change in Yoga*

Manocha, Noyce, Rohowyj, and Turek (2005) inquired the reasons yoga and meditation practitioners perceive it as “uniquely beneficial, and yet there is not substantive scientific proof for its effectiveness” (p. 22). They proposed that the concern stems from an inappropriate research model which attempted to view meditation through a Westernized mindset, and which therefore minimized yoga and meditation to merely a method of relaxation. Likewise, Walsh and Shapiro (2006) indicate that Westernized research contexts minimize a true understanding of yoga and mindfulness practices. Both Manocha et al. and Walsh and Shapiro indicated a need for a research context, which is relevant to a holistic Eastern perspective. It is proposed, however, that while a holistic Eastern perspective is necessary for understanding yoga and mindfulness practices in their traditional form that a modernized understanding is also relevant and necessary to understanding yoga and mindfulness practices as most individuals utilize them today. Many individuals in western culture use yoga in a modern form; for instance, practicing a specific type of yoga in a limited context and with minimal or basic philosophical training. An understanding of yoga should not be limited to an alternate form of relaxation training (Manocha et al.) but should reflect the perspective of both the contemporary practitioners and the contemporary applications of yoga. Cognitive Behavioral Therapy (CBT) is proposed as a modern psychological theory, which encompasses both an individual’s mental process and his/her physical interactions with the world, and therefore CBT is proposed as an appropriate theoretical model with which to understand modern applications of yoga.

A traditional view of yoga (McCall, 2007) is remarkably similar to CBT, in which a psycho-educational model is used to help clients learn, acquire, and practice new skills, thought patterns, and coping strategies (Corey, 2005). CBT focuses on cognitions as the major determinates for human behavior, and faulty thought patterns as the cause of emotional and behavioral disturbance (Corey). In CBT, a psycho-educational model is used to help clients
learn, acquire, and practice new skills, thought patterns, and coping strategies (Corey). A traditional view of yoga contends that our thought patterns create the likelihood of similar future thought patterns. Over time, mental samskaras (i.e., mental ‘grooves’) form; these mental patterns deepen over time and continually reinforce the same tendencies (McCall, 2007). When yoga is approached as a form of psychological therapy, its practice is viewed as the appropriate place for both the identification and the overcoming of these samskaras. According to McCall, the experience of a yoga practice allows students to see their patterns. He encourages yoga teachers to encourage students to observe their thought processes during yoga practice. “Are your students judging themselves as they attempt a pose? Is fear limiting them from attempting practices that their bodies are ready for? Are they telling themselves that they’ll never be any good at yoga? The habit of self-study you help them cultivate on their yoga mats can spread to a broader awareness of mental habits” (McCall, p.1). Through the yoga practice, students may first become aware of those flawed thought patterns, and then learn new ways of thinking (McCall). “Yoga offers a non-verbal, experiential adjunct to talking therapy that provides an opportunity for connection with the physical body and the inner experience” (Boudette, 2006, p. 167). Therefore, in a yoga class, while physical exercise is an integral part of the experience, physical exercise is only a means to better understand the participant’s mental process. While yoga may yield the benefits of its physical components, it is therefore fundamentally different than exercise. Mindfulness approaches such as yoga work by “using intervention strategies with mechanisms familiar to cognitive behavioral therapists …[and] promote positive adjustment by strengthening metacognitive skills and by changing schemas related to emotion, health, and illness” (Hamilton, Kitzman, & Guyotte, 2006, p. 123). In one empirical investigation, CBT and yoga, both led to significant (and similar) improvements in psychological and physiological indicators of stress (Granath, Ingvarsson, Von Thiele, & Lundberg, 2006).

In the present study, a traditional Hatha yoga format was modified to accommodate physical limitations and allow for the yoga practice to be conducted while sitting on chairs. Each session began and ended with meditation and pranayama, and the bulk of each class focused on asana practice. During yoga instruction, participants received guidance about how and where to focus their attention. For instance, during a traditional meditation process, participants are instructed to focus on the sensation of the breath in the nostrils, to the exclusion of all other sensations. Typical instruction may include: “Maintain your awareness at your nostrils, feeling
the physical sensation of your breath. If your mind wanders to something else – to a discomfort in your back or knee, or what you have to do after class, bring it back to your nostrils. Use the physical sensation of your breathing as an anchor to center you in this experience.” As another example, in mountain pose (Tadasana), students would be instructed to “come into a standing posture with your toes slightly touching and heels slightly apart. Bring one hand to your bottom and the other to your ribcage. Gently tuck your tailbone under and your ribcage in. Release your hands gently to your sides, holding on to the back of the chair for balance if it feels more secure. Roll your shoulder blades down and back to open up your chest and tuck your chin in slightly. Challenge yourself to remain perfectly still. Try not to fidget or move, but remain in complete quiet.” Through such instructions, a yoga class teaches a physical process (i.e., feeling the sensation of the breath in the nostrils or standing completely still), which is intended to teach a cognitive process (i.e., controlling the thoughts and actions and maintaining awareness in the present moment). In beginner yoga classes, such as the one employed in this intervention, students are not actually taught about mental control or the underlying philosophy of mindfulness (i.e., a practice of complete present moment awareness), but the physical exercises which are experienced provided initial training in mindfulness practice. It should be noted that in traditional yoga philosophy, these physical exercises are considered foundational; they are necessary for learning yoga, and they begin to lead to the benefits of yoga, but ultimately the asanas of physical yoga are a means not the end (Swenson, 1999). Still, yoga theory holds that even initial asana training will lead to improved well-being (Khalsa, 2006), and the results of the present study indicate that even beginners with limited and brief yoga training can benefit from its underlying mechanisms.

According to traditional yoga philosophy, mindfulness makes yoga fundamentally different from non-yoga exercise, even when similar physical movements are practiced (Lasater, 2000). This mindfulness is the primary cognitive strategy, which practitioners learn through yoga practice, and the adoption of this cognitive strategy improves the individual’s capacity to interact appropriately with his/her environment. Inherent in present moment awareness is acceptance of things as they are (i.e., acceptance of the present, rather than craving for change in the future) (Lasater). Yoga philosophy teaches that this acceptance frees the individual from stress, anxiety, and unhappiness. When the individual accepts that the present moment is exactly as it is supposed to be; in other words, there is no need for change, then the individual is freed from
psychological pains such as stress, anxiety, and depression (Devananda, 1983).

Yoga also provides the tools and environment to help the mind (and the body) heal itself (Payne & Usatine, 2002). Particularly relevant to older individuals; Kabat-Zinn and colleagues provided evidence those mindfulness techniques may work as pain management strategies (Kabat-Zinn et al., 1992; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellers, 1987). For older adults facing physical health impairments, loss of independence, the death of loved ones, and their own impending death, this acceptance and greater self-control, might provide profound tools for reducing discomfort and increasing well-being (Devananda, 1983). If the elderly person can accept his/her current situation and enjoy the present moment, without fear or anxiety about tomorrow, he/she can perhaps achieve improved psychological health and functioning. In fact, yoga may be particularly relevant for older adults who are dealing with physical and environmental limitations, because its purpose is “getting your mind to work for you, not against you” (McCall, 2007, p. 1). According to McCall, yoga is more useful than psychotherapy or medicine, where practitioners may be satisfied with a return to normal mental health, while “yoga aims much higher, seeking to put its practitioners in touch with a state of peace, joy, and equanimity that yogis insist is everyone’s birthright” (McCall, p.2).

**Self-control as a result of yoga.** It was proposed that the psychological benefits of yoga may be due to increased self-control acquired during yoga practice, and that therefore changes in psychological well-being would be correlated with changes in self-control. Standardized effect-size comparisons for the immediate effect of yoga were $ES = 0.39$ (versus exercise) and $ES = 0.59$ (versus waitlist) and sustained effects were $ES = 0.33$ and $ES = 0.36$ in comparison to exercise and waitlist, respectively. Clearly, yoga did lead to increased self-control. However, while yoga led to increased self-control in comparison with exercise and no treatment, changes in self-control were correlated only with general self-efficacy and trait anxiety (and these were low correlations). No relationship was identified between self-control and any other measure of psychological health. The yoga philosophy reflects an underlying premise that self-control is integral to the improved psychological function, which an individual can learn, and experience through yoga. It is unclear whether lack of relationship between self-control and all psychological traits measured reflect an actual lack of relationship, an incongruence between the yogic concept of self-control and the self-control reflected in Rosenbaum’s measure, or an
incongruence between Rosenbaum’s perception of self-control and self-control as experienced by older adults. Future research is needed in order to untangle these issues and clearly understand the relationships between yoga practice and the development of self-control and of self-control as a causative factor of improved psychological status due to yoga practice.

The physiological changes accompanying the mental state. In this study, findings were not limited to participants self-report of improved well-being. Yoga also increased the capacity for self-regulating physiological arousal, which may reflect both improved awareness and greater control of the body and body functions. Tangible impact of yoga on physiological processes, such as brain wave patterns (Corby et al., 1978; Dostálek, 1970, 1979; Elson et al., 1977; Lou et al., 1999; Roldán & Dostálek, 1985; Roldán et al., 1983; Yamazaki et al., 1987), body temperature (Benson et al., 1982), and sensory perceptions (Telles et al., 1995; Telles & Naveen, 2004) were previously noted. The psychological control, which is developed through yoga practice may lead to physiological and hormonal changes, which in turn may lead to further psychological changes. While yoga clearly has an impact on physical health (exercise), and on mental health (through improved cognitive strategies), it may also have a more subtle impact on neurological and hormonal processes. Alternatively, the impact of yoga on neurological and hormonal processes may be a causative factor in cognitive and psychological improvements. However, hormonal changes have not been measured in this study, so the causal effect of hormonal changes on well-being cannot be inferred.

Vedamurthachar et al. (2006) found that reductions in depression were correlated with reductions in plasma cortisol levels, among participants trained in yoga, and proposed a biological mechanism in producing beneficial effects. West et al. (2004) also reported a decrease in salivary cortisol following yoga training. A single session of yoga has been found to decrease levels of salivary cortisol, which indicates stress. Reduction in cortisol level indicates reduction in stress level (Michalsen et al., 2006). Additional research has confirmed cortisol changes in response to yoga training, and also identified changes in blood pressure, heart rate, and urinary catecholamines, which reflect reduced stress (Granath et al. 2006). Heart rate was the sole indicator of arousal reduction in the current study, but extrapolation to the other physiological indices cannot be denied.

Sarang and Telles (2006) propose that “mental equilibrium” as a result of yoga practice is created through the “combination of yoga postures with supine rest [i.e., Shavasana]” which
therefore “reduces the oxygen consumption” (p. 143). It was hypothesized that the change in oxygen consumption is a causative factor for increased mental calm. Chaya, Kurpad, Nagendra, and Nagarathna (2006) measured basal metabolic rate (BMR) for individuals learning and practicing yoga over a six month period and compared results to control participants with similar lifestyle characteristics and also to World Health Organization (WHO) predictive equation values. Yoga participants had lower BMR than both control participants and WHO predictions, and Chaya et al. theorized that the reduced BMR reflects subsequent reduction level of arousal due to yoga training. Bhattacharya, Pandey, and Verma (2002) proposed that the effects of yoga may be attributed to beneficial effects of improved breathing technique; they demonstrated that training in yoga breathing decreased blood levels of free radicals and increased blood levels of super oxide dismutase. Bhattacharya et al. theorized that yoga training therefore not only improves an individual’s capacity to cope with stress, but also decreases the individual’s physiological response to stressors. Further, six-weeks of yoga training led to significant reductions in blood pressure, heart rate, and body mass index, and individuals with established coronary artery disease also experienced 69% improvement in endothelial-dependent vasodilation (Sivasankaran et al., 2006). Three months of yoga training improved lipid profiles in men and women, reducing both total and low-density lipoprotein levels (Prasad et al., 2006). Additionally, long-term yoga and meditation practice have been correlated with increased thickness of the prefrontal cortical region of the brain; specifically the inferior occipitotemporal visual cortex and the right anterior insular, when compared to non-meditating subjects (Lazar et al., 2006). The researchers found that meditation experience, measured both by total number of hours and ability to lower breathing rate during meditation, was correlated with the thickness of the two regions, and that differences were strongest in older participants. They suggest that meditation can prevent age-related cortical loss.

There is evidence in the research literature which indicates that yoga has a physiological impact on the body, and that this physiological impact may produce health-promoting changes (i.e., reduced levels of stress hormones and cholesterol, improved heart rates and blood pressures, etc). The majority of physiological studies have been conducted with young participants, and the current findings demonstrate that the capacity to learn greater control of arousal through yoga extends to older adults. This may have important implications for the health and well-being of older adults. For instance, older adults who learn to control
physiological arousal may become empowered to improve high heart rate, high blood pressure, and other risk factors for chronic conditions. Future research should assess the extent to which yoga practice can improve physiological characteristics in older adults, and the amount of yoga practice and training, which is required to produce such broad-ranging effects.

Moving from mechanisms of change to a holistic explanation. Explanations for the way meditation and mindfulness strategies work and impact human behavior can be clustered into three categories: metaphors, mechanisms, and processes (Walsh & Shapiro, 2006). Traditional explanations of the impact of yoga and meditation usually involve metaphors (i.e., freeing, awakening, or purifying the mind). A focus on mechanisms includes specific components of the process; for instance, as discussed here, specific biological processes such as reduced arousal or cognitive processes such as increased self-control. Walsh and Shapiro concluded that eventually explanations of the meditative experience must move to an overall process of the system, rather than a lower level explanation of the mechanisms within the system. At this early stage of yoga research and understanding, we have begun to understand the mechanisms at work in yoga’s impact – the psychological and physiological changes which occur due to yoga practice. Through continued research, a more in-depth understanding of those mechanisms can be acquired, which will eventually facilitate an overarching theoretical understanding of the process behind yoga’s impact. One important process that may be central both to meditations and to psychotherapies is refining awareness, a process that may, of course, incorporate and facilitate several of the mechanisms and metaphoric processes already discussed (Walsh & Shapiro). Because the refinement of awareness is one of the central purposes of traditional meditative and yoga practice, and because it is also a purpose of CBT, CBT is an appropriate model for research of how and why yoga works, especially in order to develop an understanding of yoga practice within a modern context, and as practiced by modern individuals. Yoga is a 5,000-year-old practice and involves spiritual awareness, which is ultimately more than the sum of its mechanistic processes; it may perhaps be beyond the capacity of western psychology to capture the traditional and holistic practice of yoga. Still, we can assess yoga through a CBT framework, and through this perspective gain insight into safe and effective yoga practice.

Maintenance of the Impact of Yoga

The improved psychological status due to both yoga and exercise began to decline after the cessation of the intervention. This may have been caused by cessation of contact with the
instructor, and lack of social support from the group. Some of the participants may have continued to practice on their own through the provided guidelines, but Netz et al. (2005) reported that longer interventions were actually associated with less positive change in well-being. They proposed that after relatively little exercise activity, individuals can realize the increased weight they can lift, or the increased distance they can walk, which may stimulate an increased sense of control and general well-being. Once individuals increase their sense of well-being in response to exercise after a relatively short time, they may feel that exercise provides no further benefits, and therefore have less motivation to continue. Thus, initial results are more noticeable and lead to greater boosts in mood. Decrement in psychological health after the end of the intervention were most likely caused by participants ceasing to practice once the structured support was no longer available. Yoga effects were better sustained than were exercise effects, which may provide further evidence that yoga practice is more than just physical exercise, and is also a mental process, which impacts cognitive structure.

Limitations of the Current Research

Walsh and Shapiro (2006) identified three broad categories of research limitations, which are common in studies investigating meditation and related domains. Design problems include issues with sample size, suboptimal control groups, and a lack of randomized assignment. Assessment problems include reliance on self-report methods and short-term assessment. Finally, Walsh and Shapiro indicate a research focus on beginner practice as a subject limitation. The present study took these limitations into consideration as much as possible. First, design problems were prevented through the use of power analysis and random assignment of participants to the three groups. Power analysis identified the minimum number of participants required to observe an effect size of .80, with \( \alpha = 0.05 \). Furthermore, participants were randomly assigned to groups, and control groups shared equivalent characteristics and size as the experimental group.

While Walsh and Shapiro (2006) express valid concern over assessment and subject group limitations, other perspectives prevailed in the design of the present study. Sherman (2006) indicates that yoga research at the current stage should focus on specific conditions in which short-term practice by novice participants can lead to marked improvement. According to Sherman, the National Institutes of Health (NIH) mission statement indicates the importance of offering therapies to those with the greatest need. While yoga research with advanced
practitioners may lead to more interesting results, an understanding of the possible improvements which may occur due to yoga training among previously inexperienced older adults could lead to interventions which could improve quality of life for an underserved population. Sherman points out that many yoga instructors may already engage in “outreach work” without documenting results; greater understanding of the implementation of yoga in these settings is vital in order to determine standards of safety and efficacy. In fact, this research project was initially proposed in response to the researcher’s volunteer outreach work in senior citizen communities, and a desire to empirically investigate anecdotal experience. Although the implementation of a yoga program with novice practitioners was determined to be of interest, this decision may be viewed as a limitation of the current research. Likewise, the reliance on self-report measures may be considered a limitation of the current study. In order to reduce the impact of this limitation, self-report measures were carefully selected for their theoretical appropriateness, and their psychometric characteristics. Further, physiological arousal was added to the design in order to increase both reliability and validity of results. Finally, semi-structured interviews were conducted with yoga participants upon completion of the program in order to gain additional insights into the yoga experience, and to triangulate research findings. Sherman (2006) indicated the need for early stage yoga research to include qualitative inquiry to better understand how people are benefiting (or not) from their Yoga practice. The findings from initial inquiries, such as this, may guide both the development of future research questions and the framework of future research investigations.

Further limitations in the present study are the result of the instructor and the style of yoga. One instructor (the primary researcher) taught both the exercise and the yoga classes, and the instructor’s personal experiences with yoga may have led to a greater unconscious effort put into the yoga group; some of the effects of yoga could therefore reflect the instructor’s personal beliefs and preferences for yoga. It should be noted that the instructor has been teaching senior citizen group fitness classes for over a decade, in diverse formats including yoga, chair fitness, chair aerobics, and tai chi, and that the instructor attempted to approach all class sessions with the same level of professionalism, competency, and enthusiasm. Still, unconscious forces could have impacted study outcomes. Future research which employs similar techniques and instrumentations, but with the addition of multiple groups led by multiple instructors, is recommended, in order to minimize the potential of instructor preference to impact outcomes.
Finally, the type of yoga used can be considered a limitation of the present study. Because there are many styles of yoga, one cannot generalize the current results across all yoga forms. Most yoga research, which has been conducted to this point, has focused on a particular format of yoga or a generalized Hatha format. Future research, which investigates the impact of various forms of yoga on specific outcomes, would provide greater insight into the critical components and underlying mechanisms of yoga.

**Future Directions in Yoga Research**

Interest in yoga is slowly spreading into the scientific community. Currently, the NIH lists 13 research grants in progress in the U.S. which focus in some way on yoga processes or meditation, or on evaluations of clinical applications of yoga for conditions such as back pain, insomnia, and quality of life in chronic conditions such as cancer and HIV (Shapiro, 2006). However, while the field of yoga research continues to grow, most of the yoga research currently being conducted is low level, in terms of quantity, and nothing that will shift paradigms (Khalsa, in Weeks, 2006). In order for the mechanisms and impact of yoga to be understood and applied appropriately in therapeutic settings, more and better research is needed. “The concept is critical mass. We need replication – many well-done studies by different investigators done on different populations. This provides more confidence in the results. More review articles and meta-analyses are also useful (Khalsa, in Weeks). Khalsa projects that a major obstacle in future yoga research will be the absence of funding, due to the difficulties inherent in evaluating CAM therapy research by traditional scientific standards. Greater research is needed in order to truly understand both the underlying mechanisms of yoga, and the potential therapeutic and medical applications of this ancient practice. Furthermore, a sound scientific framework is needed to enhance research, which will facilitate investigation of both the processes and impacts of yoga.

According to Tashiro and Mortensen (2006), over 6 million adults and over 3 million children each year terminate psychotherapy without experiencing recovery. In an effort to develop techniques and strategies, which may be useful for these individuals who are not being served by the current model of psychological treatment, the National Institute of Mental Health (NIMH) has placed an emphasis on translational research, which is research that revolves “around the broad idea of applying basic science findings to the prevention and treatment of illness. … the benefits from translational research are often bidirectional, with translational research often revealing new research questions that are highly relevant to basic science”
(Tashiro & Mortensen, p.960). According to Tashiro and Mortensen, translational methods are relevant to diverse subfields of psychology, so that basic science concepts from a particular domain can be translated into innovative treatment. Tashiro and Mortensen indicate that translational research serves both broad and specific purposes in connecting theory and practice:

The science-practice gap has been a long-standing problem in the sciences, but translational research provides a systematic framework for moving basic science knowledge into effective treatments for mental illness. The process of translational research not only enhances treatments for mental illness, it also requires that researchers return to the laboratory when applied studies raise new questions about basic psychological processes. Systematic variation … provides a starting point for thinking about the progression of a program of translational research (Tashiro & Mortensen, p. 964).

We propose that translational research is an appropriate model with which to approach the emerging field of yoga therapy. Yoga is an ancient practice and comprises a vast body of philosophy and knowledge, but this domain must be better understood in terms of its clinical and therapeutic applications. According to Tashiro and Mortensen (2006), translational research provides a framework for empirical investigation. There are five methodological considerations derived from their observations of methods commonly implemented in successful programs of translational research: (a) time, (b) scope, (c) dose, (d) contraindication, and (e) sampling.

Established yoga scholars agree that the future of yoga as a therapeutic and medical application requires adaptation to a scientific framework. The interests of the NIH include evaluating the efficacy of Yoga and understanding the mechanisms of action. Thus, to receive support from the NIH, Yoga and other CAM therapies must fit into this framework (Sherman, 2006). Sherman recommends that research at this point focus on those conditions, like back pain, where experience with novices and modest practice over a relatively short timeframe, can improve physical or mental health to a marked degree. Indeed, this recommendation reflects Tashiro and Mortensen’s (2006) recommendation for early stage translational research, in that it focuses on short-term interventions, which are specific in scope and geared to a targeted and relatively healthy population (while back pain may be considered a clinical condition, it is not life threatening).
Any advances in research on yoga, however, are complicated by the diversity within the modern yoga community. A main problem is the multiplicity of overlapping concepts and the variety of Yoga ‘schools’ and practice. In planning research on yoga, there were many difficulties in communicating with Yoga teachers, based on differences in belief systems, frameworks, methods, standards, and goals (Shapiro, 2006). Furthermore, theoretical incompatibilities between western scientific methods and eastern philosophical approaches could lead to complications, both in design of appropriate research methods and in authentic interpretation of research results (Manocha et al., 2005; Walsh & Shapiro, 2006). Researchers must be cognizant of these issues throughout the scientific process and should clearly identify the type of yoga implemented, and the theoretical framework and philosophical approach used for interpretation and understanding.

According to Shapiro (2006), barriers in the medical community cause further complications in yoga research and application. Astin, Goddard, and Forys (2005) conducted focus groups with medical students, residents, primary care doctors, and specialists, and identified the barriers, which prevent medical professionals from accepting or integrating CAM therapies (such as yoga). Barriers included lack of knowledge of the evidence base of CAM practices, lack of attention to these practices during training, and lack of competence in these methods. In general, medical training may not include exposure to CAM therapies and physicians feel ill-equipped to deal with them (Shapiro). If medical professionals do not understand either the philosophical basis for or the therapeutic applications of yoga, and the diversity of yoga schools and traditions creates a lack of consensus as to what that basis and those applications are, then yoga research and application will continue to operate only in a minimal and non-cohesive manner, rather than as an integrated system. Shapiro proposes that an integrated model, such as the Biopsychosocial Model proposed by George Engel (1977) be an alternative to the biomedical model. Engel’s biopsychosocial model suggested a view of health and disease, which encompassed not just symptoms, but that worked not only to achieve integration, but also to consider the role of social-cultural factors, the relationship between the patient and the health-care system, and the social cultural context of healthcare (Shapiro). A medical and research perspective, which views yoga as an integrative system of person, relationship, and cultural will retain the tradition of yoga as “a way of life” (Khalsa, 2006, p.5). Shapiro asserts that true progress in yoga research will require deliberation and discussion, and
the necessity of reaching consensus within the yoga community. Viewing the development of scientific knowledge about yoga through the perspective of translational research would allow for those discussions to occur within the context of yoga as a practice, and allow research questions and methods to be informed by the answers, which were formulated. Likewise, through the understanding of research questions, which came from the yoga community, scientific information could guide the future developments of yoga practice as a medical and therapeutic intervention.

**Conclusions**

Yoga training can improve psychological well-being in older adults and therefore support overall health and well-being. Because yoga classes can be implemented in community-based settings to large numbers of individuals at low cost, they offer the potential of providing affordable preventative mental health care to large numbers of older adults, including older adults with dementia (Lindberg, 2006). Further, because yoga classes are free from the stigma of medical care (Murray, 1982), yoga may be particularly useful for older adults with cultural and personal beliefs that create resistance to medical treatment (i.e., fear of needing help or being perceived as weak). Elders may prefer mind-body strategies that are self-administered, and include both physical and cognitive elements, as they wish to remain involved in their self-care as long as possible (Yuen & Baime, 2006). Yoga may serve to complement the medical treatment, which an older adult may already be receiving. According to McCall (2007), the self-study, which a yoga student can undergo, can bring greater awareness and effort to the individual’s work with a doctor or psychotherapist. Because yoga can simultaneously provide gentle and effective physical exercise as well as teach increased emotional and cognitive control, it may be particularly well-suited to older adults. Older adults need physical exercise to maintain functionality and independence. Likewise, an increased capacity for self-regulation can help older adults to maintain a sense of competence and self-sufficiency. As well, a yoga intervention can be offered at low cost in a senior citizen community center or living facility. However, because certain traditional yoga poses and breathing exercises may be contraindicated for older adults, and for both acute and chronic conditions, which may be common in a population of older adults, a modified yoga format is necessary in these settings.

*Modifying yoga for special populations.* The modification of the traditional yoga format in order to meet the needs of a particular population has been criticized by traditionalists who
express the “depth of our derision of limited Yoga” (Khalsa, 2006, p.6). However, Khalsa contends that change is inevitable, and need not be feared by the yoga community. Khalsa proposes that limited and Americanized forms of yoga may feel more comfortable to many new students, and may facilitate the practice of yoga by individuals who would not have attempted a traditional form of yoga laced with philosophy and Sanskrit. According to Khalsa, individuals who practice yoga as fitness will still receive more benefit than someone practicing conventional Western physical fitness programs, and a limited yoga practice could eventually inspire and lead to a deeper involvement with Yoga that might never have happened without the experience of limited Yoga. Regardless of whether an individual is practicing ‘limited’ or ‘traditional’ yoga, the practice is likely to improve both physical and psychological health. Further, in some cases, modified yoga may be the only option available to certain populations; for instance, older adults and individuals with disabilities may be unable to practice traditional forms of yoga. Specific yoga postures may be contraindicated, particularly for older adults (i.e., sirsasana – headstand posture – may increase intraocular pressure and increase the risk of developing glaucoma and should therefore be avoided by older adults at risk; Gallardo; Aggarwal, Cavanagh, & Whitson, 2006; history of hyperextension of the neck during yoga practice can be associated with spontaneous dissection of the carotid or vertebral artery in at-risk individuals; Caso, Paciaroni, & Bogousslavsky, 2005). Modified yoga programs can include all of the core elements of a traditional yoga practice (including asana, meditation, pranayama, and philosophical instruction) while making adaptations for the sake of accessibility and safety. The yoga practice, which was implemented in this study, achieved positive outcomes without any injuries or complications, and can be used as a model for older adult yoga programs. Further research should determine the key elements, and use different models for older adult yoga in order to determine the most effective and safest poses and protocols, and establish guidelines for adapting yoga exercises safely for various conditions and populations.

Standards for yoga implementation. Since yoga offers the potential to improve psychological health and well-being, insuring safe delivery of yoga through greater regulation and clearer standards for training and delivery is of vital importance. Though yoga is not legally considered a healthcare practice at the present time, many yoga practitioners and yoga instructors approach yoga as medicine. Additionally, yoga students may develop emotional attachment to their teachers and approach them for assistance outside the scope of yoga practice (e.g., for
issues including general emotional distress, addiction, and even psychological disorders; Charnas, 2007). A Yoga Therapist’s practice may appear to include elements of talk therapy and physical medicine (Weeks, 2006) (although for legal reasons, Yoga Therapists decline to call themselves healthcare practitioners; Weeks). Ethical yoga instructors carefully monitor their boundaries and restrict their assistance to a legitimate scope of practice, referring students who ask for additional assistance to licensed healthcare practitioners. However, because yoga is not a licensed or regulated profession, training standards vary from completely absent to several years of intensive study and internship. Many yoga teachers may not know what their ethical boundaries or obligations are, and may be unaware when they cross them. Some leaders in the yoga movement contend that state licensing is a necessity [for yoga teachers and yoga therapists], and that means establishing standards of education, training, and clinical experience, as well as procedures for certification by professional Yoga organizations (Shapiro, 2006). Preliminary yoga research has demonstrated yoga’s potential as an effective medical and psychological technique. Further research concerning the safety and efficacy of yoga and its implementation should be used to shape guidelines for yoga training and delivery. The impact of relevant variables – for instance, instructor training, individual or group instruction, and the yoga components included in a program – must be established. Empirical investigation should guide implementation of standards for training and delivery of yoga.

CAM education for medical professionals. The National Institutes of Health (NIH) is setting the standard for CAM therapies in a medical setting. While NIH medical staff address patients’ disease, its Pain and Palliative Care Service (PPCS) addresses their suffering” (Miles, 2004). The PPCS offers CAM therapies, including yoga. Scientific research into CAM practices, such as yoga, is useless if medical professionals are not appropriately educated about the safe use and practice of CAM techniques, and informed about their patients’ use of such modalities. According to Fowler and Newton (2006), the Healthy People 2010 report included an intention to increase both quality and years of healthy life (Fowler & Newton). CAM strategies can help individuals meet this goal, but only if medical professionals are involved in the process. Fowler and Newton emphasize the importance of nurses becoming educated about all aspects of CAM, including costs, patient knowledge, and drug interactions. Likewise, Allen, Blashki, and Gullone (2006) highlight the importance of accurate professional awareness and understanding of mindfulness and its therapeutic applications. Already, some practitioners, such as medical
doctors, psychotherapists, and chiropractors, are recommending yoga to help reduce stress (Butera, 2006), but yoga has the potential to be useful for more than just stress management. In a survey of practicing psychologists, respondents reported little knowledge of yoga (Miller, 2006); since yoga may be useful for improving mood and reducing symptoms in many psychological disorders, and since yoga practitioners may be implementing yoga in an attempt to self-treat psychological issues, it is imperative for psychologists to become better informed about yoga as complementary treatment. Moreover, it is critical for primary care physicians to become informed about CAM therapies such as yoga, since yoga is especially useful as a stress regulation strategy, and 60 – 90% of individuals suffering from stress-related complaints turn to their family doctor for guidance (Schwickert, Langhorst, Paul, Michalsen, & Dobos, 2006).

Scientific research concerning the mechanisms and impact of yoga (and other CAM modalities) is only useful insomuch as it informs medical professionals and consumers about implementation.

Final words. In sum, yoga, like other CAM therapies, provides an approach to health promotion and disease prevention and treatment, which can serve as a supplement to modern medical interventions, especially with regard to chronic conditions, which are often inadequately treated with allopathic techniques. Yoga and CAM therapies can “be used as primary therapy to treat specific diseases, as injunctive therapy in comprehensive treatment plans, and as a means of improving the quality of life of individuals with chronic or debilitating illnesses” (Yuen & Baime, 2006, p. 233). CAM techniques such as yoga may be useful (1) for chronic conditions for which modern medical interventions are limited, (2) for management of symptoms related to chronic conditions or which occur due to treatment for specific conditions, and (3) to help “outlier patients who are not seeing positive results from traditional therapy and continue to need help” (Goldstein, 2005). CAM use among patients has already become increasingly common and health professionals need to be informed of application and potential contraindication to guide safe and effective use (Dhalla, Chan, Montaner, & Hogg, 2006).

Currently, though much empirical work is needed to determine the parameters of mindfulness meditation’s benefits, and the mechanisms by which it may achieve these benefits, theory and data thus far clearly suggest the promise of mindfulness (Hamilton et al., 2006). Allen et al. (2006) conclude that “the combination of some well-developed conceptual models and a developing empirical base justifies a degree of optimism that mindfulness-based approaches will
become helpful strategies to offer in the care of patients with a wide range of mental and physical health problems” (p. 285). However, in order for yoga and other mindfulness-based approaches to truly become both useful and acceptable health strategies, a three-fold approach is needed to (1) establish clear guidelines based on empirical results which will direct the implementation of yoga for both specific populations and specific conditions, (2) develop guidelines of yoga teaching and implementation (and consistent standards for yoga teachers and yoga teacher training), in order to insure that the teachers who are implementing yoga within the medical context are doing so appropriately, and (3) to educate medical professionals about both the use of yoga for specific populations and conditions, and also the necessary standards for yoga instructors, in order to insure that medical professionals establish collaborations with appropriate practitioners and are able to supervise their patients’ use of yoga.
Health History Form

Name:
Age:
Sex:
Current Weight:
Desired Weight:
Personal Physician:
Physician’s Address:

Directions: Please answer the following questions to the best of your knowledge about yourself. Check below any medical condition, treatment or problems that concern you.

I. HEART and CIRCULATORY
A. _____ Heart Attack, Heart disease or any other heart related problems
B. _____ Heart Valve Problems
C. _____ Heart Murmur
D. _____ Enlarged Heart
E. _____ Irregular Heart Beat
F. _____ Atherosclerosis
G. _____ Stroke
H. _____ High Blood Pressure (controlled)
I. _____ High Blood Pressure (uncontrolled)
J. _____ Rheumatic Fever
K. _____ Cardiac Surgery
L. _____ Coronary Bypass
M. _____ High Triglyceride Level
N. _____ High Cholesterol Level
O. _____ Varicose Veins
P. _____ Anemia
Q. _____ Hemophilia
R. _____ Diabetes (controlled)
S. _____ Diabetes (uncontrolled)
T. _____ Phlebitis, Emboli (blood clots)
U. _____ Other, Specify____________________________________

II. RESPIRATORY
A. _____ Emphysema
B. _____ Bronchitis
C. _____ Pneumonia
D. _____ Asthma: _______ (childhood) _________ (currently)
E. _____ Lung Disease
F. _____ Other, Specify____________________________

III. OTHER DISEASE or ALIMENTS
A. _____ Back Injuries/Back Pain
B. _____ Epilepsy/Seizures (past or present)
C. _____ Allergies
D. _____ Liver Disease (Hepatitis, Jaundice)
E. _____ Kidney Disease
F. _____ Arthritis
G. _____ Orthopedic Leg, Arm or Joint Problems
H. _____ Neurologic Diseases
I. _____ Migraine Headaches/Other Frequent Headaches

Please explain any conditions you checked YES in I-III above:
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
IV. HAVE YOU RECENTLY HAD:
A. _____ Chest Pain
B. _____ Shortness of Breath Upon Exertion
C. _____ Heart Palpitations
D. _____ Cough on Exertion
E. _____ Cough Up Blood
F. _____ Swollen, Stiff or Painful Joints
G. _____ Dizziness
H. _____ Lightheadedness
I. _____ Fainting
J. _____ Back Problems
K. _____ Gastrointestinal Disturbances (nausea, vomiting, diarrhea, abdominal pains)

Please explain any conditions you checked in IV above:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
V. FAMILY MEDICAL HISTORY (Immediate Relatives)
A. _____ Heart Attack, Heart Disease or other heart related problems
B. _____ Stroke
C. _____ Atherosclerosis
D. _____ High Blood Pressure
E. _____ Diabetes
F. _____ Lung Disease
G. _____ Respiratory Problems
H. _____ Heart Surgery or
I. _____ Heart Related Surgery
J. _____ Other, Specify: ______________________________________________________________
VI. TOBACCO
A. Do you currently smoke or use tobacco products?
   _____ Yes _____ No
B. What type?
   _____ Cigarette
   _____ Pipe
   _____ Cigar
   _____ Chewing tobacco
C. How long? _____
D. Amount smoked per day? __________
E. If you do not currently smoke, have you ever?
   _____ Yes _____ No
F. If YES, how long ago did you quit? __________

VII. EXERCISE
A. Do you exercise? _____ Yes _____ No
B. What kind of exercise do you presently engage in?
   __________________________________________________________________________
   __________________________________________________________________________
   __________
C. Is your level of effort: _____ minimal _____ moderate _____ high
D. How often do you exercise? __________ days per week
E. How long do you exercise? __________ minutes per day

Please list any prescription medications, vitamin/nutritional supplements, over-the-counter medications you are currently taking or have taken in the last 7 days (don’t forget to include hormones, headache/migraine medications, etc.):

___________________________________________________________________________
___________________________________________________________________________

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Please describe your present medical condition and anything we should be aware of concerning your health:

Date of last physical examination? _______________________
Results: _____________________________

Date of last EKG _______________________
Results: ____________________________________________

I certify that my responses to the foregoing questionnaire are true, accurate and complete:
Signature: ____________________________________________ Date: ______________________

Signature of Parent/Guardian: ____________________________
Date: ______________________
(required for participants under 18 years of age)
Demographic Questionnaire

(1) Name: ________________________________

(2) Age (in years) __________

(3) Gender (circle one): Male       Female

(4) Marital Status: ________________

(4) Occupational Status (circle one): Working full-time Disabled Working part-time Retired

(6) How many days per week do you engage in exercise? ________________
    When you exercise, how many minutes per session? ________________
    What kind of exercise? _________________________________________
APPENDIX C: STATE-TRAIT ANGER EXPRESSION INVENTORY
The State-Trait Anger Expression Inventory is a copyrighted assessment. Test materials and usage privileges may be purchased from Psychological Assessment Resources, Inc.

PAR, Inc.
16204 North Florida Avenue
Lutz, FL 33549

Phone:
1.800.331.8378
+813 968 3003, ext 361

Fax:
1.800.727.9329

Website:
http://www3.parinc.com
APPENDIX D: STATE-TRAIT ANXIETY INVENTORY
The State-Trait Anxiety Inventory is a copyrighted assessment. Test materials and usage privileges may be purchased from Mind Garden, Inc.

Mind Garden Inc.
855 Oak Grove Road, Suite 215
Menlo Park, CA 94025 USA

Phone:
(650) 322-6300

Fax:
(650) 322-6398

Website:
http://www.mindgarden.com

Email:
info@moldgarden.com
APPENDIX E: GERIATRIC DEPRESSION SCALE
Geriatric depression scale (GDS)

Choose the best answer for how you have felt over the past week:

1. Are you basically satisfied with your life?  
   - Yes / No
2. Have you dropped many of your activities and interests?  
   - Yes / No
3. Do you feel that your life is empty?  
   - Yes / No
4. Do you often get bored?  
   - Yes / No
5. Are you hopeful about the future?  
   - Yes / No
6. Are you bothered by thoughts you can’t get out of your head?  
   - Yes / No
7. Are you in good spirits most of the time?  
   - Yes / No
8. Are you afraid that something bad is going to happen to you?  
   - Yes / No
9. Do you feel happy most of the time?  
   - Yes / No
10. Do you often feel helpless?  
    - Yes / No
11. Do you often get restless and fidgety?  
    - Yes / No
12. Do you prefer to stay at home, rather than going out and doing new things?  
    - Yes / No
13. Do you frequently worry about the future?  
    - Yes / No
14. Do you feel you have more problems with memory than most?  
    - Yes / No
15. Do you think it is wonderful to be alive now?  
    - Yes / No
16. Do you often feel downhearted and blue?  
    - Yes / No
17. Do you feel pretty worthless the way you are now?  
    - Yes / No
18. Do you worry a lot about the past?  
    - Yes / No
19. Do you find life very exciting?  
    - Yes / No
20. Is it hard for you to get started on new projects?  
    - Yes / No
21. Do you feel full of energy?  
    - Yes / No
22. Do you feel that your situation is hopeless?  
    - Yes / No
23. Do you think that most people are better off than you are?  
    - Yes / No
24. Do you frequently get upset over little things?  
    - Yes / No
25. Do you frequently feel like crying?  
    - Yes / No
26. Do you have trouble concentrating?  
    - Yes / No
27. Do you enjoy getting up in the morning?  
    - Yes / No
28. Do you prefer to avoid social gatherings?  
    - Yes / No
29. Is it easy for you to make decisions?  
    - Yes / No
30. Is your mind as clear as it used to be?  
    - Yes / No
APPENDIX F: LAWTON’S PGC MORALE SCALE
Lawton’s PGC Morale Scale

DIRECTIONS: Choose the best answer for how you have felt over the past week. Answer YES or NO

1. Things keep getting worse as I get older. Yes / No
2. I have as much pep as I had last year. Yes / No
3. Do you feel lonely? Yes / No
4. Little things bother me more this year. Yes / No
5. I see enough of my friends and relatives. Yes / No
6. As you get older, you are less useful. Yes / No
7. I sometimes worry so much that I can’t sleep. Yes / No
8. As I get older, things are better than I thought they would be. Yes / No
9. I sometimes feel that life isn’t worth living. Yes / No
10. I am as happy now as I was when I was younger. Yes / No
11. I have a lot to be sad about. Yes / No
12. I am afraid of a lot of things. Yes / No
13. I get mad more than I used to. Yes / No
14. Life is hard for me much of the time. Yes / No
15. Are you satisfied with your life today? Yes / No
16. I take things hard. Yes / No
17. I get upset easily. Yes / No
General Self-Efficacy Scale

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Somewhat</th>
<th>Moderately</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can always manage to solve difficult problems if I try hard enough.</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>If someone opposes me, I can find the means and ways to get what I want.</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>It is easy for me to stick to my aims and accomplish my goals.</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>I am confident that I could deal efficiently with unexpected events</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Thanks to my resourcefulness, I know how to handle unforeseen situations</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>I can solve most problems if I invest the necessary effort</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>I can remain calm when facing difficulties because I can rely on my coping abilities</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>When I am confronted with a problem, I can usually find several solutions</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>If I am in trouble, I can usually think of a solution</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>I can usually handle whatever comes my way</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
</tbody>
</table>
APPENDIX H: CHRONIC DISEASE SELF-EFFICACY SCALE
Chronic Disease Self-Efficacy Scales

We would like to know how confident you are in doing certain activities. For each of the following questions, please choose the number that corresponds to your confidence that you can do the tasks regularly at the present time.

Exercise Regularly Scale

1. How confident are you that you can do gentle exercises for muscle strength and flexibility three to four times per week (range of motion, using weights, etc.)?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

2. How confident are you that you can do aerobic exercise such as walking, swimming, or bicycling three to four times each week?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

3. How confident are you that you can exercise without making symptoms worse?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

Get Information About Disease Item

1. How confident are you that you can get information about your disease from community resources?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

Obtain Help from Community, Family, Friends Scale

1. How confident are you that you can get family and friends to help you with the things you need (such as household chores like shopping, cooking, or transport)?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

2. How confident are you that you can get emotional support from friends and family (such as listening or talking over your problems)?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

3. How confident are you that you can get emotional support from resources other than friends or family, if needed?

   not 1 2 3 4 5 6 7 8 9 10 totally confident

4. How confident are you that you can get help with your daily tasks (such as housecleaning, yard work, meals, or personal hygiene) from resources other than friends or family, if needed?

   not 1 2 3 4 5 6 7 8 9 10 totally confident
Communicate With Physician Scale

1. How confident are you that you can ask your doctor things about your illness that concerns you?

2. How confident are you that you can discuss openly with your doctor any personal problems that may be related to your illness?

3. How confident are you that you can get work out differences with your doctor when they arise?

Manage Disease in General Scale

1. Having an illness often means doing different tasks and activities to manage your condition. How confident are you that you can do all the things necessary to manage your condition on a regular basis?

2. How confident are you that you can judge when the changes in your illness mean you should visit a doctor?

3. How confident are you that you can do the different tasks and activities needed to manage your health condition so as to reduce your need to see a doctor?

4. How confident are you that you can reduce the emotional distress caused by your health condition so that it does not affect your everyday life?

5. How confident are you that you can do things other than just taking medication to reduce how much your illness affects your everyday life?

Do Chores Scale

1. How confident are you that you can complete your household chores, such as vacuuming and yard work, despite your health problems?

2. How confident are you that you can get your errands done despite your health problems?
3. How confident are you that you can get your shopping done despite your health problems?

Social/Recreational Activities Scale
1. How confident are you that you can continue to do your hobbies and recreation?
2. How confident are you that you can continue to do the things you like to do with friends and family (such as social visits and recreation)?

Manage Symptoms Scale
1. How confident are you that you can reduce your physical discomfort or pain?
2. How confident are you that you can keep the fatigue caused by your disease from interfering with the things you want to do?
3. How confident are you that you can keep the physical discomfort or pain of your disease from interfering with the things you want to do?
4. How confident are you that you can keep any other symptoms or health problems you have from interfering with the things you want to do?
5. How confident are you that you can control any symptoms or health problems you have so that they don’t interfere with the things you want to do?

Manage Shortness of Breath Item
1. How confident are you that you can keep your shortness of breath from interfering with what you want to do?

Control/Manage Depression Scale
1. How confident are you that you can keep from getting discouraged when nothing you do seems to make any difference?
2. How confident are you that you can keep from feeling sad or down in the dumps?

3. How confident are you that you can keep yourself from feeling lonely?

4. How confident are you that you can do something to make yourself feel better when you are feeling lonely?

5. How confident are you that you can do something to make yourself feel better when you are feeling discouraged?

6. How confident are you that you can do something to make yourself feel better when you feel sad or down in the dumps?
APPENDIX I: SELF-CONTROL SCHEDULE
Self-Control Schedule

Directions: Indicate how characteristic or descriptive each of the following statements is of you by using the code given below.

6 very characteristic of me, extremely descriptive
5 rather characteristic of me, quite descriptive
4 somewhat characteristic of me, slightly descriptive
3 somewhat uncharacteristic of me, slightly undescriptive
2 rather uncharacteristic of me, quite undescriptive
1 very uncharacteristic of me, quite nondescriptive

(1) _____ When I do a boring job, I think about the less boring parts of the job and the reward that I will receive once I am finished.
(2) _____ When I have to do something that is anxiety arousing for me, I try to visualize how I will overcome my anxieties while doing it.
(3) _____ Often by changing my way of thinking I am able to change my feelings about almost everything.
(4) _____ I often find it difficult to overcome my feelings of nervousness and tension without any outside help.
(5) _____ When I am feeling depressed I try to think about pleasant events.
(6) _____ I cannot avoid thinking about mistakes I have made in the past.
(7) _____ When I am faced with a difficult problem, I try to approach its solution in a systematic way.
(8) _____ I usually do my duties quicker when somebody is pressuring me.
(9) _____ When I am faced with a difficult decision, I prefer to postpone making a decision even if all the facts are at my disposal.
(10) _____ When I find that I have difficulties in concentrating on my reading, I look for ways to increase my concentration.
(11) _____ When I plan to work, I remove all the things that are not relevant to my work.
(12) _____ When I try to get rid of a bad habit, I first try to find out all the factors that maintain this habit.
(13) _____ When an unpleasant thought is bothering me, I try to think about something pleasant.
(14) _____ If I smoked two packages of cigarettes a day, I probably would need outside help to stop smoking.
(15) _____ When I am in a low mood, I try to act cheerful so my mood will change.
(16) _____ If I had the pills with me, I would take a tranquilizer whenever I felt tense and nervous.
(17) _____ When I am depressed, I try to keep myself busy with things that I like.
(18) _____ I tend to postpone unpleasant duties even if I could perform them immediately.
(19) _____ I need outside help to get rid of some of my bad habits.
(20) _____ When I find it difficult to settle down and do a certain job, I look for ways to help me settle down.
(21) _____ Although it makes me feel bad, I cannot avoid thinking about all kinds of possible catastrophes in the future.
(22) _____ First of all I prefer to finish a job that I have to do and then start doing the things I really like.
(23) _____ When I feel pain in a certain part of my body, I try not to think about it.
(24) _____ My self-esteem increases once I am able to overcome a bad habit.
(25) _____ In order to overcome bad feelings that accompany failure, I often tell myself that it is not so catastrophic and that I can do something about it.
(26) _____ When I feel that I am too impulsive, I tell myself “stop and think before you do anything.”
(27) _____ Even when I am terribly angry at somebody, I consider my actions very carefully.
(28) _____ Facing the need to make a decision, I usually find out all the possible alternatives instead of deciding quickly and spontaneously.
(29) _____ Usually I do first the things I really like to do even if there are more urgent things to do.
(30) _____ When I realize that I cannot help but be late for an important meeting, I tell myself to keep calm.
(31) _____ When I feel pain in my body, I try to divert my thoughts from it.
(32) _____ I usually plan my work when faced with a number of things to do.
(33) _____ When I am short of money, I decide to record all my expenses in order to plan more carefully for the future.

(34) _____ If I find it difficult to concentrate on a certain job, I divide the job into smaller segments.

(35) _____ Quite often I cannot overcome unpleasant thoughts that bother me.

(36) _____ If I am hungry and unable to eat, I try to divert my thoughts away from my stomach or try to imagine that I am satisfied.
APPENDIX J: SAMPLE YOGA CLASS LESSON PLAN
For examples of Chair Yoga class formats:


APPENDIX K: HUMAN SUBJECTS APPROVAL
Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2763
(850) 644-8633 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 11/7/2005

To:  
Kimberlee Bethany
940 Spottwood Drive, Tallahassee, FL 32308

Dept:  EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS

From:  Thomas L. Jacobson, Chair

Re:  Use of Human Subjects in Research  
The Effects of a Yoga Intervention on Health and Well-Being in Elderly Adults

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on 10/12/2005. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals which may be required.

If the project has not been completed by 10/11/2006 you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. The principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000448.

cc:  Gorosh Tenenbaum  
HSC No. 2005-607
APPENDIX L: INFORMED CONSENT FORMS
INFORMED CONSENT FORM

I freely and voluntarily and without element of force or coercion, consent to be a participant in the research project entitled “Effects of Selected Exercise Modalities upon Feelings and Attitudes of Adults.”

This research is being conducted by Kimberlee Bethany, who is a graduate student in Sport and Exercise Psychology at Florida State University. I understand the purpose of her research project is to better understand how regular exercise affects feelings and attitudes. In addition to general health care practices it is exploring several different forms of exercise. I understand that if I participate in the project I may participate in 6 weeks of exercise. I understand that I may be asked to participate in 10-minute individual relaxation sessions, during which biofeedback will be used to record physiological responses.

I understand I will be asked to fill out paper and pencil questionnaires on 3 different occasions. I may also be asked to participate in an interview. The total time commitment would be 135 minutes per week for 6 weeks of exercise, plus 3 sessions of approximately 45 minutes for the questionnaires. I will have the opportunity to receive printed information about the benefits of exercise. My questions about exercise will be answered by the researcher or she will refer me to a knowledgeable source.

I understand my participation is totally voluntary and I may stop participation at anytime. All my answers to the questions will be kept confidential, to the extent allowed by law, and identified by a subject code. My name will not appear on any of the results. All documentation will be kept in a locked file cabinet the research office of Dr. Gershon Tenenbaum, and will be destroyed after 1 year. No individual responses will be reported. Only group findings will be reported.

I understand there is a possibility of a minimal level of risk involved if I agree to participate in this study. I might experience physical or emotional discomfort while exercising, although the risks of physical injury will be minimized as much as possible. The researcher will be available to talk with me about any emotional or physical discomfort I may experience while
participating, and to help me make decisions concerning continued participation in the study which are best for my health and well-being. I am also able to stop my participation at any time I wish.

I understand there are benefits for participating in this research project. First, I will have the opportunity to receive six-weeks of fitness classes or social activities with a trained instructor, free of charge. Second, my own awareness about my health may be increased. Also, I will be providing health care professionals with valuable insight into the benefits of exercise on feelings and attitudes. This knowledge can assist them in providing health services that help adults stay as healthy as possible.

I understand that this consent may be withdrawn at any time without prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have answered any inquiry concerning the study. Questions, if any, have been answered to my satisfaction.

I understand that I may contact Kimberlee Bethany, Florida State University, College of Education, XXX – XXXX, or her major professor, Dr. Gershon Tenenbaum, Stone 307-H, 644-8791, for answers to questions about this research or my rights. Group results will be sent to me upon my request.

I have read and understand this consent form.

______________________________________________________________  (Subject) (Date)
INFORMED CONSENT FORM (Guardian)

I freely and voluntarily and without element of force or coercion, give consent for my legal dependent ________________________________ to be a participant in the research project entitled “Effects of Selected Exercise Modalities upon Feelings and Attitudes of Adults.”

This research is being conducted by Kimberlee Bethany, who is a graduate student in Sport and Exercise Psychology at Florida State University. I understand the purpose of her research project is to better understand how regular exercise affects feelings and attitudes. In addition to general health care practices it is exploring several different forms of exercise. I understand that if my dependent participates in the project, s/he may participate in 6 weeks of exercise. I understand that my dependent may be asked to participate in 10-minute individual relaxation sessions, during which biofeedback will be used to record physiological responses.

I understand my dependent will be asked to fill out paper and pencil questionnaires on 3 different occasions. S/he may also be asked to participate in an interview. The total time commitment would be 135 minutes per week for 6 weeks of exercise, plus 3 sessions of approximately 45 minutes for the questionnaires. S/he will have the opportunity to receive printed information about the benefits of exercise. Any questions about exercise will be answered by the researcher or she will refer me to a knowledgeable source.

I understand participation is totally voluntary and I may stop participation at anytime. All answers to the questions will be kept confidential, to the extent allowed by law, and identified by a subject code. My dependent’s name will not appear on any of the results. All documentation will be kept in a locked file cabinet the research office of Dr. Gershon Tenenbaum, and will be destroyed after 1 year. No individual responses will be reported. Only group findings will be reported.

I understand there is a possibility of a minimal level of risk involved if I agree to allow my legal dependent to participate in this study. S/he might experience physical or emotional discomfort while exercising, although the risks of physical injury will be minimized as much as possible. The
researcher will be available to talk with me about any emotional or physical discomfort that may be experienced during participation, and to help me make decisions concerning continued participation in the study which are best for my dependent’s health and well-being. I am also able to stop participation at any time I wish.

I understand there are benefits for participating in this research project. First, my dependent will have the opportunity to receive six-weeks of fitness classes or social activities with a trained instructor, free of charge. Second, his/her own awareness about his/her health may be increased. Also, I will be providing health care professionals with valuable insight into the benefits of exercise on feelings and attitudes. This knowledge can assist them in providing health services that help adults stay as healthy as possible.

I understand that this consent may be withdrawn at any time without prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have answered any inquiry concerning the study. Questions, if any, have been answered to my satisfaction.

I understand that I may contact Kimberlee Bethany, Florida State University, College of Education, XXX – XXXX, or her major professor, Dr. Gershon Tenenbaum, Stone 307, 644-8791, for answers to questions about this research or my rights. Group results will be sent to me upon my request.

I have read and understand this consent form.

______________________________________________________________
(Subject)           (Date)

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633.
For examples of home exercise instructions:


REFERENCES


Baptiste, B. (2002). *Journey into power: How to sculpt your ideal body, free your true self, and


Moolasarn, S., Sripa, S., Kuessirikiet, V., Sutawee, K., Huasary, J., Chaisila, C., Chechom, N., &


BIOGRAPHICAL SKETCH

Kimberlee Bethany Bonura

EDUCATIONAL HISTORY

PhD, Educational Psychology, Florida State University, Tallahassee, FL, 2007
Major: Sport & Exercise
Dissertation: The Impact of Yoga on Psychological Health in Older Adults, major professor Dr. Gershon Tenenbaum

MS, Educational Psychology, Florida State University, 2005
Major: Sport & Exercise
Thesis: The Effects of Selected Exercise Modalities on Stress, Anxiety, & Depression Responses in the Elderly, major professor Dr. David Pargman

BA, Thomas Edison State College, Trenton NJ, 1998
Major: Psychology

ACADEMIC EMPLOYMENT

Instructor, United States Military Academy, Department of Physical Education, 2006 - 2007

Graduate Research Assistant (for Dr. David Pargman), FSU, Department of Educational Psychology and Learning Systems, 2003 - 2007

Graduate Teaching Assistant (Instructor of Record), FSU, Department of Educational Psychology and Learning Systems, 2003 - 2006

Editorial Assistant, Journal of Sport and Exercise Psychology, (Editor Dr. Robert Eklund), 2005

Adjunct Faculty, Florida Southern College (Lakeland, FL), Dept of Physical Education, 2002 - 2003

Research Assistant, University of Texas – Brownsville, Department of Psychology, 1996 - 1997

ACADEMIC CERTIFICATIONS & TRAININGS

Graduate Certificate in Educational Measurement & Statistics, FSU, 2006

Online Mentor Training Certification, FSU, 2005
Skills & technology required to manage an online course using Blackboard & WebCT systems.

Human Participant Protection Education for Research Certification, National Institutes of Health, 2005
Graduate Certificate in Program Evaluation, FSU, 2005

Program for Instructional Excellence Teaching Certificate, FSU, 2004 & 2005

FITNESS & WELLNESS CERTIFICATIONS & TRAININGS

Champions of Character Coaching Certification, National Association of Intercollegiate Athletics (NAIA), offered through the United States Military Academy Department of Physical Education, 2006

Continuing Education in Exercise & Obesity, AFAA, 2006

Continuing Education in Exercise Management of Chronic Diseases & Disabilities, AFAA, 2006

Certified Senior Fitness Specialist, International Fitness Professionals Association (IFPA), 2005

Healthcare Providers Course for Adult, Child, & Infant CPR & Airway Obstruction Skills & AED, American Heart Association (Most recent renewal, 06/06/2005)

Certified Anger Resolution Therapist, The Center for Anger Resolution, Inc, 2005

Certified Kickboxing Instructor, AFAA, 2004

Certified Tai Chi - Chi Kung Instructor, IFPA, 2003

Certified Group Fitness Instructor, IFPA, 2003

YogaKids Facilitator Training, YogaKids International, 2002

Certified Reiki Master Teacher & Reiki Master Practitioner, Reiki Usui Shiki Ryoho System, 2002

Certified Power Yoga Teacher, Baptiste Power Yoga Institute, 2002

Certified Personal Trainer, AFAA, 2002

Certified Ashtanga Yoga Teacher, David Swenson / Ashtanga Yoga Productions, 2002

Certified Hatha Yoga Instructor (200-hour Yoga Alliance-approved Teacher Training Program), Yoga West, 2002

REFEREED ACADEMIC PRESENTATIONS

Bonura, K.B. (2007). The Effects of Yoga on Anxiety in Older Adults. Accepted as a lecture for the Symposium on Yoga Therapy and Research, Los Angeles, CA, January 18 – 21.


INVITED PRESENTATIONS