Does Daily Practice of Meditation or Coherent Breathing Influence Perceived Stress, Stress Effects, Anxiety, or Holistic Wellness in College Freshmen or Sophomores?

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DOES DAILY MEDITATION OR COHERENT BREATHING INFLUENCE PERCEIVED STRESS, STRESS EFFECTS, ANXIETY, OR HOLISTIC WELLNESS IN COLLEGE FRESHMEN AND SOPHOMORES?

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Does Daily Practice of Meditation or Coherent Breathing Influence Perceived Stress, Anxiety or Perceived Holistic Wellness in College Freshmen and Sophomores?

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Abstract
This randomized pilot intervention study examined the influence of two self regulatory techniques, coherent breathing and meditation, in reducing perceived stress and anxiety scores, and increasing holistic wellness scores in college freshmen and sophomores. Too much stress is well documented throughout the literature to have adverse effects on physical, mental and spiritual health. Stress has been identified by college students as a barrier to academic performance. Both coherent breathing and meditation inhibit the secretion of stress hormone production responsible for the persistent state of sympathetic dominance experienced with daily living.

A total sample of 37 Boston College freshmen and 3 sophomores was recruited for random assignment into three groups, meditation, n=14, coherent breathing n=14, and reading group as a control, n=12. The instruction of the intervention techniques was conducted through an 8 hour weekend workshop on two dates, October 2010, and September 2011. Participants were asked to practice their respective techniques daily for three weeks. All groups met once weekly throughout the duration of the study.

Univariate ANOVA was conducted on pre and post test change of scores for the following instruments: Cohen’s Perceived Stress Scale(PSS), Speilberger’s State-Trait Anxiety Index, (STAI), and the Mind Body Spirit Wellness Behavior Characteristic Index (MBS-WBCI). The two self regulatory stress management techniques of coherent breathing and meditation
demonstrated positive effects for this self selected small sample of freshmen and sophomores at Boston College. Participants of both intervention groups experienced reductions in perceived stress, state and trait anxiety scores, as well as increases in holistic wellness scores, as compared with controls.

The favorable results achieved from this study strongly support future research investigations with larger samples and expanded populations. The implementation of mandatory college life skills courses incorporating these techniques could advance the potential for evaluating these techniques in a true randomized sample. The college environment provides an ideal opportunity for introducing prevention and early intervention techniques addressing mental health issues for students in their formative years.
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Table of Contents

Chapter One: Statement of the Problem       page 1
   Definition of Terms       page 12

Chapter Two: Scientific Theory       page 26
   Hypo-thalamic Pituitary-adrenal Axis       page 28
   Technique Benefits       page 29
   Psycho-neuro-immunology (PNI) theory       page 38

Chapter Three: Methodology       page 42
   Data Collection       page 46
   Program Methodology       page 48

Chapter Four: Data Analysis       page 50
   Research Questions       page 51
   Description of Sample       page 52
   Instruments and Measurement       page 57
   Results       page 59
   Summary       page 66

Chapter Five: Discussion       page 67
   Conclusion and Recommendations       page 73
   References       page 80

APPENDIX A. Recruitment Materials       page 88

APPENDIX B. Instruments       page 90

APPENDIX C. IRB Notices and Consent Form       page 97

APPENDIX D. Permissions for Instruments       page 105

List of Tables

Table 1.  Gender and Ethnicity of two participant sessions       page 54
Table 2.  Comparison of group mean test scores       page 54
Table 3.  t-test results       page 55
Table 4.  t-test results       page 56
Table 5.  Gender and ethnicity of participant groups       page 57
Table 6. Descriptives
Table 7. Test of Homogeneity of Variances
Table 8. ANOVA
Table 9. Perceived Stress Scale
Table 10. State Anxiety
Table 11. Trait Anxiety
Table 12. Holistic Wellness

List of Figures

Figure 1. Participant flow through study
Figure 2. Results of the pre- and post test change of scores
CHAPTER 1

Statement of the Problem

This pilot intervention study examines the influence of two, ancient mind/body techniques; a yoga breathing technique called “coherent breathing” and a mindfulness meditation technique consisting of distraction-meditation, on perceived stress, stress effects, anxiety, or perceived holistic wellness in college freshmen. The college years present unique developmental and age-related threats to personal health (Adams, Bezner, Drabbs, Zambarano, & Steinhardt, 2000). Many college students experience common mental health conditions, including depression, anxiety, obsessive-compulsive disorder (OCD), eating disorders, and problems with stress management (Kitzrow, 2003). It is well documented that college students face their greatest psychological challenges in the first year and that many of these challenges can induce perceived stress, stress effects, and anxiety. The majority of freshman college students are making their own lifestyle decisions for the first time in addition to experiencing stressful academic, financial and social demands (Travis, 2009). They may experience role conflict as a result of balancing competing and potentially conflicting demands from their over-stimulating environments.

Developing new social groups, pursuing academic excellence, and meeting personal needs such as nutrition, laundry, and time management are all contributing factors of the freshman year transitional issues (Hudd, 2000). Freshmen are also reported to be most vulnerable for adverse consequences due to heightened levels of stress and anxiety from unfamiliar environments and managing new responsibilities (Von Ah 2004). They often lack adequate coping skills and social support to respond effectively to stress. Attrition rates for
the freshman class exceed the upper classes and average 20-30%. Overall, approximately 40% of students leave college without completing their degree requirements, and freshmen represent 75% of these students (Deberard M. 2004).

Pressures from the developmental transitions that first-year students experience may contribute to the use of alcohol and other substances due to the students’ inability to cope. Unhealthy coping behaviors are often responses to manage stress (Schulenberg 2002). Stress effects can influence health in two ways, directly through physiological innervations, and indirectly through maladaptive health behaviors (Von Ah, 2004). Approximately 80% of college students identify themselves as “moderately stressed” or “burned out”. In addition, students reporting more chronic stress may be more likely to experience illness, anxiety, and depression (Larson 2006).

Each year, an estimated 1,700 college students die from alcohol-related injuries, including motor vehicle accidents, and freshmen represent approximately half of this number (College Data, 2005). The practice of health risk behaviors such as “pulling all nighters” to cram for exams, taking sexual risks, and abusing alcohol are pervasive and, depending on campus culture, even considered appropriate in certain instances such as when celebrating a 21st birthday (Hudd, 2000). These environmental factors can be difficult to change despite the best prevention efforts applied through campus health-promotion programming (Ross 2008). Research has shown the importance of peer relationships. Peers influence patterns of thought and behavior, and the performance of health behaviors is impacted by peer pressure in the first years of college (Hudd, 2000). Frequently, college students put themselves at risk through poor decision-making in regards to their health. The Center for Disease Control
(CDC 1997) conducted a sentinel National College Health Risk Behavior Survey in 1995, and the findings were alarming. The college students surveyed reported the following: only 57% admitted to practicing any regular exercise; 20% were overweight; 29% smoked cigarettes; 29% of sexually active students admitted to condom usage in the 3-month period preceding the survey; 20% of females reported an unwanted sexual experience; 34.5% reported episodic heavy drinking; 27% admitted to drinking and driving within the month prior to the survey; and 73.7% had neglected to eat 5 servings of fruits and vegetables on the day prior to completing the survey (CDC, 1997, p 1.). These behavioral trends present challenges to the college health administrators and health educators attempting to improve students’ health-risk behaviors (Hey, 2003).

In the United States, 16.8 million undergraduate students attend more than 4,000 colleges and universities, according to the National Center for Education Statistics (NCES, 2010). In fact, students arrive on campus overwhelmed, and some have persistent difficulties throughout their academic years (Kitzrow 2002). College students have been experiencing increased levels of distress, along with increased usage of psychotropic medication, as reported in recent years (Chiauzzi 2008). The American College Health Association’s National Collegiate Health Assessment (NCHA) was administered to 83,070 college students at 113 post-secondary institutions in North America in Spring 2008. The analysis revealed 33.7% of 16,000 students surveyed by the American College Health Association identified stress as the number one impediment to their academic performances. Indicators to confirm these data included receiving lower grades, missing or dropping classes, and increasing attrition rates (Association 2008).
The current generation of college students in the United States differs from prior generations in many respects. Today’s student body represents an approximate 10% increased enrollment of racial and ethnic minority students as compared to 20 years ago, and in 1997, the number of women enrolled exceeded men, a trend that has remained consistent (Upcraft, 2002). Approximately 10% of today’s college students identify themselves as gay, lesbian, bisexual, or transgendered (GLBT). There is also an increased global consciousness on college campuses with international students representing an average of 3%, up to 20%, foreign born.

The dynamics of American families have also changed over the past two decades. Increased divorce rates and increased incidence of physical violence, sexual abuse, alcohol abuse, and other drug abuse problems have contributed to the issues facing college students today. These changes are also reflected in the severe psychological problems that students present with for counseling on college campuses. Physical health problems are also closely related to the mental health of these students, as evidenced by increases in eating disorders, alcohol and drug abuse, date rape, and incidences of sexually transmitted infections.

Age-related brain conditions that occur in this age group may be considered possible contributing factors to student behavior. The psychiatric conditions of bipolar disorder or schizophrenia can occur abruptly at this age. In addition, unhealthy behavior choices may result from age-related, brain-development limitations imposed by an immature prefrontal cortex in adolescents/young adults. The absence of optimal functioning by the prefrontal cortex contributes to lack of impulse control and difficulty with rational decision-making.
Unique, age-related, psycho-neuro-endocrine physiology related to recent research findings on adolescent/young adult brain development helps to explain these behaviors.

The brain continues to grow during adolescence, and some postulate that complete growth does not occur until well into the 20s. Early adolescence represents a stage of significant brain development characterized by the processes of proliferation, pruning, and myelination of expanding neurons. Along with this complex activity, the brain continues to develop from back to front with the pre-frontal cortex as the final section to reach maturity in the mid-20s (Herrman, 2005). The pre frontal cortex is responsible for rational problem-solving and interpretation of emotional cues. Another area is responsible for interpretation of emotional stimulus and the response. A network of the following structures comprise the neural systems that mediate increased levels of anxiety: the amygdala, the insula, the anterior cingulate gyrus, and medial frontal cortex. These areas responsible for brain function have been identified, through neuroimaging studies (Stein, 2007).

These theories provide a physiological explanation for common adolescent behaviors of impulsivity and risk-taking. As a result of an age-specific endocrine response to stress in adolescence, a greater release of stress hormones results in an increased level of physiologic disruption, requiring additional time for adolescents/young adults to recover from stressful events. Unfortunately, the body becomes sensitized to stress when there is lack of recovery from stressful events. This can lead to either a chronic state of stress reactivity or a quicker activation of the response from minor threats (McEwen, 2006). This accentuated response to stress may contribute to the propensity for adolescents/young adults to seek relief from substance abuse.
There may also be environmental conditions influencing college students’ questionable decision-making. These environmental trends may include decreased societal levels of physical activity and pervasive consumption of convenient or satisfying foods that are unhealthy. The sedentary behavior associated with the use of technology has resulted in an approximate 50% decrease in physical activity levels of college students. The U.S. Department of Health focused on improving the physical health of the U.S. adolescent and adult populations since the publication of *Healthy People 2020*. This publication identified the increasing levels of obesity and inactivity in adults and adolescents and established objectives to reduce obesity and increase physical activity as a national initiative.

A study conducted at the University of Minnesota identified that many college students have poor overall health habits and excessive debt. In a survey of over 3,000 students, researchers sought to identify the associations of credit card debt, stress, and health-risk behaviors. Approximately one-fourth of the study participants admitted to an excess of $1,000 in credit-card debt. Students who reported this level of credit-card debt were also more likely to report insufficient exercise, poor nutritional choices, poor weight control, poor stress management, binge drinking, substance use, and violence. College students were identified to be at risk for various co-occurring factors, which present barriers to engaging in healthy behaviors. These factors, along with increased stress levels as reported by college students and pervasive tendencies to apply ineffective coping mechanisms, support the importance for research investigations to seek effective methods for coping in response to stress and anxiety for this age group.
Symptoms of stress effects in college students can range from psychiatric disorders to high-risk behaviors like substance abuse or sexual risk-taking and sleep disturbances. Additional maladaptive stress management techniques have also been identified such as over-involvement with hobbies, excessive TV watching, video game playing, exercising, or using Internet social networking sites. A dramatic increase in the number of students seeking college counseling services has been reported resulting from increased perceived stress levels, stress effects, and maladaptive coping or emotional problems. Educators are concerned about these harmful trends and recognize the potential opportunity presented throughout the college years to influence healthy decision-making skills with long-term health benefits.

Implementation of successful stress reduction programs may contribute to a reduction in risk-taking or injuries and, ultimately, contribute to an easier transition to college life. Identifying successful methods for reducing stress is particularly important in educational settings because high-stress levels, sleep disturbances, and alcohol and drug use are commonly reported experiences of college students. These health-risk behaviors have been identified as negatively impacting cognitive brain function and may also present long-term health consequences.

Reportedly, the specific effects of stress on the brain are determined by the type of stressor; high psychological stress causes the brain to revert to a stimulus response mode of elevated sympathetic reactivity. This has been correlated with excessive daytime sleepiness due to poor night sleep quality, along with deteriorations in cognitive ability. High psychosocial stress is associated with structural brain remodeling of the emotion and memory.
areas such as the hippocampus, amygdala, and prefrontal cortex, subsequently resulting in memory impairment, anxiety, and increased aggression. These stress effects create a barrier to optimal brain receptivity and establish unfavorable conditions necessary for learning new facts and skills. Effects of stress on the brain oppose the strengthening of synaptic connections and cortical plasticity.

Although, little research is available on effective stress reduction programs on college campuses, several institutions have recently implemented programs to include knowledge development about healthy lifestyle skills and wellness concepts as part of their curricula (Gieck, 2007; Sidman, 2009). Greater success in achieving positive health outcomes through programming efforts may result from initiating a comprehensive approach to address students’ mental and spiritual health needs in addition to their academic needs (Hey, 2003). Ancient mind/body techniques like meditation and coherent breathing have a positive effect on improving both physical and psychological well-being through adjusting the physiological response to stress. Successful reduction of stress and anxiety levels in college students, along with establishing a community of like-minded, health focused students who practice mind/body techniques, may create a supportive environment for reducing unhealthy coping behaviors. Research has shown that social support has a direct positive association with the practice of healthy behaviors.

Mind/body techniques, including meditation and coherent breathing, are recommended in general to minimize the negative effects from the body’s persistent sympathetic overload to everyday stressors of our fast-paced society. Considering the additional stress that is intrinsic to college campus environments and first year transition
issues, college administrators should evaluate successful mind/body interventions for implementation on college campuses in order to begin to assemble a knowledge base for evidence-based practice and to fill gaps in the literature. Identifying effective stress prevention strategies for college students to practice may contribute to their achieving healthy transitions to college and into young adulthood. Possibly, students who learn these self-regulating techniques at an early age could invoke the use of these healthy habits as needed for responding to future stressful events. The potential long-term benefits are improved, perceived wellness and potential reductions of health care costs. The cost savings could be significant if the use of these techniques reduces medication usage and ameliorates stress induced chronic conditions such as cardiovascular and autoimmune diseases as well as accelerated physiologic aging at the cellular level (Oman, 2008).

Coherent breathing and meditation both inhibit the secretion of stress hormones through balancing the autonomic nervous system by stimulation of the parasympathetic system or through the release of relaxation hormones to adjust for the persistent state of sympathetic dominance. An underlying assumption of this study is that reducing stress and anxiety in college freshmen will lead to improved wellness. The effectiveness of implementing preventative self-help techniques like yoga breathing and meditation in college freshmen is yet to be evaluated. This pilot intervention study prospectively attempts to evaluate the four study instruments and to examine the influence of two self-regulatory techniques--coherent breathing and meditation--on perceived stress, stress effects, anxiety, and perceived holistic wellness in college freshmen and sophomores to answer the following primary research question: Does daily practice of meditation or coherent breathing influence
perceived stress, stress effects, and anxiety, or perceived holistic wellness in college freshmen and sophomores? Additional research questions to be investigated are:

- Will daily practice of meditation succeed in reducing perceived stress, stress effects, and anxiety in college freshmen and sophomores?
- Will daily practice of coherent breathing be successful in reducing perceived stress, stress effects, and anxiety in college freshmen and sophomores?
- Will reducing stress, stress effects, and anxiety in college freshmen and sophomores lead to improved perceived holistic wellness?
- Will both intervention groups report greater effects than the control group?
- Will both intervention groups report satisfaction with these techniques?

A growing body of research supports the beneficial effects of yoga and meditation on common mental health conditions experienced by many college students, including depression, anxiety, sleep disturbance, stress management, OCD, and eating disorders. These same mental health conditions, along with sleep disturbance, social dysfunction, and psychological distress, have shown reduction of symptoms from the practice of meditation and coherent breathing in particular. Many clinical studies have been conducted on various mind/body and meditation techniques to evaluate their effectiveness as treatment modalities for other chronic medical conditions such as asthma, hypertension, pain management, congestive heart failure, seizure disorder, multiple sclerosis, and enhancement of the immune system. Even women’s health conditions such as premenstrual syndrome and menopause have demonstrated beneficial results from positive research outcomes in reducing undesirable symptoms.
Meditation and coherent breathing may be easily implemented as treatment modalities in general primary care settings, especially through increasing numbers of practitioners with first-hand knowledge of these types of therapy. The various outcomes reported from using a comprehensive yoga practice for the treatment of mental health conditions of college students range from the promotion of volunteerism to treatment and primary prevention-based wellness programs. Identifying effective stress prevention strategies for college students to practice may contribute to a healthy transition into young adulthood. If proven successful, these programs could be replicated on any college campus, expanded to other populations, and implemented as self-regulatory treatments for a variety of mental health conditions such as depression, OCD, anxiety, and sleep disorders. These ancient mind/body techniques have a positive effect on improving both physical and psychological well-being through adjusting the physiologic response to stress (Deckro, 2002; Finger, 2002; Brown, Gerbarg, 2005).
Definition of Terms

Holistic Wellness

The concept of wellness was coined by Dr. Halbert Dunn in 1961 to describe a concept of integrated functioning that is oriented toward maximizing the potential of which the individual is capable. Wellness requires the individual to maintain a balance and purposeful direction within one’s environment. The National Wellness Institute defines “wellness” as an active, evolving process of becoming aware and making choices toward a more successful existence and a way of living that is sensitive and responsive to all the dimensions of the body, mind, and spirit. The majority of wellness definitions, depending on the model, may also include interrelated dimensions of physical, emotional, intellectual, social, environmental, and spiritual aspects that contribute to holistic wellness. These dimensions represent the whole person in body, mind, and spirit. This concept represents a shift in attention toward implementing proactive efforts for achieving positive health outcomes as opposed to treating illness as the primary means of maintaining good health. It provides an opportunity to include the important aspect of spiritual wellness.

Spiritual wellness focuses on one’s sense of satisfaction and confidence with individual spiritual beliefs and inner strength. Spirituality is closely related to the construct of inner strength. McCain et al. have described inner strength as, “a central human resource that enhances psychological well-being and quality of life” (2005, p.329). Spirituality may be characterized by three aspects, a mystery to be revealed through purpose or meaning, interconnectedness in relationships with others and/or God, and inner strength with a sense of
the sacred. Research has investigated spirituality and inner strength as a psycho spiritual dimension integral to psychosocial well-being, quality of life, and physical health.

**Anxiety**

Anxiety is exhibited by fidgeting, nervousness, long-term worrying, and symptoms of sympathetic hyperactivity. According to a Cochrane review, the definition of an anxiety disorder is “a state of pathological anxiety characterized by autonomy (spontaneous induction or minimal trigger from stimuli and autonomic nervous system over activity), intensity (in which the severity exceeds the individual’s capacity to bear the level of intensity), and duration, which is usually persistent, or chronic, and behavior, in which coping ability is impaired, with disabling behavior as a consequence”. According to the *Diagnostic and Statistical Manual of Mental Disorders 4th edition* (DSM-IV-TR), anxiety disorders are classified by the following various types: panic disorders, phobias, social phobias, OCD, post-traumatic stress disorder (PTSD), acute stress disorder, and generalized anxiety disorder.

Anxiety disorders are among the most prevalent research topic in psychiatric clinical settings and result in the highest incidence of psychiatric visits (Stein, 2009). These studies have persistently demonstrated the production of morbidity, a drain on the health care services, and functional impairments. In addition, recent findings have suggested that chronic anxiety disorders may be linked to cardiovascular-related mortality. The following prevalence rates in the United States are reported as estimated lifetime prevalence rates for: individual anxiety disorders and panic disorder, (2. 3-2.7%); generalized anxiety disorder (4.1-6.6%); OCD, (2.3-2.6%); PTSD, (1.9%); and social phobia (2.6-13.3%). The
cumulative total of these estimates without considering comorbidity, may potentially impact approximately one-third of the US population. The percentage of this population representing college students or whether a valid assessments exist for determining the incidence and prevalence of anxiety disorders in college students are unclear.

A current debate exits over whether the primary pathopsychology of anxiety is due to either biological or psychological factors. This Cartesian, dualistic view is gradually being replaced by a pragmatic approach based on research findings that support relative contributions of both mind and body. The prevailing approach in treatment research is to examine the combined somatic and psychological treatments for anxiety. Significant progress has also been made with successful non-pharmacologic treatments.

**Stress**

Initial research on mind-body interactions was conducted by Walter Cannon in the 1930s. Decades later, the effects of stress that led to the understanding of the fight or flight response was documented in the 1950s by Hans Selye and Walter Hess. One definition of the physiologic response to stress is a transaction between an individual and the environment when an individual interprets personal stimuli as damaging, threatening, or challenging or an awareness of demands that exceeds available resources. Ivancovich and Matteson provide a definition of stress as, “an adaptive response mediated by individual differences and/or psychological processes that is the consequence of any external environmental action, situation, or event that places excessive psychological or physical demands on a person”. Homes and Rahe introduced the concept of measuring the relationship of stressful life events
to illness with their stress scale from the 1960s. Stress levels are generally considered valid measurements of an individual’s ability to cope.

Stress is generated when an environmental stimulus is perceived by an individual as challenging, and their ability to respond is deemed ineffective due to lack of confidence in personal resources. Stimuli that produce stress, or stressors, have a unique effect in relation to quality or intensity dependent upon each individual. They can arise from various sources such as socio-cultural, physiological, or psychological stimuli. Psychological stress is correlated with increased depressed mood and negative affect (McCain, 2005).

**Coping**

“Coping” is the term identified by Lazarus and Folkman, which describes the healthy reactive counterpart of stress. It refers to one’s ability to anticipate and respond to personal challenges or troubling conditions. This includes cognitive and behavioral efforts applied to control, tolerate, or reduce external and internal demands and conflicts. Effective coping intervenes on two levels. One is to focus on the problem, which seeks to result in an alteration of the stressor. The other is emotion-focused coping to regulate the stressful emotions produced by the physiologic response (Gammon, 2005). This is the definition to be used in this study. It emphasizes the importance of the psychosocial element of coping and supports a mind-body interaction perspective.

The manner in which stress is conceptualized has the greatest impact on how coping is defined and studied. College students perceive stress from a variety of sources of competing demands. Academic stress may be related to exams and long study hours; assignments and grades; lack of free time, time management and/or time scheduling; and lack
of structure for free time. Psychosocial stress can be experienced from emotions or feelings of separation from the transition loaded with change: distance from traditional support systems; first-time independence from families; separation from former friends; having to make new friends; and learning to live with a roommate when conflict resolution issues may arise.

Even activities like recreational and athletic events or socializing with new peers that one might expect to reduce stress have been demonstrated through research findings to increase feelings of stress in college students. In addition, one research study found that a significant change in performance of healthy behaviors during the first three years of college leads to decreased feelings of well-being and the ability to cope (Lau, 1990). Higher self-esteem was also correlated with educational ability and more proactive coping. Self-efficacy influences one’s behavior and perceptions about abilities and characteristics and contributes to how much effort will be applied to the individual’s performance. Perceived levels of stress-coping and self-esteem as reported on a study of nursing students suggested an association among chronic stress, avoidance behavior, and negative self-esteem.

**Meditation**

The word “meditation” is derived from the similar Latin and Greek roots of the word “medicine”). In ancient times, physicians were traditionally spiritual advisors as well as healers. Meditation is an ancient self-regulatory strategy currently gaining more interest in psychiatry and mental health practices. Meditation has been demonstrated to reduce the
arousal state and may also ameliorate the symptoms of anxiety in various anxiety conditions (Krisanaprapornkit, 2009). Meditation may also be defined as, “a set of attentional practices leading to an altered state or trait of consciousness characterized by expanded awareness, greater presence, a more integrated sense of self”. According to the Eastern beliefs of Buddhism and Hindu Vedic traditions, meditation is a path to “transcendental consciousness” also called “Samadhi,” “Self,” and “state of least excitation of consciousness.” Chinese and Japanese traditions based on Taoism include T’ai Chi, Qi Gong, and Zen and describe this state as “wuji” or “The Qualityless Absolute.” Ancient Greeks described a meditation tradition which led to “Being”.

Philosophers postulate that regular practice of meditation leads to the state of enlightenment. Orme-Johnson describes enlightenment as, “the highest level of health with adaptive advantages for cognition and behavior and a permanent plateau of self actualization. It is perceived through jogging the mind out of its usual narrow ruts to experience and expand the mind’s fundamental blissful nature with ensuing laughter or feelings of inspiration. This state of consciousness can also be invoked on a physical level through achieving a highly integrated nervous system response through skilled performances by musicians, artists, and athletes. The mind experiences the state of maximum integration with the activity, and the resulting outcome is one of living in the moment, being at one with everything, and spontaneous right action” (Orme-Johnson, 2008). Orme-Johnson generally recommends that future studies should be conducted on the effects of meditation to verify its potential for generating a happier, healthier, and wiser society.
Meditation originated in India more than 3,000 years ago. It has existed over the years primarily as a ritual practice in some major religions such as traditions of Hinduism and Buddhism but has recently been adapted as a secular practice in traditional health care organizations such as the Center for Mind Body Medicine at Massachusetts General Hospital, directed by Herbert Benson, and the Stress Reduction Clinic of the University of Massachusetts Medical Center, directed by Jon Kabat Zinn (Jacobs, 2001; Kabat Zinn, 2005). Meditation can be considered a form of relaxation therapy, but it also can create another beneficial effect. When meditating, one produces an altered state of consciousness, facilitating a meta-cognitive method of thinking, making the expectation of cognitive–behavioral benefits possible. Meditation has a broad array of applications and has been demonstrated as effective in the treatment of stress and anxiety related disorders. Meditation is comprised of two general types, concentrative meditation and mindfulness meditation.

Concentrative meditation instructs the emphasis of focusing and sustaining one’s attention on an object such as a mantra, or word, until the mind achieves stillness. The beneficial outcomes are relaxation and clarity of the mind from continuous practice. One example of a concentrative meditation is a very well studied discipline from the Hindu Vedic tradition called “transcendental meditation” (TM). This is achieved through the use of a mantra. The relaxation response developed by Herbert Benson (Bensonian meditation), is another example of concentrative meditation. The research findings on the practice of either of these types of concentrative meditations have been proven to elicit the relaxation response. The relaxation response was first described by Herbert Benson in 1975. It has
been proven to reduce heart rate, blood pressure, metabolic rate, and breathing rate in those who practice it.

Mindfulness meditation is approximately 2,500 years old and is based on the Buddhist tradition for increasing awareness, wisdom, and the ability to live each moment of life to the fullest. Mindfulness meditation is defined by Kabat-Zinn as “paying attention in a particular way on purpose in the present moment and non-judgmentally”. Jon Kabat-Zinn, the Director of the Stress Reduction Clinic at the University of Massachusetts, conversely discusses the difficulties created from living with a diminished awareness of the present moment, which allows for the development of deep-seated fears and insecurities over time. The mindfulness meditation technique is based on emphasis for opening awareness to all contents of the mind that emerge. These techniques focus on awareness to develop a detached observation of the contents of consciousness and have the potential to provide a powerful cognitive behavioral coping strategy for transforming the manner of responding to life events. After regularly practicing this technique, one develops a sustainable attentive observational capability of not reacting to thoughts and emotions. The equanimity of the mindful state assists in retraining, or deconditioning, previous poorly-adapted patterns of reacting to external reality. Mindfulness-based stress reduction programs are based on these principles.

The mindfulness meditation technique to be utilized in this dissertation study is distraction meditation (D-M). The rationale for this method is based on an electrophysiological demonstration of an association between distractions and psychophysiological arousal. This technique has been taught for over 30 years by Joseph
Tecce, PhD, Boston College professor of psychology. According to Tecce, distraction is a primary cause of stress. By allowing distractions to enter consciousness during meditation in association with deep relaxation, there are three beneficial effects. The first is based on the principle of reciprocal inhibition, the relaxation state mutes the stressful properties of stressful events that are recalled during the meditation. In addition, there is a reduction for the need of distractions to enter the consciousness during daytime activities when the distractions appear in the meditation session. As a result, the lowering of arousal during D-M, the reciprocal augmentation of distraction and arousal is blocked, as would be expected on the basis of the distraction-arousal hypothesis. To practice distraction-meditation, the mind is allowed to wander in an effortless way, and the result is a full awareness of distracting thoughts and sensations, including positive and negative experiences. Previous anecdotal results from the Boston College students who have practiced this technique show decreases in alcohol intake and cigarette smoking, increases in exercise and studying time, and improved weight control.

**Yoga**

In the United States, it is estimated that 5% of adults practice some type of yoga (Barnes, 2004). It has become increasingly popular within mainstream American culture and among many college students (Adams, 2008). Most of the benefits attributed to yoga relate to improved physical conditioning, but the mental health benefits of yoga cannot be overstated. In addition to being a form of exercise or a stress reduction technique, “yoga also offers a comprehensive theory of human suffering and a holistic means of achieving physical, psychological, and spiritual wellbeing” (Fields, 2001). The ultimate goal of the yoga
tradition is to achieve mental, spiritual, and physical well-being through creating balance of the internal and external environments (Evans, 2008). The practice of yoga seeks to attain the balance of the autonomic nervous system through the use of controlled breathing practices, physical exercise, and meditation (Adams, 2008).

The word “yoga” is Sanskrit, meaning to unite with discipline and concentration. To practice yoga, one engages a philosophy or belief to result in transcending normal levels of consciousness to connect the self with the divine. This promotes the well-being of the body, mind, and spirit. There are several aspects to the yoga tradition, consisting of eight dimensions of yoga practice:

1. asana, (poses),
2. pranayama (breath or breath control),
3. dhyana (meditation),
4. yama (ethical behavior, or one’s moral code),
5. niyama (self-discipline or self-purification),
6. dharana (concentration),
7. pratyahara (sense withdrawal or control of the senses), and
8. samadhi (deep meditative awareness or contemplation).

The first four dimensions are considered external cleansing practices, and the others are internal, and it is generally recommended to practice yoga with full intention, although the predominant use of yoga in the United States today is for exercise and relaxation. Yoga also has its roots in healing and medicine. Even though it was practiced for centuries in India, it
was not formally documented until 200 A.D. by Patanjali, an Indian physician. He developed a science of yoga as detailed in the Yoga Sutras and outlined the practice of Ashtanga yoga. He detailed a path for internal purification to reveal the Universal Self, through the practice of the previously described eight spiritual dimensions.

A universal philosophy of yoga proposes that the mind, body, and spirit are interconnected. It also describes the cause of physical and mental suffering as being due to an over-identification with the body and mind. One consistent theory of yoga professes a common type of human condition as a state of suffering resulting from over-identification of the self with the material world. Examples of this type of attachment can be witnessed through various societal problems, from the recent massive financial failures and economic crises resulting from greed-based practices to pervasive bullying in schools and on social networking sites. Freedom from suffering only results when there is unification of the mind, body, and spirit. Achievement of this state of consciousness results when the awareness of self is separate from the attachments of the mind, body, and material world. Most yoga disciplines incorporate the use of at least three dimensions of the branches previously described: asana, pranayama and meditation are the basic paths to follow. The pursuit of mind, body, and breath awareness in yoga has a corresponding impact on psychophysiological functioning.

**Coherent Breathing**

There are several yogic disciplines teaching variations of the basic yoga breathing patterns. The yoga breathing technique to be evaluated in this study is Coherent Breathing, also referred to as “resonant breathing.” This technique invokes slowing the breath-rate to
relaxed breathing at five breaths a minute. It relies on the principle that the distinct relationship between emotions and the breath is based on neurological innervations. Coherent breathing helps to achieve a better sympa-tho-vagal balance. It is similar to the yoga practice of belly breathing and has been well researched with favorable results using various western techniques such as biofeedback and functional magnetic resonance imaging (MRI).

Coherent breathing provides a form of exercise for the diaphragm, assisting with its crucial role in contributing to bodily functions. The diaphragm functions as a pump, flexing or moving down on the inhale to pump food and blood through the digestive tract and relaxing or moving up on the exhale, pumping blood through the heart and lungs. The autonomic nervous system controls the activity of the circulatory system, and the enteric nervous system controls the digestive system. Both are innervated by the movement of the diaphragm. Limited motion of the diaphragm impedes bodily functions and causes the cardiovascular and digestive systems to work harder. The diaphragm can move as much as 10 centimeters, although most adults only use 10% of the available range. Recommended diaphragmatic range is 40-60% to avoid deleterious effects of acute and chronic diseases from “stagnation.” Coherent breathing is breathing slowly and deeply at the rate of five breaths a minute with conscious relaxation on the exhale (Elliot, 2010). This self-regulatory technique may provide a state of mind/body balance, resulting in improved health and perceived wellness.

Qigong
Qigong is a physical, mental, and spiritual practice based on foundations from traditional Chinese medicine (TCM). Qi, also referred to as “Chi,” is considered life’s energy force, and the underlying theory of Qigong is to bring intention, awareness, and skill to direct the function and movement of the Qi within one’s body. Directing the movement of Qi also directs the blood flow in the body. Regular practice continuously reinforces internal homeostasis and enhances optimal use of one’s human potential (Sancier, 2004). The multiple benefits achieved from consistent practice are keener senses, stronger organ function, relaxed sympathetic nervous system, stimulated parasympathetic nervous system, and a relaxed and alert mind. Participants of Qigong report experiencing a greater understanding of internal balance and enhancement of the physical, mental, and spiritual human potential.

Qigong has been extensively researched in complementary, alternative medicine (CAM) intervention studies. Spiritual healing benefits, through repeated practice of intention, have been observed from this technique for thousands of years in China by lamas. Empirical evidence has been collected through studying the brains of highly trained Buddhist lamas using functional MRIs, EEGs, neurometer measurements, and applied kinesiology. Well-practiced lamas have been successful in directing electrical brain activity away from the amygdala and right prefrontal cortex, affiliated with stress response biochemistries. Conversely, they have increased brain activity in the left prefrontal cortex, associated with more healthy physical and emotional states. These early findings suggest that the stress reflexes of the brain are capable of being changed through the practice of Qigong through
conscious intention. There are over 2,000 research studies on Qigong available on the Qigong database (Sancier, 2004).
CHAPTER 2

Scientific Theory

Research investigations evaluating the mechanisms of action and effects of mind/body techniques over the past 25 years resulted in over 2,000 published peer reviewed studies. In the United States, approximately six peer reviewed journals exclusively publish mind/body/health research. These journals focus on the topics of biofeedback, self-regulatory techniques, psychosomatic or biobehavioral medicine, and health psychology. One of the underlying tenets of mind/body techniques is thoughts and emotions produced by the mind affect physical health. This wealth of published data supports the scientific credibility to encourage the use of mind/body interventions as mainstream treatment options in the pursuit of improving health outcomes.

Many mind/body techniques are currently being used to achieve positive biobehavioral effects, including various techniques of yoga such as coherent breathing and meditation that have existed for centuries. These multiple disciplines have similar philosophical underpinnings. The practice of coherent breathing is similar in philosophical concept to mindfulness meditation through inducing mindful awareness. This is also the same mind/body approach responsible for the principles of cognitive behavioral therapy (CBT). CBTs have integrated the cognitive methods and theories developed by Aaron T. Beck, Albert Ellis, B.F. Skinner, and Ivan Pavlov, and CBT interventions have been implemented in stress management programs. The successful outcome of this method increases one’s ability to apply effective coping strategies and reduces somatic complaints, along with generalized distress or perceived stress. Various techniques are applied for
invoking mind/body therapeutic effects. Many successful techniques include meditative prayer, therapeutic touch, guided imagery, massage therapies, Alexander technique, Feldenkrais, medical Qigong, Tai Chi, relaxation response, and all types of physical exercise. All have demonstrated the ability to improve mood and reduce stress effects. These techniques focus on developing a detached observation of the contents of one’s consciousness and have the potential to provide a powerful cognitive behavioral coping strategy for transforming the manner of responding to life events (Astin, 1997).

A 1992 seminal article in the *Journal of the American Medical Association* written by Chouras and Gold identified the relationship between the effect of stress in contributing to autoimmune diseases, coronary heart disease, gastrointestinal disorders, chronic pain, and psychiatric conditions. They concluded that stressful life events cause over-activation of the fight or flight response (sympathetic overload), impacting morbidity and mortality (Jacobs, 2001). Autonomic nervous system (ANS), imbalances contribute to many chronic health conditions. Sympathetic dominance is the persistent state of sympathetic emphasis and parasympathetic under-emphasis. This autonomic nervous system imbalance stimulates a chronic state of hyperactivity of all bodily functions with increased production of biochemicals, cortisol, and epinephrine and increased energy consumption and byproduct production of free radicals, leading to depletion of energy supplies. The physiological reaction to stress is also referred to as “the allostatic load.” This physiological response usually results in a prolonged state of this heightened defensive posture with sustained increases of heartbeat, muscle tension, biochemical production, and elevated levels of carbon dioxide. The process of aging may also be accelerated from overactivation of the
sympathetic nervous system with an end result of prematurely wearing down the bodily systems. This physiological response of the fight or flight mechanism is intended for survival and appropriate when engaged in response to an actual threat to personal safety, but it is unhealthy to live in a persistent state of sympathetic dominance.

**Hypo-thalamic Pituitary-adrenal Axis**

The activation of the hypo-thalamic pituitary-adrenal axis (HPA), or the stress response, is an instinctual reflex for use in preparation for true life-threatening situations, not in continuous activation to perceived stressors. The manner in which a threat is perceived triggers activity in the hypothalamus and limbic systems, releasing hormones. This influences the immune system through white blood-cell activity, affecting disease vulnerability (Kang, 2001). White cells, brain cells, and nerve fibers all secrete stress chemicals. This represents a multi-system response to stress through activation of the brain, nervous system, endocrine system, and immune system. Research initially conducted by Hans Selye in the 1950’s identified the general adaptation syndrome. He defined the inability to adapt to a stressor as “the exhaustion phase” and showed subsequent correlations with illness and shrinkage of the thymus, spleen, lymph nodes, peptic ulcers and-- in rare instances--death.

The negative impact of stress has been linked to various musculoskeletal, gastrointestinal, central nervous system, and mental health conditions. Various studies demonstrate activation of the HPA axis leads to an imbalance in the ANS from sympathetic dominance with the following conditions: back pain, muscle contraction headaches, immunosuppression, insomnia, irritable bowel syndrome, negative emotions, apathy, and
depression. Increased daytime stress has been linked to increased nocturnal catecholamines, or stress hormones (Jacobs, 2001). Commonly, the acute stimulation of stress response while sleeping is engaged with dreaming (Elliot, 2009). Other correlations have been made between the creation of harmful stress effects from academic exams, job loss, grieving, marital conflict, separation, divorce, or care-giving (Jacobs, 2001).

**Technique Benefits**

Both coherent breathing and meditation provide proven benefits for reversing the allostatic response through vagus nerve stimulation. Both coherent breathing and meditation inhibit the secretion of stress hormones through balancing the autonomic nervous system. This is accomplished through stimulation of the parasympathetic system, or release of the relaxation hormones, to adjust for the persistent state of sympathetic dominance (Elliot, 2006). Clinical measurements of vital signs taken under stressful conditions have consistently demonstrated increases in blood pressure and pulse rates and decreases in blood flow to the heart (Jacobs, 2001).

The body’s defensive mechanism intended to aid the survival of the species has evolved into a potential source of harm. Excessive activation of the fight or flight response in reaction to a threat that cannot be fought or fled has damaging effects on the central nervous, peripheral nervous, cardiovascular, and immune systems (Jacobs, 2001). Stress from increased feelings of hostility, toxic work environments, or lack of social support has repeatedly been identified as a contributing factor in hypertension, heart disease, cardiac arrest, increased cholesterol, coronary artery constriction, ischemia, and cardiac arrhythmias.
The benefits of meditation are supported by over 400 published articles documenting the psychophysiological changes resulting from the use of these practices. Benson and Kabat-Zinn have published results from extensive studies conducted on the physical benefits of meditation and have speculated on potential psychological and spiritual healing derived from meditation (Monk-Turner, 2003). A 1987 study by Orme-Johnson supports the findings that reducing stress in one’s life will increase happiness and self confidence while also being effective in reducing medication use due to a reduction of somatic complaints. These benefits have the potential for achieving a reduction in overall utilization and costs. In limited studies, meditation has been proven effective as a coping mechanism for burnout and a potential for decreasing violent tendencies along with preventing recidivism in prison populations. Many profess the meditative state is more psychologically and physiologically restful than sleep (Monk-Turner, 2003). The practice of meditation has been linked to activation of the area of the pre-frontal cortex, responsible for planning and guiding behavior (Travis, 2009). This finding supports speculation that practicing meditation may lead to healthier decision making and lifestyle choices. The following examples are a few types of yoga traditions that have undergone prior research investigations:

1. **Iynegar** emphasizes alignment and holding postures for periods of time, sequencing postures, and using props. It is best known for providing health benefits from musculoskeletal conditions and has an extensive teacher training program.

2. **Hatha** yoga is the most familiar type practiced in the United States. It encourages the use of breathing and postures to allow practitioners to experience awareness of their bodily sensations and subsequent self-training to achieve a state of physical and
mental relaxation. It is believed to be effective in alleviating depression and other emotional disorders through various postures and breathing practices. There are multiple forms of Hatha yoga, each with a particular emphasis and style, ranging from slow-paced Kripalu to intense, athletic Astanga. This yoga uses breathing exercises and quick progression of poses designed to produce internal heat, improved circulation, and strength.

3. **Karma & Bhakti** yoga place emphasis on service to others and a selfless motivation. It is postulated that Karma yoga fosters internal harmony through mindful acknowledgement of the performance of good actions for its own sake, not based on external rewards. Bhakti yoga encourages selfless involvement with others to promote connectedness and develops a sense of community. It recognizes that anxiety or depression often result from isolation and disconnectedness.

4. **Kundalini** yoga is a system taught by Yogi Bhajan, who left India for the West in 1968. He broke the tradition of secrecy which shrouded yoga for thousands of years in India by teaching its principles to leaders with the power to heal, uplift, and inspire humanity. Specific asanas, postures, and pranayamas, and breathing patterns, described as “yoga meditation techniques,” are recommended for the treatment of a variety of mental health conditions and presented by Shnnahoff-Khalsa, 2004, in the *Journal of Alternative and Complementary Medicine*.

5. **Sudarshan Kriya** Yoga (SKY) was developed over 25 years ago by Sri Sri Ravi Shankar, a spiritual leader from India and founder of the Art of Living Foundation. This is a Sanskrit term meaning, “proper vision by purifying action.” Practicing
SKY fosters the unity of the mind and the body. It relies on the principle that the distinct relationship between emotions and the breath is based on neurological innervations. Both the sympathetic and parasympathetic nervous systems are engaged, whether breathing or exhibiting emotional responses. The autonomic visceral system, brain stem, limbic system, and neuroendocrine systems are intricately fused together and react to complex neurological feedback. Through the modulation of hormonal responses to daily stress, other physiologic and health benefits are reported by yoga practice such as improved musculo-skeletal flexibility, balance, strength, memory, endurance, and cardio-vascular disease risk reduction.

**Brain Response**

Recent research conducted on brain function through both neuroimaging studies and uses of electroencephalograms (EEGs) resulted in interesting findings in relation to meditation. Kubota et al. (2001), investigated the correlation between frontal midline theta rhythm (Fm theta) and autonomic activities with a group of young adults practicing a form of Zen meditation. This was described as an attention demanding meditation procedure. Levels of Fm theta are believed to be present during meditative states and mental concentration and provide a measure of relief from anxiety. The Fm theta was measured with EEG activity and was found to be present in high amplitude over the frontal lobes during meditative states and attentive states. Previous studies on measuring the effects of brain waves with meditation have demonstrated a drop in alpha activity followed by significant increases in both theta and delta frequencies produced from both hemispheres (Jacobs, 2001).
The Kubota study attempted to explain the relationship between cardiac autonomic function and the activity of the medial prefrontal neural circuitry through the use of measuring heart rate variability (HRV). HRV measures cardiac autonomic activity through amplitude, frequency, average heart rate, and coherence. This was the first study to report measurements of the sympathetic and parasympathetic activity separately. Frontal theta activity tended to increase with mental concentration and bodily relaxation. The analysis reported elevated HRV during relaxed concentration. The somatic nervous system and peripheral nervous system were both impacted along with Fm theta activity.

The anterior cingulated cortex (ACC) appears to be the area of the brain that generates the Fm theta wave activity. The ACC functions include working memory skill and autonomic control resulting from cognitive process. Research indicates that lesions in this area of the brain result in attention deficit (Kubota, 2001). Studies in animals show that changes in heart rate and blood pressure were caused by stimulation of the ACC. Another significant study finding suggests the ACC has two subdivisions, the dorsal cognitive and the ventral affective. Recent neuroimaging studies suggest different functions for these subdivisions. The cognitive division is interconnected to the lateral prefrontal cortex, parietal cortex, and motor areas. The ventral division is connected to the amygdala, hypothalamus, hippocampus, and orbitofrontal cortex with outflow to autonomic motor and endocrine systems. This discovery identifies a link and may provide an opportunity for the collection of empirical measurements to validate the physiologic impact of mind/body techniques.

**Neurological Response**
Studies investigating the influences on the autonomic nervous system of yoga practices that include coherent breathing identify objective measures supporting a reduced stress response, as demonstrated through reduced blood pressure, heart rate, and respiratory rate and increased HRV (Evans, 2009). Low heart rate amplitude is highly correlated with elevated risk of cardiac sudden death, coronary heart disease, and other causes of mortality (Elliot, 2006). Reduced risk of cardiovascular disease and healthy cardiac function is reflected with increased HRV parameters (Evans, 2009). Research demonstrates voluntary control of breath is associated with increased HRV (Lehrer et al., 1999) and supports the positive regulating effects that coherent breathing has on the sympathetic response. Coherent breathing leads to autonomic nervous system balance through stimulating the parasympathetic nervous system (Elliot, 2006). The resulting release of relaxation hormones, norepinephrine and oxytocin, along with cytokines from the immune system, inhibits stress hormone secretion and stimulates vagus nerve pathways. The vagus nerves influence alertness, attention, cognitive processes, emotion regulation, and stress response (Brown, 2009).

**Breath Response**

One of the body’s first responses to increased stress is to accelerate breathing. Rapid breathing is caused by stress, and it also innervates sympathetic emphasis, resulting in a vicious cycle. This can occur even from breathing at an average rate of 15 breaths a minute (Elliot, 2006). Deliberate control of breathing checks emotional excitement. Emotional excitement increases the rate of breathing; inversely, voluntary slow-paced breathing can be
emotionally calming (Brown, & Gerbarg, 2009). Both the sympathetic and parasympathetic nervous systems are engaged with breathing rates and emotional responses.

Clinical evidence repeatedly confirms the relationship between breathing and anxiety and the effectiveness of breath training in reducing anxiety. Manipulation of respiratory rate proves to be an effective means for influencing overall physiological adjustments through changes in respiratory rate and depth. Breathing affects multiple physiological responses, including cardiovascular alterations and skin conductance, verified through biofeedback measurements (Philippot, 2002). Respiratory feedback is associated with inducing certain emotional states. Fear, anger, hostility, and panic are illustrated with rapid breathing. Many studies demonstrate that feelings of anxiety can be alleviated through implementing specific breathing exercises.

Conscious breathing is extremely powerful. Existing data show the changes in the rate and depth of breathing produce changes in the quantity and kind of peptides that are secreted by the brainstem. Engaging in this process intentionally, either holding the breath or rapid breathing, causes the body to attempt to restore homeostasis, and peptides diffuse rapidly through the cerebrospinal fluid. The peptide-respiratory link is well documented through the presence of all types of peptides in the respiratory center. Pert postulates that this peptide connection may explain the scientific rationale behind the healing effects of consciously controlled breathing. Respiratory feedback provides a rich topic for future research investigations on the regulation of emotion.

Immune System Response
Cytokines are peptides released by activated immune cells. They provide a communication network for crucial cell-to-cell interactions. Many stress-induced outcomes from immune system responses are suspected of being mediated through changes from specific reactions of cytokine production. Kang (2001) reports a large body of evidence supporting the effects of stress on neuroendocrine and immune responses. The impact of stress on the immune system has received attention of researchers due to the function the immune system provides in relation to defending the body against negative health consequences. Stress can alter cellular, humoral, and innate immunity on the following levels: lymphocytic proliferation, natural killer (NK) cell activity, phagocytosis, oxidative stress, and cytokine and antibody production. Pathological conditions and mood disorders are linked to a dysregulation of the cytokine response. The pathology of Hashimoto’s thyroiditis and rheumatoid arthritis reportedly have a Th1-type cytokine pattern. A common chronic condition linked to the production of the Th2-type cytokine is the pathogenesis of asthma and allergic reactions. Th2-type cytokine responses are also identified with assisting in the progression of infection as opposed to the Th1 association, which fosters resistance to infections.

The production of cytokines in relation to stress effects is not well understood. An acute single stressor and a persistent chronic stressor may elicit divergent immune responses. “The direction, magnitude, and persistence of stress responses may differ accordingly to the specific nature of the stressor” (Kang, 2003, p. 421). NK cell activity is associated with a transient increase in the acute stress phase and a significant sustained decrease with consistent exposure to stress. There appears to be a similar reaction in the neuroendocrine...
response. Sympathetic nervous system response is promptly activated and lasts for a short period in comparison to the endocrine response; cortisol production occurs slower but lasts longer. The various types of cytokines demonstrate diverse temporal kinetics with exposure to stress.

T-cells are the principal regulators and conductors of the immune response and consist of three types. T-helper-cells stimulate and help to sustain the immune response. T-suppressor-cells prevent over-activation of the immune system by down-regulating. T-cytotoxic-cells kill other cells identified as “non-self” (Kang, 2003). The cytokines produced by the T-helper-cells are generally referred to as “Th1 and Th2.” Cytokines in the Th1 domain include gamma interferon and interleukin. Both of these promote cell-mediated immunity and enhanced NK cell activity along with multiple other cell functions. Th2 cytokines include IL-4, IL-5, and IL-6. These three subtypes are responsible for facilitating humoral immune responses. Evidence also shows that these cytokines closely interact and cross regulate the other’s development and activity (Kang, 2003).

A study conducted by Kang and Fox (2001) attempts to measure the impact of academic stress on the cytokine response in college students. They demonstrate significant changes in specific cytokine levels. Il-6, one of the Th-2 type of cytokines contributing to humoral immune response, is increased during academic examinations. In contrast to the Th-1 cytokines, interferon and interleukin with decreased levels are responsible for cell mediated immunity during the same examination period. This theory suggests that a certain balance exits between theTh1 and Th2 cells, contributing to the body’s defensive capabilities against a threat, perceived or actual. Psychological stressors have been demonstrated to influence a
range of immunologic alterations in relation to both cell-mediated and humoral immunity. These changes contribute to a negative impact on multiple immune cells, including natural killer cells’ cytotoxicity.

Most importantly, researchers must understand the complex multidirectional communication and interactions of the nervous, endocrine, and immune systems with investigations in biobehavioral research. The neuroendocrine system exerts hormonal influence on the immune response, and the immune system is connected to the central nervous system directly through nerves. Lymphoid organs are innervated by noradrenergic nerve fibers. Immune cells are made up of adrenergic, noradrenergic, and cholinergic receptors with neurons possessing receptors for immune products. This clearly defines the bidirectional nature of communication among these three systems. (Ader, et al., 2001).

**Psychoneuroimmunology Theory**

Candace Pert (1997), professor at Georgetown University School of Medicine and research professor in the Department of Biology and Physiology, identified the presence of neuropeptides and their receptors in the brain, the intestinal tract, and immune system. She described her theory in 1985 as “Neuropeptides and their receptors thus join the brain, glands, and immune system in a network of communication between brain and body, probably representing the biochemical substrate of emotion” (Pert, 1997, p,179). She dedicated her field of research to investigating the mind/body connection at the molecular level, acknowledging the potential for self-healing capabilities. She is responsible for suggesting that the areas of neuroscience, endocrinology, and immunology are joined through a multidirectional network, communicating through the information carried by
neuropeptides produced by the brain, glands, spleen, bone marrow, and lymph nodes. The evidence of this communication network of neuropeptides and their receptors establishes a physiological link between the body’s cellular defense, healing mechanisms, endocrine system, and brain functions. The role of neuropeptides, the regulators of moods and emotions, are well known to innervate the limbic system.

Another important mind/body theory Pert espouses is that intelligence is not only located in the brain but distributed throughout the body. This indicates that mental processes and emotions cannot be considered as separate from the body. She supports this theory by stating that the immune system is capable of learning with memory like the nervous system. Her research findings provide the foundation for psychoneuroimmunology (PNI).

PNI is a theoretic framework readily applied to biobehavioral nursing research investigations. It helps to explain psychobehavioral and physiological, mind/body interactions. PNI addresses the multidimensional interactions between psychobehavioral, neuroendocrine, and immune systems. This concept was described by McCain, Gray, Walter, and Robinson (2005) as, “An integrative paradigm for advancing both theoretical and empirical knowledge of physiological patterns that contribute to the dynamics of health” (McCain, et al, 2005, p.320). It is applied through integrating the Lazarus and Folkman cognitive-transactional model of stress with the pathophysiological interactions, affecting health dynamics in multiple stress induced health conditions (McCain, et al, 2005). This theoretical framework offers nurse researchers a valuable reference to aid in the discernment of physical and psychological processes and outcomes of the stress coping response. A PNI research question is one that seeks to determine the effect of stress on health outcomes.
Under controlled conditions, individuals with high stress levels have been reported to have increased susceptibility to respiratory illness, herpes virus, and delayed wound healing (Jacobs, 2001; Kang, 2003). When implemented properly, PNI/biobehavioral research can provide a powerful tool for nurse scientists to investigate mind/body interactions in relation to health outcomes (Kang, 2003).

The application of PNI in nursing research provides a biobehavioral model for exploring psychosocial, behavioral, environmental, and biological interactions. It can be utilized for obtaining a physiologic measurement to evaluate the effectiveness of psychobehavioral nurse interventions designed to help reduce one’s response to stress and to improve coping. The multi-system comprehensive design of the PNI model also supports the foundation of nursing philosophy that human beings are complex, multidimensional, holistic individuals. Within the psychobehavioral domain, inner strength, spirituality, and social support are viewed as key modulators for influencing the stress appraisal process and successful coping in the absence of any intervention. Successful implementation of stress management through mind/body/spirit intervention strategies may contribute to psychological adaptation through the use of positive coping methods such as finding meaning or benefit in the stress producing experience and enhancing inner strength and spirituality.

Many of the Eastern traditions practice the use of breathing to alter physiologic responses. These yoga breathing techniques, including coherent breathing, have the potential to relieve anxiety, depression, post traumatic stress disorder (PTSD), and chronic pain. The therapeutic results of coherent breathing are explained by causing a reduction in the sympathetic nervous system activity with an increase of activity in the parasympathetic
nervous system. A developing body of research supports investigating associations between emotional disorders and autonomic functions. This includes all types of anxiety, depression, PTSD, hostility, and aggression (Brown, 2005). Coherent breathing provides a unique and powerful tool for adjusting imbalances of the autonomic nervous system. Coherent breathing has been credited with achieving biopsychosocial benefits with potential for enhanced well-being.

Coherent breathing and meditation are each associated with psychological benefits such as enhanced coping, self-efficacy, and positive mood. In addition, they provide spiritual benefits of compassionate understanding and mindful awareness (Evans, 2009). The combination of awareness in the mind/body and awareness of breath associated with coherent breathing and meditation practices is believed to have a positive impact on psychophysiological function (Evans, 2009). The autonomic nervous system benefits are associated with short- and long-term parasympathetic nervous system dominance.

Coherent breathing provides a bridge for experiencing health and wellness that the mind/body connection fosters. Meditation keeps the channels of communication between the mind and the body open and enhances the circulation of energy, prana, or chi, resulting in balancing, cleansing, and nurturing of the mind, body, and spirit (Gimbel, 1998). The physiologic response of persistent sympathetic activity is counteracted by the daily practice of coherent breathing and meditation through stimulating the relaxation response. Herbert Benson (1996) describes the relaxation response as an innate mechanism to counteract the stress response. It is a self-regulating technique to gain better control over the peripheral nervous system and the CNS, and has been recognized as an effective treatment for
musculoskeletal conditions, cardiac and gastrointestinal disorders, arthritis, and insomnia and for reducing blood glucose levels, hostility, and anxiety (Benson, 1996). These mind/body techniques induce a “wakeful hypometabolic state of parasympathetic predominance which relaxes the body and the mind, especially in stressful conditions” (Parshad, 2004; p.193).
CHAPTER 3

Methodology

The research design for this pilot intervention study includes two intervention groups. One intervention group received the coherent breathing instruction; the other intervention group received the meditation instruction. A third group, a reading group, functioned as the control. Students were randomly assigned into one of three groups—-the meditation group, the coherent breathing group, or the reading control group. Each intervention group attended a weekend workshop conducted by professors who are experts in their respective fields, and weekly follow-up sessions were offered. The control group received the same number of weekly follow-up sessions without a self-help intervention. Participants in the control group functioned as a reading group with weekly reading assignments and weekly meetings to discuss the readings. Members of the control group were offered an intervention technique after the study was completed. The coherent breathing technique involved learning several ancient patterns of breathing and required 20 minutes of practice daily. The distraction meditation technique required 10 minutes of daily practice. Both intervention groups were instructed to practice their techniques daily throughout the 21-day length of the study. The literature suggests that meditation and yoga breathing techniques are most effective in resulting beneficial physiologic changes after at a minimum of three to four weeks practice. Therefore, this intervention consisted of 21 days of practice.

Sample
Recruitment was accomplished through sending an invitation about participation in the study through email distribution to all members of the Boston College Class of 2014 for participation in session 1 of the study, Fall 2010. A second session was conducted in Fall 2011 to increase the sample size. Recruitment for Session 2 included email distribution to all freshmen, members of the Class of 2015, and sophomores who met eligibility for participation in 2010. Interested students were directed to reply to a health services departmental email account to receive additional information about eligibility for the study. Eligibility to participate in the study is determined based on inclusion and exclusion criteria.

Potential participants were determined by compiling the names of all students who acknowledged interest in attending the introductory meeting and who meet study inclusion criteria through email communication. Additional recruitment efforts were conducted through posting flyers in the first-year residence halls and distribution of flyers to first-year program administrators and faculty members. At the introductory meetings, study aims and expectations were clearly stated. Upon reviewing these conditions and agreeing to participate, study participants were given a paper consent form to sign. All pre-test survey instruments were completed at the introductory meeting after obtaining written informed consent.

Three groups were formed, consisting of Boston College freshmen and sophomores. Attempts were made to comprise each group with equal numbers of males and females when possible. The subjects were randomly assigned into either of the experimental groups or the control group by using color-coded index cards, Red, Blue, and Yellow, drawn from manila envelopes. These cards were split into two envelopes for the selection of equal numbers of
males and females. Once the participants were randomly assigned into the experimental or control groups, they were provided with a written explanation of expectations for their participation in the research study. Information provided to the intervention groups included statements regarding required attendance at the weekend workshop, follow-up sessions, and daily practice of their respective techniques. The reading group members were required to attend weekly meetings to discuss the reading assignments. All three groups were required to attend the final large group meeting to complete all post survey questionnaires.

**Methods**

Students attended the weekend workshop involving Qigong movements, positive psychology, cognitive behavioral components, and group process exercises. They separated into two groups for the instructions of their intervention technique based on random assignment. The students in the distraction meditation group received instruction from Joseph Tecce, PhD., a professor in the psychology department of Boston College. Tecce has taught his distraction meditation technique to students in his psychology course at Boston College for over 30 years. He has collected data over the years supporting the positive impact of meditation in reducing stress and stress effects in the college students who practiced the technique. The students in the coherent breathing group received instruction from Richard Brown, MD. Brown is Associate Clinical Professor of Psychiatry at Columbia University and certified teacher of Qigong, yoga, Aikido, and meditation. Brown developed a comprehensive neurophysiological theory of the effects of various types of yoga breathing on the mind and body. The third group functioned as the control group and did not receive either of the interventions but were asked to attend weekly focused reading group meetings.
The reading group read the *Autobiography of St Ignatius Loyola*, which is approximately 75 pages. Reading assignments were posted online for students to access or provided with paper copies if requested. All groups completed the pre- and post instruments at the same three week interval, and the reading/control group were offered the intervention techniques after data collection.

The two-day, eight-hour weekend workshop for both intervention groups included ancient Qigong practices to alter the physical energy fields and brief cognitive behavioral group process exercises. Upon completion of the instruction of the techniques, the students in the intervention groups were asked to perform their respective meditation or coherent breathing exercises for a total of 21 days. The coherent breathing technique consisted of a 20-minute practice session. The meditation technique was to be practiced for 10 minutes daily. The instructions for the daily practice of the coherent breathing was available through a compact disc recording to be played on a personal computer or downloaded on another listening device.

Students must have had no prior experience with either coherent breathing or meditation and be at least 18-years-old. The participants were assigned individual code numbers for the completion of all study instruments to maintain confidentiality and were provided with a $25 stipend upon successful completion of the study.

**Data Collection**

Pre- and post-test measurements were self-administered on four paper instruments, the Cohen Perceived Stress Scale (PSS), Speilberger’s State and Trait Anxiety Inventory (STAI), the Body-Mind-Spirit Wellness Behavior and Characteristic Inventory (BMS-
WBCI) and a self-report questionnaire (SRQ), to identify frequencies of a limited number of physical symptoms and health behaviors correlated with stress effects. The Cohen PSS is the most widely used psychological scale for determining perceived stress. It consists of 10 items that measure the degree to which experiences in someone’s life are deemed stressful. It has good internal consistency with coefficients ranging from .84-.86 and test-retest reliability of .85. The STAI was developed by Charles Spielberger and is the worldwide leading measure of personal anxiety. It consists of 40 questions, and differentiates between “state anxiety” (how the participant feels at the current time) and “trait anxiety” (how the participant feels generally) (Spielberger, 1989). The test-retest reliability for the state scale ranges from .16-.62, and the trait scale is higher, ranging from .65-.86. The BMS-WBCI is a 44 question, inventory consisting of three dimensional subscales, a body scale measurement, a mind scale measurement, and a spirit scale measurement. The cumulative numeric value results in the total wellness score. This instrument was designed for use with college students. It has good reliability with coefficient values ranging from .73-.86, and high internal consistencies with alpha ranges of .81-.91. The construct and validity of each of these instruments has been determined to be reliable for use with college students (Deckro, 2002; Hey, 2006). The SRQ collected demographic information as well as measurement of the frequency of a limited number of physical symptoms including headaches, sleep disturbances, and health behaviors such as cigarette and coffee consumption to correlate with stress effects. A daily practice log was distributed at the introductory session and collected at the final session for reporting the frequency of daily practice on a weekly basis throughout the 21-day study.
## Program Methodology

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<tr>
<th>PART I</th>
<th>PART II</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Recruitment of freshmen and sophomores</td>
<td>• Control group meeting to receive reading assignment</td>
</tr>
<tr>
<td>• Attendance at an introductory meeting,</td>
<td>• Attendance at weekend workshop for intervention groups</td>
</tr>
<tr>
<td>• Complete pre-test instruments SRQ, STAI, PSS, &amp; BMS-WCI, participant burden of ~ 40 minutes</td>
<td>• Groups receive separate instruction for either coherent breathing or meditation techniques</td>
</tr>
<tr>
<td>• Random assignment to yoga breathing group</td>
<td></td>
</tr>
<tr>
<td>• Random assignment to meditation group</td>
<td></td>
</tr>
<tr>
<td>• Random assignment to control group</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART III</th>
<th>PART IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Practice for 21 days, keeping log</td>
<td>• Final large group session for intervention groups and control group</td>
</tr>
<tr>
<td>• Email reminder sent weekly to encourage the tracking of the daily practice log</td>
<td>• Completion of post-test instruments, SRQ, STAI, PSS, &amp;BMS-WBCI, and collection of yoga/meditation daily practice forms</td>
</tr>
<tr>
<td>• Separate weekly follow-up sessions scheduled for each intervention group and control group</td>
<td>• Students receive $25 stipend upon completion</td>
</tr>
</tbody>
</table>

### Data Analysis

A t-test was performed on the pre-test scores of the four study instruments from both sessions of the study to determine if the two samples were similar enough to combine the data for final data analysis. No significant differences were identified between the participants from Session 1 or Session 2 based on age, gender, ethnicity, and pre-test median scores on the PSS, STAI and MBS-WCI. Therefore, the data from both sessions were combined.
Statistical analysis was conducted through using SPSS software programs for performing analysis of variance (ANOVA) on the change of scores for each of the four dependent variables, of perceived stress, state anxiety, trait anxiety, and perceived holistic wellness. Comparisons are made between the intervention groups and the control group to evaluate the use of the four study instruments and to measure the influence of the intervention techniques in answering the research questions.

**Inclusion Criteria**

Student eligibility was determined through being a registered student of Boston College in the graduating Class of 2014 or 2015, being over 18 years of age, and signing the informed consent form.

**Exclusion Criteria**

Students with prior history of regular practice of either meditation or coherent breathing and certain health conditions requiring daily medication were excluded from participating in the study.

In addition, previous diagnosis and treatment of anxiety, bipolar disorder, OCD, or schizophrenia were also excluded from participation.

Students taking any medications on the following list were excluded from the study:

- Adderal, Stratera, Vivanse, Ritalin, or any other prescription for treatment of Attention Deficit Disorder
- Ativan, Xanax, or any other medication prescribed for anxiety disorder
- Cymbalta, Effexor, Paxil, Prozac, Lexapro, Wellbrutin, Zoloft, or any other medication prescribed for the treatment of depression
• Dilantin, Depakote, or any other medication prescribed for seizure disorder.
CHAPTER 4

Data Analysis

The purposes of this study were to evaluate the four instruments used and to examine the influence of two self-regulatory techniques—coherent breathing and meditation—on perceived stress, stress effects, anxiety, and perceived holistic wellness in college freshmen and sophomores to answer the following primary research question:

Does daily practice of meditation or coherent breathing influence perceived stress, stress effects, anxiety, or perceived holistic wellness in college freshmen and sophomores?

Additional research questions that were investigated by this pilot intervention were:

1. Will daily practice of meditation succeed in reducing perceived stress, stress effects, and anxiety in college freshmen and sophomores?

2. Will daily practice of coherent breathing succeed in reducing perceived stress, stress effects, and anxiety in college freshmen and sophomores?

3. Will reducing stress, stress effects, and anxiety in college freshmen and sophomores lead to improved perceived holistic wellness?

4. Will both intervention groups report greater effects than the control group?

5. Will both intervention groups report satisfaction with the techniques?

The effects were measured by comparing the pre- and post-test change of scores of both intervention groups and controls, using the following instruments: Cohen’s Perceived Stress Scale (PSS), Speilberger’s State and Trait Anxiety Index (STAI), Body-Mind-Spirit Wellness
Behavior and Characteristic Inventory (BMS-WBCI), and a self-report questionnaire (SRQ) (Tecce, 1995).

**Description of Sample**

The first session of this study conducted in the fall of 2010 yielded a total of 30 Boston College freshmen meeting eligibility criteria who completed the pre-survey instruments at the introductory session. Eleven of these students withdrew from participation in the study due to either changing their minds or being too busy. One student in the meditation group neglected to attend any of the three follow-up sessions or complete the post-survey instruments after receiving instruction. The second session of the study yielded a total of 22 freshmen and 3 sophomores who met eligibility criteria and completed the pre-intervention instruments at 1 of 4 introductory sessions. One student in each of the intervention groups withdrew prior to receiving the technique instructions and one student withdrew from the reading group. Figure 1 shows the flow of students in both waves through the study.

The sample for Session 1 was comprised of 18 participants who were ages 18 and 19, including 6 males and 12 females, and the following ethnicities: 13 Caucasians, 4 Asians, and 1 Hispanic. The sample for Session 2 was also comprised of 18- and 19-year-olds, including 6 males, 16 females, and the following ethnicities: 12 Caucasians, 6 Asians, 3 Hispanics, and 1 mixed race. Group demographics and means of pre-test score comparisons are represented in Tables 1 and 2.
Figure 1. Participant flow through study

Session 1: Fall 2010
140 Volunteer Student Participants
Responding to email and meeting eligibility

Session 2: Fall 2011
60 Volunteer Student Participants
Responding to email and meeting eligibility

Coherent Breathing Group

Meditation Group

Final Pilot Study Sample

<table>
<thead>
<tr>
<th></th>
<th>Session 1:</th>
<th>Session 1:</th>
<th>Session 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherent Breathing</td>
<td>n = 7</td>
<td>n = 7</td>
<td>n = 18</td>
</tr>
<tr>
<td>Meditation</td>
<td>n = 7</td>
<td>n = 11</td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>n = 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>n = 14</strong></td>
<td><strong>n = 14</strong></td>
<td><strong>n = 40</strong></td>
</tr>
</tbody>
</table>

Reading Groups

<table>
<thead>
<tr>
<th></th>
<th>Session 1:</th>
<th>Session 2:</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 4</td>
<td>n = 8</td>
<td>n = 12</td>
<td></td>
</tr>
</tbody>
</table>

Intervention Workshops
No appreciable differences were identified between the participants from Session 1 or Session 2 based on age, gender, ethnicity, and pre-test median scores. Therefore, a dependent $t$-test analysis was conducted to determine differences between the two sessions on the pre-test scores for each of the dependent variables of perceived stress (PSS), state anxiety (SA), trait anxiety (TA), and perceived holistic wellness (BSM). The MBS-WBCI was the instrument used as a measurement for perceived holistic wellness. The pre-test mean scores of the two sessions of the study did not identify significant differences through the $t$-test analysis. These two groups were combined for conducting univariate analysis of variance (ANOVA) statistics.

**Table 1.** Gender and ethnicity of two participant sessions

<table>
<thead>
<tr>
<th></th>
<th>Mean Age</th>
<th>Female</th>
<th>Male</th>
<th>Asian</th>
<th>Caucasian</th>
<th>Hispanic</th>
<th>Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session 1</strong></td>
<td>18.2</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>13</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Session 2</strong></td>
<td>18.3</td>
<td>16</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 2.** Comparison of group mean pre-test scores

<table>
<thead>
<tr>
<th></th>
<th>Pre PSS</th>
<th>Pre SA</th>
<th>Pre TA</th>
<th>Pre MBS-WBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session 1</strong></td>
<td>18.9</td>
<td>40.1</td>
<td>44.6</td>
<td>107</td>
</tr>
<tr>
<td><strong>Session 2</strong></td>
<td>17.3</td>
<td>36.7</td>
<td>43.3</td>
<td>105</td>
</tr>
<tr>
<td><strong>Combined</strong></td>
<td>18.1</td>
<td>38.2</td>
<td>43.9</td>
<td>106</td>
</tr>
</tbody>
</table>

PSS, Perceived Stress Score; SA, State Anxiety; TA, Trait Anxiety; BSM, Body Spirit Mind
The three \( t \)-test assumptions were met for conducting this analysis of the pre-test mean scores within each of the three groups—reading control, meditation, and coherent breathing. These groups were close to equal size, although one session was smaller than the recommended total of 20. The group mean pre-test scores indicate a high degree of similarity between the groups to support homogenous variances. On two separate occasions, 11 months apart, the data was sampled independent. The data of each group followed a Normal distribution meeting the third assumption.

**Tables 3 and 4.** \( t \)-test results

<table>
<thead>
<tr>
<th>session</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre PSS 1.00</td>
<td>18</td>
<td>18.94</td>
<td>5.081</td>
<td>1.198</td>
</tr>
<tr>
<td>2.00</td>
<td>22</td>
<td>17.36</td>
<td>5.965</td>
<td>1.272</td>
</tr>
<tr>
<td>pre BSM 1.00</td>
<td>18</td>
<td>107.39</td>
<td>8.665</td>
<td>2.042</td>
</tr>
<tr>
<td>2.00</td>
<td>22</td>
<td>105.27</td>
<td>11.046</td>
<td>2.355</td>
</tr>
<tr>
<td>pre SA 1.00</td>
<td>18</td>
<td>40.17</td>
<td>10.929</td>
<td>2.576</td>
</tr>
<tr>
<td>2.00</td>
<td>22</td>
<td>39.41</td>
<td>8.732</td>
<td>1.862</td>
</tr>
<tr>
<td>pre TA 1.00</td>
<td>18</td>
<td>44.67</td>
<td>10.906</td>
<td>2.571</td>
</tr>
<tr>
<td>2.00</td>
<td>22</td>
<td>43.27</td>
<td>8.614</td>
<td>1.837</td>
</tr>
</tbody>
</table>

*PSS, Perceived Stress Score; SA, State Anxiety; TA, Trait Anxiety; BSM, Body Spirit Mind*
<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>pre PSS</td>
<td>.744</td>
<td>.394</td>
<td>.890</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>.905</td>
<td>37.921</td>
<td>.371</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>.905</td>
<td>37.921</td>
<td>.371</td>
</tr>
<tr>
<td>pre BSM</td>
<td>.784</td>
<td>.382</td>
<td>.662</td>
</tr>
<tr>
<td>pre SA</td>
<td>3.486</td>
<td>.070</td>
<td>.244</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>.238</td>
<td>32.270</td>
<td>.813</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>.238</td>
<td>32.270</td>
<td>.813</td>
</tr>
<tr>
<td>pre TA</td>
<td>2.328</td>
<td>.135</td>
<td>.452</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>.441</td>
<td>32.029</td>
<td>.662</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>.441</td>
<td>32.029</td>
<td>.662</td>
</tr>
</tbody>
</table>

PSS, Perceived Stress Score; SA, State Anxiety; TA, Trait Anxiety; BSM, Body Spirit Mind

This analysis reports a high degree of similarity among the mean pre-test scores for the members of all three group in Session 1 and Session 2. Using a significance level of \( p \leq 0.05 \),
no significance is reported by the Levene’s test for equality on pre-test mean scores for group variance in relation to each of the dependent variables. The p values for each of the dependant variables are: perceived stress, \( p \leq 0.39 \); holistic wellness, \( p \leq 0.38 \); state anxiety, \( p \leq 0.07 \); trait anxiety, \( p \leq 0.14 \).

Based on this favorable analysis to confirm no appreciable differences of groups, Session1 and Session 2 were combined for further data analysis.

**Table 5.** Gender and ethnicity of participant groups

<table>
<thead>
<tr>
<th>*Groups</th>
<th>Gender</th>
<th>Total Gender</th>
<th>Ethnicity</th>
<th>Total Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>2.00</td>
<td>9</td>
<td>5</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>3.00</td>
<td>11</td>
<td>1</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Totals</td>
<td>28</td>
<td>12</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>

*Group1–Coherent Breathing; Group 2–Meditation; Group 3–Reading/Control

**Instruments and Measurement**

Data were analyzed to determine Cronbach’s alpha for each of the four study instruments to measure their respective reliabilities and internal consistencies. This quantitative inter-relater reliability measurement evaluates construct validity of an instrument.
and its stability over time as compared to a series of random picks. The alpha is closer to 1 when items are measuring the same construct and are correlated. Alphas equal to or >.80 are desirable, and >.70 are acceptable (Polit, 2010). Excellent alphas for all of these instruments, except for the self-assessment questionnaire, are reported with this age group throughout the literature (Speilberger, 1989; Misra, 2000; Deckro, 2002; Brown, 2004; Hey, 2006). Similar results were not replicated with this study due to the extremely low sample-size and low number of items on the instruments, except for the MBS-WBCI. The results reported by this analysis cannot be generalized due to the small sample-size of this study.

Cronbach’s alpha for the MBS-WBCI ranged from .75 to .87. The range for the PSS alpha was .34 to .44. Alpha coefficients reported for PSS in other studies with college students range from .78 to .85 (Deckro, 2002; Oman, 2008). STAI normative alpha is reported as .92 (Speilberger, 1989), and other studies with this age group report ranges from .62 to .74 for state and .76 to .86 for trait (Misra, 2000; Deckro, 2002; Brown, 2004). Cronbach’s alpha for the STAI this sample ranged from .23 to .28 for state, .12 to .39, for trait, and the alpha for the SRQ was .52. This unpublished instrument was developed by Joseph Tecce for use with students at Boston College (Tecce, 1995).

The pre- and post-SRQ completed by the participants consisted of 12 questions. Items were rated using a Likert scale, ranging from 0 (“never”) to 4 (“very frequently”) in order to measure the frequencies of stress effects, including symptoms of headaches, sleep disturbances, and health-related habits of coffee consumption, exercise, and more. For the purposes of this data analysis, only demographic information was used from the self-report questionnaire. The responses to the items measuring stress effects, symptoms of stress, and
health habits were low to moderate on both the pre- and post-test and did not reflect any appreciable changes to report in this sample.

**Data Analysis**

A univariate ANOVA was run with SPSS on the four dependent variables of perceived stress, state anxiety, trait anxiety, and perceived holistic wellness. The pre- and post-test change of scores are represented either as positive or negative numbers to measure and compare the impact of the interventions. The results are depicted in Figure 2. These results are reported both positively and negatively, representing the reduction in perceived stress and anxiety scores as a positive outcome, and conversely, an increase in wellness scores indicates improvement.

![Figure 2. Results of the pre- and post-test change of scores for the 3 study groups on the 4 dependant variables, perceived stress, state and trait anxiety, and perceived holistic wellness.](image-url)
A post hoc analysis was also conducted using Bonferroni and Scheffe to reduce the possibility of a Type I error and to test for unequal variance. Scheffe is considered to be the most conservative of these with high regard from the research community (Burns, 2005). The results indicated no appreciable differences between the two intervention groups and group differences were confirmed between the reading control group and each of the intervention groups. SPSS Output is represented in Tables 6 through 8.

Table 6. Descriptives

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval for Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
</tr>
<tr>
<td>PSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>read</td>
<td>12</td>
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<td>5.179</td>
<td>1.495</td>
<td>-5.79</td>
<td>.79</td>
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<tr>
<td>cb</td>
<td>14</td>
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<td>1.390</td>
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<tr>
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<td>6.089</td>
<td>.963</td>
<td>-8.00</td>
<td>-4.10</td>
<td>-16</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>read</td>
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<tr>
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<td>9.670</td>
<td>1.529</td>
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<td>-3.93</td>
<td>-24</td>
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<tr>
<td>TA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>read</td>
<td>12</td>
<td>-2.83</td>
<td>2.980</td>
<td>.860</td>
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<td>-9.4</td>
<td>-6</td>
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<tr>
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<td>6.630</td>
<td>1.772</td>
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<td>-7.67</td>
<td>-21</td>
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<tr>
<td>cb</td>
<td>14</td>
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<td>7.208</td>
<td>1.926</td>
<td>-16.59</td>
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<td>7.252</td>
<td>1.147</td>
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<td>-6.91</td>
<td>-23</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>read</td>
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<td>6.887</td>
<td>1.988</td>
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<td>8.21</td>
<td>-8</td>
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<td>9.36</td>
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<td>15.81</td>
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<td>Total</td>
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<td>7.817</td>
<td>1.236</td>
<td>5.73</td>
<td>10.72</td>
<td>-8</td>
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PSS, Perceived Stress Score, SA, State Anxiety, TA, Trait Anxiety, BSM, Body Spirit Mind
Table 7. Test of homogeneity of variances

<table>
<thead>
<tr>
<th></th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>37</td>
<td>.292</td>
</tr>
<tr>
<td>SA</td>
<td>1.385</td>
<td>2</td>
<td>37</td>
<td>.263</td>
</tr>
<tr>
<td>TA</td>
<td>2.962</td>
<td>2</td>
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<td>.064</td>
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<td>BSM</td>
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<td>2</td>
<td>37</td>
<td>.158</td>
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</tbody>
</table>

PSS, Perceived Stress Score, SA, State Anxiety, TA, Trait Anxiety, BSM, Body Spirit Mind

Table 8. ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
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<td>PSS</td>
<td>Between Groups</td>
<td>216.614</td>
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<td>108.307</td>
<td>3.260</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1229.286</td>
<td>37</td>
<td>33.224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1445.900</td>
<td>39</td>
<td></td>
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<td>457.148</td>
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<td>Within Groups</td>
<td>2732.679</td>
<td>37</td>
<td>73.856</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3646.975</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA</td>
<td>Between Groups</td>
<td>706.380</td>
<td>2</td>
<td>353.190</td>
<td>9.719</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1344.595</td>
<td>37</td>
<td>36.340</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2050.975</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BSM</td>
<td>Between Groups</td>
<td>346.380</td>
<td>2</td>
<td>173.190</td>
<td>3.146</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>2036.595</td>
<td>37</td>
<td>55.043</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2382.975</td>
<td>39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PSS, Perceived Stress Score, SA, State Anxiety, TA, Trait Anxiety, BSM, Body Spirit Mind

Cohen’s PSS measures how unpredictability, uncontrollable forces, and overload are appraised as stressful by respondents. Scores range from a low of 0 to a high of 40. The items of the PSS ask about feelings and thoughts on current levels of experienced stress over
the past month. The normative mean scores reported by the L. Harris Poll for this age group was 14.2 with a standard deviation of 6.2 (Cohen, 1994). Study participants’ pre-survey PSS test scores ranged from 7-30 for all groups (mean 18.1). Post-survey PSS scores reduced overall for the intervention group participants, ranging from 3-27. The post-test mean was 9.92 for meditation group and 9.5 for coherent breathing group. All but two members of the intervention groups experienced a reduction of their scores by 1-16 points. Other studies report PSS pre- and post-test scores averaging from 20-30 in college students; a low score is reported as 20 or less (Deckro, 2002; Lane, 2007). With the exception of one student in the meditation group with a post-test score of 24, no other intervention group members reported a post-test score higher than 16.

The reading group post-test scores ranged from 7-27 with a mean of 16.4. One member of the reading group had no change in PSS scores; 8 had reductions, ranging from 1-15 points; and 3 experienced an increase in perceived stress at the end of 3 weeks. A decrease in post-test scores of the PSS is determined for members of each intervention group, Table 9.

<table>
<thead>
<tr>
<th>Group</th>
<th>PSS Pre-test</th>
<th>Mean</th>
<th>PSS Post-test Mean</th>
<th>Average Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherent breathing</td>
<td>16.9</td>
<td></td>
<td>9.9</td>
<td>-7.4</td>
</tr>
<tr>
<td>Meditation</td>
<td>18.5</td>
<td></td>
<td>9.5</td>
<td>-8.4</td>
</tr>
<tr>
<td>Reading/control</td>
<td>18.9</td>
<td></td>
<td>16.4</td>
<td>-2.5</td>
</tr>
</tbody>
</table>

Speilberger’s STAI is a 40-item instrument; 20 questions measure state anxiety (how the participant feels and the current time), and 20 questions measure trait anxiety (a measure of how the participant feels generally). Responses range from 1 (“not at all”) to 4 (“very
much”). Scores for each scale range from 20-80. Spielberger (1989) reports the norm for college students’ state anxiety mean score is 35.5, and mean trait anxiety score is 34.8. A score of 48 or higher indicates clinically significant anxiety (Stauder, 2009). The sample mean pre-test score for state anxiety is 38.2, and post-test mean is 30.6. The sample mean pre-test score for trait anxiety is 43.9, and post-test trait anxiety mean is 32.2.

**Table 10.** State Anxiety

<table>
<thead>
<tr>
<th>Group</th>
<th>SA Pre-test</th>
<th>Mean</th>
<th>SA Post-test</th>
<th>Mean</th>
<th>Average Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherent breathing</td>
<td>36.2</td>
<td></td>
<td>25.7</td>
<td></td>
<td>-9.6</td>
</tr>
<tr>
<td>Meditation</td>
<td>38.6</td>
<td></td>
<td>28</td>
<td></td>
<td>-10.6</td>
</tr>
<tr>
<td>Reading/control</td>
<td>45.2</td>
<td></td>
<td>42.1</td>
<td></td>
<td>0.5</td>
</tr>
</tbody>
</table>

The greatest effect reported is in the post-test trait anxiety scores in the members of the coherent breathing group with a mean reduction of -12.4, followed closely by the mean reduction for the meditation group of -11.5 and then by the reading group of -2.8.

**Table 11.** Trait Anxiety

<table>
<thead>
<tr>
<th>Group</th>
<th>TA Pre-test</th>
<th>Mean</th>
<th>TA Post-test</th>
<th>Mean</th>
<th>Average Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherent breathing</td>
<td>41.9</td>
<td></td>
<td>29.4</td>
<td></td>
<td>-12.4</td>
</tr>
<tr>
<td>Meditation</td>
<td>43.8</td>
<td></td>
<td>30.1</td>
<td></td>
<td>-11.5</td>
</tr>
<tr>
<td>Reading/control</td>
<td>46.4</td>
<td></td>
<td>43.5</td>
<td></td>
<td>-2.8</td>
</tr>
</tbody>
</table>

MBS-WBCI is the instrument used as a measurement for perceived holistic wellness. This instrument consists of a total of 44 questions--9 questions relate to physical health and fitness; 20 questions evaluate mental health; and 14 questions assess spirituality. The range
of total scores is from 44-132. The pre-test mean score of this sample is 106, and the post-test mean score is 114.1.

_Table 12._ Holistic Wellness

<table>
<thead>
<tr>
<th>Group</th>
<th>BSM Pre-test Mean</th>
<th>BSM Post-test Mean</th>
<th>Average Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherent breathing</td>
<td>107.1</td>
<td>118</td>
<td>10.9</td>
</tr>
<tr>
<td>Meditation</td>
<td>107.6</td>
<td>116.9</td>
<td>9.4</td>
</tr>
<tr>
<td>Reading/control</td>
<td>103.6</td>
<td>107.4</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Students who participated in the intervention groups reported positive satisfaction as demonstrated by their comments.

Meditation participants’ comments included:

I want to thank you for the amazing experience of meditation. I truly gained a lot. It was like a stressless technique to deal with stress. I almost did nothing and effectively coped with everything. I ascertained the importance of simplicity in life and how such focus can completely change one’s outlook, whether dealing with stress or any other matter. Life is too great to be overwhelmed by stress. This is the way to let go and appreciate life.

I really enjoyed meditation. Allowing my mind to have a set time to wander made me more productive during the rest of the day.

I enjoyed the study and have learned a valuable skill. I think it would be great to have a real place on campus where we could all meditate.

My experience with the meditation practice was positive. I tried to meditate almost everyday. Some days, it was more difficult to meditate. It helped me process thoughts and helped me feel less anxious/stressed/upset (whatever I was feeling pre-meditation). I plan to practice meditation in the future to be more at peace.

Coherent Breathing participants’ comments included:

The experience was extremely enriching and beautiful to me. I learned so much about myself and about others. I feel like a much healthier being, and I am much more aware of my own thoughts and actions. This study has aided me in relieving stress and putting life in perspective, and to live at peace in the present moment.
I found the breathing techniques to be very valuable. They are a way for me to disconnect from the world. I look forward to implementing this type of relaxation into my lifestyle.

Over the course of three weeks my body has never felt more secure and stable. I’ve always been able to control a lot of my life, but the help of coherent breathing really enhanced my ability. I thoroughly enjoyed the experience and practice of breathing to reach a state of calmness. The breathing clears my mind so well. It feels so good.

The experience of coherent breathing over the past few weeks was highly satisfying, stress relieving, and effective. As a busy college student, I found it hard to find even 20 minutes for the breathing, and that 20 minutes made a tremendous difference because of how busy and stressed I am. It clearly affected my physical health/strength and energy as well as my ability to sleep. I enjoyed this study and strongly recommend the practice of coherent breathing to everyone.
Summary

This three week pilot intervention study was conducted with thirty-seven Boston College freshmen and three sophomores. Participants were randomly assigned to three groups: fourteen in the coherent breathing group, fourteen in the meditation group, and twelve in the reading control group. A univariate ANOVA was run on the pre- and post-test change of scores to measure the influence of two interventions—coherent breathing and meditation—on four dependent variables of perceived stress, state anxiety, trait anxiety, and perceived holistic wellness. Data analysis revealed an overall reduction in perceived stress, and trait anxiety scores in all three groups. Both intervention groups reported greater results as compared with the control group for each of the dependant variables. State anxiety scores reduced in both intervention groups as compared to a slight increase in the reading group. Trait anxiety reported the greatest effect in the coherent breathing group. Wellness scores showed greater improvement in both intervention groups as compared to the reading group.
CHAPTER 5

Discussion

The findings generated by the four study instruments in relation to answering the research questions posed by this pilot study, should be confirmed in future research investigations with larger samples. Although no generalizations can be implied due to the sample size, perceived stress, state, and trait anxiety scores were more reduced as compared to the reading/control group and perceived holistic wellness scores increased more in the intervention groups as compared to the reading/control group. This self-selected sample demonstrated lower post-test PSS scores for both intervention groups as compared to the control. Stress management intervention studies previously conducted with this age group have reported higher pre-test PSS scores ranging from 18-29 as compared with the pretest average mean for this sample of 17 (Deckro, 2002; Lane, 2007; Oman, 2008). These studies also reported reductions of post test scores in the range of 5-6 points as compared to an average of 7.9 points experienced by the intervention groups of this sample. This positive finding affirmatively answers research questions.

The mean reduction in state anxiety scores for the meditation group of -10.6 exceeded the other two groups. The coherent breathing group reduced scores by -9.6, and the reading group increased state anxiety by 0.5. Post-test state anxiety scores reduced in both intervention groups. These results show improvement over other published studies with this age group. The range of mean reduction of state anxiety scores reported from other intervention studies using the state version of the STAI with similar pre test mean scores,
range from 4-9 points (Deckro, 2002; Brown, 2004; Lane, 2007). Research questions are answered affirmatively based on these positive findings.

The post-test change of mean scores for the intervention groups for trait anxiety is consistent with the state anxiety score findings. All three groups experienced a reduction of trait anxiety scores over the three weeks duration of the study. The two intervention groups reported reductions of their trait anxiety scores by an average of 11.9 points. The average reduction reported in trait anxiety scores by previously conducted intervention studies with this age group is 5-6 points (Deckro, 2002; Kirby, 2006; Jefferson, 2010). These positive findings support an affirmative answer to the research questions.

The coherent breathing group experienced the greatest results with holistic wellness post-test mean score of 118, representing average increase of 10.9 points. The meditation group post-test mean of 116.9 is close with 9.4 as the average increase. The reading group’s mean score for holistic wellness is 107.4 with an average increase of 3.8. Both intervention groups experienced higher scores as compared to the control. Comparison of these favorable findings was unavailable due to the lack of currently published studies using this instrument, although the 8.5% average mean score increase is clinically significant. This positive outcome does provide an affirmative answer to the following research question: Will reductions in perceived stress and anxiety result in increased perceived holistic wellness?

These preliminary positive findings support the conduction of future research investigations to use the MBS-WCI with larger sample sizes and expanded populations to evaluate statistical significance and confirm replication of these findings.
Early student response to recruitment efforts for study participants was favorable. The initial email announcement distributed approximately two months prior to the study yielded 140 affirmative responses from students who agreed to participate in 2010, Session 1. The study volunteers were sent reminder emails each week for the three weeks prior to the date of the introductory session. Based on my prior experience and knowledge as an advanced practice nurse in a college health setting where I often observed the impulsivity of first year students, I decided to provide a condensed weekend experience that included one introductory session the evening prior to the two-day workshop for instruction of the intervention techniques. Thirty students attended the introductory session, completed pre-survey instruments, and received random assignments to the coherent breathing, meditation, or reading groups. Recruitment for Fall 2011, Session 2 study, included multiple introductory sessions offered throughout the week preceding the weekend 8-hour intervention instruction workshop.

Attrition was another major issue of Session 1. In addition to a disappointing 21% yield of original study volunteers, 11 students dropped out after completing their pre-survey instruments. This represented a slightly greater than 30% attrition rate. Average attrition rates reported for this age group range from 17%-30% (Timmins, 2002; Geick, 2007; Lane, 2007). Five students assigned to the intervention groups neglected to attend the instructional workshop and were lost to follow up. Two members of the reading group never replied to follow-up emails, and three others withdrew, citing they were too busy to participate. Only one student who completed the instruction in the meditation group dropped out during the three-week study and never completed the post-survey instruments. The meditation weekly
follow-up sessions were not as well attended compared to the coherent breathing group. Conflicting commitments made it difficult to establish a mutually agreeable time for all the students in the meditation group to get together weekly. There were no dropouts experienced in the coherent breathing group. Weekly meetings were well attended by members of the coherent breathing group and the reading control group.

Recruitment for Session 2 resulted in a smaller rate of attrition. Sixty students responded to the email invitation distributed approximately one month in advance of the study, with twenty-five attending one of the four introductory sessions. This reflects an approximate 41% yield with only 3 students withdrawing from the study, representing a 12% attrition rate. One student withdrew from each group prior to attending the technique instruction for the intervention groups. One student withdrew from the reading group prior to the first group meeting. Weekly meetings were well attended by the reading group. The meditation and coherent breathing group sessions were sparsely attended, but frequent daily practice was reported through the practice logs of both intervention groups.

Multiple contributing factors may explain the small number of study participants and high attrition rates. The choice of dates for the intervention weekend was primarily determined by the home football game schedule and the availability of the two professors who volunteered to teach the intervention techniques. Offering the Session 2 intervention at an earlier date in the fall semester may explain Improved retention. This may have provided first-year students with the additional incentive of meeting new classmates sooner in their first semester. The use of snowball sampling for recruitment of Session 2 yielded one sophomore.
Many comparable previous studies have investigated the effects of similar mind/body intervention programs scheduled over the course of four to eight weeks (Fontana, 1999; Deckro, 2002; Brown, 2004; Lane, 2007; Oman, 2008). The techniques examined with this sample showed improved measurements in the four variables with only three weeks of daily practice. This finding would be significant to replicate in subsequent research investigations. It may also represent a valuable asset for promoting interest and participation. Achieving potential health benefits from a brief intervention would be desirable for any age group and for college students in particular.

The most unexpected finding was the impact on post test trait anxiety scores, especially in the coherent breathing group. Trait anxiety has varied interpretations, including that of a personality trait or enduring characteristic of a person (Craighead, 2004). According to Speilberger (1989), trait anxiety levels indicate relatively stable individual differences in anxiety-proneness. Trait anxiety reflects the differences in one’s disposition to respond to stressful situations with varying amounts of state anxiety. The higher the trait anxiety score, the more probable the individual will result with higher intensity of state anxiety when facing a perceived threat (Speilberger, 1989).

Individuals with high trait anxiety levels trigger state anxiety elevations more often than those with low trait anxiety. In general, a larger range of situations are perceived as being dangerous or threatening due to high trait anxiety levels. As a result, these individuals are also more likely to experience a higher intensity of state anxiety involving interpersonal relationships with greater threats to self-esteem (Speilberger, 1989). Evaluating the influence of stress management programs on trait anxiety has been avoided in some published studies.
as researchers may have felt that influencing trait anxiety would require a long-term intervention (Fontana, 1999; Brown, 2004). These authors chose to focus only on the impact of state anxiety. The results in the reductions of both state and trait anxiety scores demonstrated in this pilot sample are promising. It provides compelling support for conducting additional research investigations to include measurement of both state and trait anxiety scores to be investigated with short term stress management interventions. Future studies should include longitudinal measures at six months and one year to evaluate potential long-term effects of these interventions.

STAI has been reported to be the most extensively used anxiety measurement tool in psychological research (Jefferson, 2010). Although, the interpretation of trait anxiety measurement has been re-examined by several authors over recent years (Bados, 2010; Arslan, 2009). It was generally accepted that trait anxiety measured long-standing and unchanging personality characteristics. This notion has been challenged through multiple stress-management intervention studies demonstrating post-test reductions in both state and trait anxiety scores (Deckro, 2002; Brown, 2004; Kirby, 2006; Lane, 2006; Arslan, 2009; Stauder, 2009; Jefferson, 2010). A recent factor analysis was conducted on the trait anxiety inventory by authors from the University of Barcelona (Bados, 2010), and their findings were suggestive that in addition to evaluating anxiety, the questionnaire may also evaluate negative affect.

The study had the following limitations. Findings from this pilot study cannot be generalized due to the small sample size and self-selected sample. No African Americans participated in this study, and the sample predominantly consisted of Caucasians and females.
(65% and 70% respectively). Other ethnicities represented included: 10% Hispanic and 25% Asian. Therefore, this pilot study cannot be generalized to other ethnic groups. Study limitations, include a self-selected sample small sample size resulting in reduced statistical power to evaluating precise changes as a result of treatment effects.

**Conclusions and Recommendations**

The negative consequences experienced from excessive stress levels continue to be evident on college campuses. In a survey distributed in 2004 to approximately 50,000 students at 74 campuses in the United States, 32% indicated stress was the most commonly identified impediment to academic performance (Oman, 2008). This perception increased slightly over the next four years. The 2008 NCHA survey reported 34% of students identified stress as the greatest impediment to academics (Association, 2008). Too much stress can have adverse effects on physical, mental, and spiritual health. An important developmental task of college students is to learn how to successfully balance their personal levels of distress with engagement in age-appropriate, healthy, lifestyle activities geared toward academic and personal growth. High levels of distress among college students have been linked with multiple adverse outcomes, including anxiety, depression, suicidal ideation, hopelessness, poor health behaviors, and increases in headaches, sleep disturbances, athletic injuries, and common colds (Oman, 2008).

An article published in the *New York Times* on January 26, 2011, presented results from an annual survey that has been distributed to college freshmen over the past 25 years. In Fall 2010, these students self-reported their levels of emotional health as the lowest on record. They rated themselves 52% above average on emotional health as compared with
64% when the survey was initiated in 1985 (Pryor, 2010). Another somewhat confounding finding was presented in this article. In spite of these lower levels of emotional health, the entering college freshmen in Fall 2010 rated their academic abilities and personal drive higher than previously reported. Approximately 75% consider themselves to be above average in these areas (Lewin, 2011). This represents a significant imbalance and inadequate emotional resources placing these students at risk for negative consequences to cope with their self-reported stress overload.

In 2004, approximately 30% of college freshmen reported frequently being overwhelmed with meeting their obligations compared to 16% in 1985 (Brown, 2004). Nearly 7% of college students report difficulties with anxiety disorders, and another 10% report a diagnosis of depression (ACHA, 2002). The associated symptoms of these mental health conditions are known to impact both life satisfaction and academic performance (Misra, 2000; Trockel, 2000; Brown, 2004; Pryor, 2010). Mental health services have also become important public health issues on college campuses due to the increased incidences of anxiety and depression in recent years. Recently, public appeals have been made by the government and educational agencies for research on prevention and early detection of mental illness. Some researchers postulate that events from periods-of-life transitions can contribute to mental health problems, and college is considered one of these transitional periods (Brown, 2004). The college environment provides an ideal opportunity to address mental health issues in regards to prevention and early interventions for students in their formative years.
The inability to cope with chronic, stressful situations has been linked to negative psychological and physiological consequences. Exposure to stressors, when combined with use of maladaptive coping mechanisms, can lead to depression, anxiety, and sustained elevations in blood pressure and heart rate may contribute to the development of hypertension. Teaching college students to manage stress more effectively may be useful in preventing future problems (Fontana, 1999). Learning to manage some level of stress contributes toward positive psychological development. Resilience is gained by learning to cope with stressors. Participants in a study with college students were instructed on attitudinal measures to influence their appraisal of potentially stressful situations. The use of similar assets may foster resilience by assisting college students in developing effective resources for responding to stressful situations. Assets are internal positive factors such as self-efficacy, coping skills, and competence used for achieving positive outcomes to overcome risk (Fergus, 2005).

Another study conducted with college students investigated the benefits of Stress Inoculation Training (SIT). This concept is based on the perspective of Lazarus’ and Folkman’s (1984) stress and coping theory to learn strategies for appraising and coping with stress. SIT instructs both cognitive and behavioral coping techniques deemed effective in prevention and alleviation of stress-related physical symptoms. Exposure to SIT conveys protection from feeling overwhelmed when confronting stressors, due to a person having a reservoir of effective coping techniques to apply (Fontana, 1999). These tools include relaxation, deep breathing, exercise cognitive restructuring, time management, and problem-
focused coping. Participants rated exercise, deep breathing, and progressive muscular relaxation as being the most effective tools.

Meditation has been linked with improved academic performance, concentration, perceptual sensitivity, reaction, time, memory, self-control, and self-esteem (Oman, 2004). Meditation may lead to neurological changes and foster physiologic health benefits through improved immune function and reduced arousal, measured through blood pressure, heart rate, cortisol, and other neurotransmitters. The practice of meditation has also been reported to reduce anxiety and modify personality characteristics through increased measurement in areas of extraversion, agreeableness, openness to experiences, and emotional stability (Walsh, 2000). It is also postulated that mediation may reduce measures of stress such as anxiety and depression while enhancing life satisfaction, empathy, self-compassion, calm, self-acceptance, and self-actualization (Deckro, 2002; Lane, 2007; Oman, 2008).

Recently, an expert panel from the National Institutes of Health reported compelling evidence for meditation leading to better patient outcome (Lane, 2007; Oman, 2008). Growing evidence suggests that yoga practice provides a relatively low risk, high yield option for improving emotional and physical health. Meditation and yoga practices like coherent breathing can modulate maladaptive sympathetic nervous system arousal (Brown, 2009; Elliot, 2006). The effectiveness of implementing preventative self-regulatory techniques like coherent breathing and meditation in college freshmen based on the results of this pilot study appear favorable and support future research investigations with larger and more diverse samples. Use of the four instruments used in this study should be replicated with larger samples to verify these favorable results. Recruitment for future studies should
include larger samples with adequate representation of ethnic diversity. However, the favorable results experienced by participants in both intervention groups support replicating the study with a larger sample in order to evaluate actual statistical significance and to determine generalizability.

Clinical Implications to be applied from these findings include testing these meditation and breathing techniques with college students who are being treated for anxiety or depression. Various mental health conditions, sleep disturbance, social dysfunction, and psychological distress, have shown reduction of symptoms from the practice of meditation and coherent breathing in particular. They should also be evaluated as interventions for potentially reducing the number of students who engage in unhealthy risk taking behaviors. Health-risk behaviors have been identified as negatively impacting cognitive brain function and may pose long term health consequences (Timmins, 2002). Identifying successful methods for reducing stress is particularly important in educational settings because high-stress levels, sleep disturbances, and alcohol and drug use are commonly reported experiences of college students (Nguyen-Michel, 2006; Travis, 2009). Developing a community of like-minded, health focused students who practice mind/body techniques, may create a supportive environment for reducing unhealthy coping behaviors. Research has shown that social support has a direct positive association with the practice of healthy behaviors (Von Ah, 2004). Stress reduction programs may contribute to a reduction in risk-taking or injuries and, ultimately, contribute to a smoother transition to the college experience.
Meditation and coherent breathing may be easily implemented as treatment modalities in general primary care settings, especially by increasing numbers of practitioners with first-hand knowledge of these types of therapy. These techniques should be taught to health care providers, medical and nursing students, psychologists and social workers. These programs could be replicated on any college campus and expanded to other populations. They may appeal to college students when being promoted as easy to practice, adaptable for daily living and targeted for diverse cultural groups (Oman, 2004). Further investigations should be pursued to identify the mechanisms, sustainability, and generalizability of these techniques with efforts made to expand the availability of offering these valuable skills to the population at large.

The use of self-selected samples creates a serious methodological limitation. In order for these techniques to be accepted as legitimate health care strategies, future research investigations should include well-controlled outcome studies replicating favorable results with true, randomized samples (Astin, 1997). The only means to correct the current voluntary nature of recruiting college students for these types of intervention studies is to establish mandatory life skills programming in the curricula to correct for any bias resulting from a self-selected sample (Deckro, 2002; Oman, 2008; Sidman, 2009). Providing instruction for self-regulatory stress-management techniques on college campuses should be implemented as mandatory college life skills courses or for partial credit toward existing courses (Fontana, 1999). The potential for future investigations with these biobehavioral techniques also presents nurse researchers with an opportunity for the development of interdisciplinary research teams and the potential for measuring physiologic effects with biomarkers.
In this self-selected sample of freshmen and sophomores at Boston College, the effects of two, self-regulatory, stress management techniques--coherent breathing and meditation demonstrated benefits for study participants with reductions in perceived stress, state and trait anxiety scores, and increases in perceived holistic wellness scores as compared with controls. Participant satisfaction was also confirmed. The positive outcomes demonstrated by the data analysis of this pilot sample provided affirmative responses to all of the research questions. Future studies with larger samples should be carried out to confirm these intriguing results.
REFERENCES


Appendix A

Recruitment Materials
Initial invitational Email  (Flyers would also be printed with this information)

Subject line: Opportunity for members of class 2014 only.

Would you like to learn an effective stress management technique to help with the transition to college?

Would you like to meet new friends and learn about the effects of stress?

Have you ever wanted to learn about meditation or coherent breathing?

Have you ever thought about participating in a research study?

Interested students are being recruited to participate in a research study to evaluate the effectiveness of meditation and a yoga breathing technique called “coherent breathing” as stress management for the members of the class of 2014.

**Limited space is available only 210 students will be recruited for the study.**

You are eligible to participate if you do not have a history of the following conditions.

- **Exclusion Criteria:** Students with prior history of regular practice of either meditation or coherent breathing and certain health conditions requiring daily medication will be excluded from participating in the study. In addition, previous diagnosis and treatment of anxiety, bipolar disorder, obsessive compulsive disorder (OCD), or schizophrenia are also excluded from participation. Students taking any medications on the following list will also be excluded from the study:
  - Adderal, Stratera, Vivanse, Ritalin, or any other prescription for treatment of Attention Deficit Disorder
  - Ativan, Xanax, or any other medication prescribed for anxiety disorder
  - Cymbalta, Effexor, Paxil, Prozac, Lexapro, Zoloft, or any other medication prescribed for the treatment of depression.
  - Dilantin, Depakote, or any other medication prescribed for seizure disorder.
  - You were selected as a possible participant because you are 18 yrs of age, and a member of the Class of 2014, have no prior history of regular meditation or coherent breathing, and do not meet any of the exclusion criteria.

**You will receive $25 upon completion of the study.**

If you are at least 18 year of age and interested or would like more information, please reply to this message.

Thank you.
Appendix B

Instruments
Self-Assessment Questionnaire

Participant number ____________________ Date ___________

Sex ______ Email address ____________________________ Age ______ Major _______________

Use the following scale to rank items below.

Scale: 0 never 1 seldom 2 sometimes 3 frequently 4 very frequently

Ethnicity: African American________

Asian________

Caucasian________

Hispanic________

Mixed Race________

Think of the past month in making your decision.

Example: ate hot dogs................. 2 (means frequently)

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>meditated</td>
<td>no/wk</td>
<td>( )</td>
</tr>
<tr>
<td>had headaches</td>
<td>no/wk</td>
<td>( )</td>
</tr>
<tr>
<td>smoked cig's</td>
<td>no/cig/day</td>
<td>( )</td>
</tr>
<tr>
<td>late for classes</td>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>ate junk food</td>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>drank soda</td>
<td>no/day</td>
<td>( )</td>
</tr>
<tr>
<td>drank coffee</td>
<td>no/day</td>
<td>( )</td>
</tr>
<tr>
<td>exercised</td>
<td>no/wk</td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>no/min/day</td>
<td>( )</td>
</tr>
<tr>
<td>trouble getting to sleep</td>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>trouble staying asleep</td>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>felt blue</td>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>studied</td>
<td>no/hr/day</td>
<td>( )</td>
</tr>
</tbody>
</table>

Form JT20606

Boston College IRB
Approved
JUL 19 2010

Thru: ___/___/___
**Perceived Stress Scale**

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

- **0 = Never**
- **1 = Almost Never**
- **2 = Sometimes**
- **3 = Fairly Often**
- **4 = Very Often**

1. In the last month, how often have you been upset because of something that happened unexpectedly? ........................................ 0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life? ................................................................. 0 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"? .......... 0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems? .............................................................. 0 1 2 3 4

5. In the last month, how often have you felt that things were going your way? ................................................................. 0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do? .............................................................. 0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life? ................................................................. 0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things? 0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control? .............................................................. 0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? ........................................ 0 1 2 3 4

Please feel free to use the *Perceived Stress Scale* for your research.

**Mind Garden, Inc.**
1650 Woodside Road, Suite #202
Redwood City, CA 94061 USA
Phone: (650) 261-3500  Fax: (650) 261-3505
E-mail: mindgarden@msn.com
www.mindgarden.com

**References**
SELF-EVALUATION QUESTIONNAIRE STAI Form Y-1

Please provide the following information:

Name __________________________ Date __________ S____

Age ______________ Gender (Circle) M F T____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. 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.

1. I feel calm ......................................................... 1 2 3 4
2. I feel secure ..................................................... 1 2 3 4
3. I am tense ......................................................... 1 2 3 4
4. I feel strained .................................................. 1 2 3 4
5. I feel at ease .................................................... 1 2 3 4
6. I feel upset ........................................................ 1 2 3 4
7. I am presently worrying over possible misfortunes .......... 1 2 3 4
8. I feel satisfied ................................................... 1 2 3 4
9. I feel frightened .................................................. 1 2 3 4
10. I feel comfortable .............................................. 1 2 3 4
11. I feel self-confident .......................................... 1 2 3 4
12. I feel nervous .................................................. 1 2 3 4
13. I am jittery ..................................................... 1 2 3 4
14. I feel indecisive ................................................ 1 2 3 4
15. I am relaxed .................................................... 1 2 3 4
16. I feel content ................................................... 1 2 3 4
17. I am worried .................................................... 1 2 3 4
18. I feel confused .................................................. 1 2 3 4
19. I feel steady .................................................... 1 2 3 4
20. I feel pleasant .................................................. 1 2 3 4

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# SELF-EVALUATION QUESTIONNAIRE

**STAI Form Y-2**

**DIRECTIONS**

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. I feel pleasant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. I feel nervous and restless</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. I feel satisfied with myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. I wish I could be as happy as others seem to be</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. I feel like a failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. I feel rested</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. I am &quot;calm, cool, and collected&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. I feel that difficulties are piling up so that I cannot overcome them</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. I worry too much over something that really doesn’t matter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. I am happy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. I have disturbing thoughts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. I lack self-confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. I feel secure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. I make decisions easily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. I feel inadequate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. I am content</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Some unimportant thought runs through my mind and bothers me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. I take disappointments so keenly that I can’t put them out of my mind</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. I am a steady person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. I get in a state of tension or turmoil as I think over my recent concerns and interests</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Body-Mind-Spirit Wellness Behavior and Characteristic Inventory (BMS-WBCI)

**Instructions:** Participants should complete the BMS-WBCI by circling the number in the box next to the statement that describes the frequency they participate in positive health behaviors and agreement with characteristics that contribute to their overall well-being in the areas of body, mind, and spirit. Participants should circle only one number per statement. The number choices correspond to the following responses. The 1 represents the frequency choice of rarely/ seldom, the 2 represents the frequency choice of occasionally/sometimes, and the 3 represents the frequency choice of often/always.

<table>
<thead>
<tr>
<th>1. Rarely/seldom</th>
<th>2. Occasionally/sometimes</th>
<th>3. Often/always</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I limit risky behaviors (e.g., drive fast, binge drinking, overeating, etc.).</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>2. I maintain my fitness by exercising regularly and maintaining my weight.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>3. I have a reasonable amount of flexibility and do exercises to help maintain my</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>range of motion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I use warm-up activities before exercising to help prevent injuries.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>5. I eat a variety of foods and get the recommended number of servings from each food group.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>6. I eat a balanced diet low in saturated fat and cholesterol.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>7. I participate in recreational sports or activities that help maintain my fitness.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>8. I drink at least eight glasses of water a day.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>9. I surround myself with physically healthy people.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td><strong>Mind</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I learn from my past life experiences.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>11. I am open to new ideas.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>12. I learn from my mistakes and try to behave differently the next time.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>13. I talk with people rather than talk at people.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>14. I accept responsibility for my actions.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>15. I understand and accept the existence of cultural diversity and its contribution to the quality of living.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>16. I make good ethical decisions.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>17. I consider alternatives before making decisions.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>18. I focus on reality.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>19. I am flexible to changes and can maintain stability in my life in healthy ways.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>20. I have strong morals and healthy values.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>21. I learn from the mistakes of others.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>22. I have satisfying interpersonal relationships.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>23. I feel loved and supported by family and friends.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>24. I am tolerant of others whether or not I approve of their behavior or beliefs.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>25. I set achievable goals for myself.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>26. I handle various social settings well.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>27. I analyze my thoughts (I think, question, and evaluate) before I act.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>28. I make the best of bad situations.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>29. I express my feelings with others and consider their feelings.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td><strong>Spirit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. I experience harmony within.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>31. I experience peace of mind.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>32. I am in touch with the soul within.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>33. I experience happiness within.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>34. I experience joy within.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>35. I experience self-satisfaction.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>36. I express my spirituality appropriately and in healthy ways.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>37. My spirituality helps me remain calm and strong and helps me to better deal with difficult times.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>38. I recognize the positive contribution faith can make to the quality of my life.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>39. I intentionally undertake new experiences to enhance my spiritual health.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>40. I have a positive outlook on life.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>41. I am content with who I am.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>42. I have my purpose in life.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>43. I read some form of spiritual literature on a regular basis.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>44. I experience love of others and myself.</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

**NOTE:** The BMS-WBCI is copyrighted by W. T. Hey & K. S. Caldwell.

---

Boston College IRB
Approved July 19, 2010

Thurs., Nov. 18, 2010
Meditation Daily Practice Log

Participant number ______

Please indicate the frequency of your daily practice by placing a check mark under the day of the week you were able to practice the meditation technique.

**Week One**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Total days for week one____

**Week Two**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Total days for week two____

**Week Three**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Total Days for week three____

---

Coherent Breathing Daily Practice Log

Participant number ______

Please indicate the frequency of your daily practice by placing a check mark under the day of the week you were able to practice the meditation technique.

**Week One**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total days for week one____

**Week Two**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total days for week two____

**Week Three**

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Total Days for week three____
Appendix C

IRB Notices of Approval and Consent Form
IRB Protocol Number: 11.023.01

DATE: July 19, 2010
TO: Nancy Baker
CC: Patricia Tabloski
FROM: Institutional Review Board – Office for Research Protections
RE: Does Daily Practice of Meditation or Coherent Breathing Influence Perceived Stress, Stress Effects, Anxiety or Perceived Holistic Wellness in College Freshmen?

Notice of IRB Review and Approval
Expeditied Review as per Title 45 CFR Part 46.110, FR 60366, FR, # 7

The project identified above has been reviewed by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;
4. You will immediately request approval from the IRB of any proposed changes in your research, and you will not initiate any changes until they have been reviewed and approved by the IRB;
5. You will only use the informed consent documents that have the IRB approval dates stamped on them (approved copies enclosed).
6. You will give each research subject a copy of the informed consent document;
7. You may enroll up to 210 participants.

8. If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the IRB approval expiration date. Without continuing approval the Protocol will automatically expire on July 18, 2011.

Additional Conditions: Any research personnel that have not completed an acceptable education/training program should be removed from the project until they have completed the training. When they have completed the training, you must submit a Protocol Revision and Amendment Form to add their names to the protocol, along with a copy of their education/training certificate.

Approval Period: July 19, 2010-July 18, 2011.

Boston College and the Office for Research Protections appreciate your efforts to conduct research in compliance with Boston College Policy and the federal regulations that have been established to ensure the protection of human subjects in research. Thank you for your cooperation and patience with the IRB process.

Sincerely,

Stephen Erickson
Director
Office for Research Protections

TSL
IRB Protocol Number: 11.023.02A

DATE: May 18, 2011

TO: Nancy Baker

CC: Patricia Tabloski

FROM: Office for Research Protections

RE: Does Daily Practice of Meditation or Coherent Breathing Influence Perceived Stress, Stress Effects, Anxiety or Perceived Holistic Wellness in College Freshmen?

Notice of IRB Review and Approval-Continuing Review
Expeditied Review as per Title 45 CFR Part 46.110, FR 60366, FR, # 7

The project identified above has been reviewed by the Boston College Institutional Review Board (IRB) for the Protection of Human Subjects in Research using an expedited review procedure. This is a minimal risk study. This approval is based on the assumption that the materials, including changes/clarifications that you submitted to the IRB contain a complete and accurate description of all the ways in which human subjects are involved in your research.

This approval is given with the following standard conditions:

1. You are approved to conduct this research only during the period of approval cited below;
2. You will conduct the research according to the plans and protocol submitted (approved copy enclosed);
3. You will immediately inform the Office for Research Protections (ORP) of any injuries or adverse research events involving subjects;
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5. You will only use the informed consent documents that have the IRB approval dates stamped on them (approved copies enclosed);
6. You will give each research subject a copy of the informed consent document;
7. You may enroll up to 210 participants.

8. If your research is anticipated to continue beyond the IRB approval dates, you must submit a Continuing Review Request to the IRB approximately 60 days prior to the IRB approval expiration date. Without continuing approval the Protocol will automatically expire on May 17, 2012.

Additional Conditions: Any research personnel that have not completed an acceptable education/training program should be removed from the project until they have completed the training. When they have completed the training, you must submit a Protocol Revision and Amendment Form to add their names to the protocol, along with a copy of their education/training certificate.

Approval Period: May 18, 2011 - May 17, 2012

Boston College and the Office for Research Protections appreciate your efforts to conduct research in compliance with Boston College Policy and the federal regulations that have been established to ensure the protection of human subjects in research. Thank you for your cooperation and patience with the IRB process.

Sincerely,

Stephen Erickson
Interim Director
Office for Research Protections

TSL
Boston College Consent Form

Boston College William F. Connell School of Nursing
Informed Consent for Participation as a Subject in a Stress Management Intervention Study for
Members of the Classes of 2014 and 2015
Investigator: Nancy C. Baker PhD (c), ANP-BC
Adult Consent Form

Introduction
• You are invited to participate in a research study that is offered to the members of Boston College Classes of 2014 and 2015. It is important that you read and understand several general points that apply to everyone who takes part in this study. Your participation is completely voluntary and withdrawal from the study is possible at anytime without risk of any penalty. You were selected as a possible participant because you are 18 yrs of age, and a member of the Class of 2014 or 2015, have no prior history of regular meditation or coherent breathing, and do not meet any of the exclusion criteria.

Purpose of Study:
• The purpose of this study is to evaluate the effectiveness of meditation and coherent breathing as stress management techniques for members of the Boston College class of 2014 and 2015.
• The total number of subjects is expected to be 210.
• The principal investigator and other members of the research team have no significant financial interest in the either of the stress management techniques offered in this study.

• Exclusion Criteria: You may not participate if you have a prior history of regular practice of either meditation or coherent breathing and certain health conditions requiring daily medication will be excluded from participating in the study. In addition, previous diagnosis and treatment of anxiety, bipolar disorder, obsessive compulsive disorder (OCD), or schizophrenia are also excluded from participation. Students taking any medications on the following list may not participate in the study:
  • Adderal, Strattera, Vivanza, Ritalin, or any other prescription for treatment of Attention Deficit Disorder
  • Ativan, Xanax, or any other medication prescribed for anxiety disorder
  • Cymbalta, Effexor, Paxil, Prozac, Lexapro, Zoloft, or any other medication prescribed for the treatment of depression.
  • Dilantin, Depakote, or any other medication prescribed for seizure disorder.

Description of the Study Procedures: If you decide to participate in this study, you will attend an introductory meeting and be randomly assigned, (like flipping of a coin) to one of three groups, the meditation group, the coherent breathing group or the focused reading group. Each group will consist of 70 members, 35 males and 35 females. All study participants will attend an introductory meeting to sign an informed consent, complete pre study questionnaires and be randomly assigned to your study group. As the study is confidential all participants will be assigned a participant number to be used instead of your name for completing all study questionnaires and forms. All follow up meetings will be scheduled in the evening to prevent conflicts with class schedules.

The meditation and coherent breathing group participants will attend an 8 hour weekend workshop, over 2 days, to learn the stress management technique appropriate to the group to which you have been assigned. The weekend workshop has been scheduled on a weekend without a home football game in October. Participants will agree to practice their technique daily for 21 days. These stress management techniques

4/13/10

Subject’s Initials

102
will take between 10-20 minutes and can be done at a time convenient for you. You will be required to attend two weekly, one hour follow up meetings to discuss your experiences and a final large group session to complete the post study questionnaires. Participants will be contacted by email weekly to remind you to practice your technique daily and record the daily practice on your log sheet. These logs will be collected at the final large group session. You will complete pre study questionnaires at the introductory meeting and post study questionnaires at the final large group session to measure stress, anxiety, and the effects on your health. The total time involved for completing all the survey instruments is approximately 30 minutes.

The focused reading group will not be required to attend a weekend workshop. The reading group will complete the pre study questionnaire at the introductory meeting and the post study questionnaire at the final large group session. You will read a short book titled *The Autobiography of St Ignatius Loyola* and meet once each week in the evening, to discuss assigned readings. At the completion of the study, if you wish to learn either the meditation or coherent breathing stress management techniques you will have an opportunity to receive instruction of either technique at the completion of the study.

**Risks/Discomforts of Being in the Study:**
There are no reasonable foreseeable risks from participating in this study. However, the study may include risks that are unknown at this time. If you do experience increased anxiety or any other type of discomfort at any time during the study, you have 24 hour access to consult the principal investigator or the University Psychologist on call at 617 552 3227.

**Benefits of Being in the Study:**
This study is designed for the researcher to learn more about effective stress management techniques. This study is not designed to treat any illness or improve your health. You may experience beneficial effects from study participation on your physical and psychological well-being. If these study techniques work effectively for you, you will be able to continue these practices to help manage your stress.

**Payments:**
- All participants who complete the study will receive a $25 stipend at the final large group session.
  You will not be compensated if you do not complete the study.

**Costs:**
- There is no cost to you to participate in this research study.

**Confidentiality:**
- The records of this study will be kept confidential. In any sort of report we may publish, we will not include any information that will make it possible to identify a participant. Research records will be kept in a locked file.
- All electronic information will be coded and secured using a password protected file.
- Access to the records will be limited to the researchers; however, please note that regulatory agencies, and the Institutional Review Board and internal Boston College auditors may review the research records.

**Voluntary Participation/Withdrawal:**
- Your participation is voluntary. If you choose not to participate, it will not affect your current or future relations with the University.
- You are free to withdraw at any time, for whatever reason.
- There is no penalty or loss of benefits for not taking part or for stopping your participation. It will not jeopardize any of your relationships with faculty, staff or access to services on campus including services received at University Health Services.
- You will be provided with any significant new findings that develop during the course of the research that may make you decide that you want to stop participating.

Subject's Initials ___
Dismissal From the Study:
• The investigator may withdraw you from the study at any time for the following reasons: withdrawal is in your best interests (e.g. side effects or distress have resulted, or you have failed to comply with the study requirements.

Compensation for Injury:
• If you experience an emergency medical problem or injury as a direct result of your participation in this research, you will receive care from university health services, these services are covered by tuition fees. Decisions regarding care and compensation for any other research related injury will be made on a case-by-case basis.

Contacts and Questions:
• The researcher conducting this study is Nancy C. Baker PhD, ANP-BC. For questions or more information concerning this research you may contact her at 617 552 2226 or bakerc@bc.edu.
• If you believe you may have suffered a research related injury, contact Nancy C. Baker at 617 459 8021 who will give you further instructions.
• If you have any questions about your rights as a research subject, you may contact: Director, Office for Research Protections, Boston College at (617) 552-4778, or irb@bc.edu

Copy of Consent Form:
• You will be given a copy of this form to keep for your records and future reference.

Statement of Consent
• I have read the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study. I have received a copy of this form.

Signatures/Dates

Study Participant (Print Name): ______________________________

Participant Signature: ____________________________ Date _____

4/13/10 Subject's Initials __
Appendix D

Permissions for instruments
Nancy Baker

From: info@mindgarden.com
Sent: Wednesday, June 01, 2011 5:37 PM
To: Nancy Baker
Subject: Response from Mind Garden - Order 13829 - STAI license extension

Hello Nancy Baker

In response to your May 31, 2011 email request to extend the expiration date on the 150 STAIAD licenses that you purchased via Order 13829 on October 5, 2010, this email provides the extension for these licenses to June 1, 2012.

Best regards,
Chris
Mind Garden, Inc.

Quoting Nancy Baker <nancy.baker@bc.edu>:

> To Whom It May Concern,
> I am requesting an extension on the expiration date for use of the
> STAI instrument.
> I will be continuing recruitment efforts this fall due to a
> disappointing initial sample last fall of 30.
> The study I am conducting is my doctoral dissertation.
> Please let me know if you need any additional data to grant this request.
> Sincerely,
> Nancy
> Nancy C. Baker PhD(c), ANP-BC
> Boston College Health Services
> Cushing Hall 106
> Chestnut Hill, MA 02467
> phone 617 552 3226
> Fax 617 552 1671
> [cid:image001.gif@01CC1F7F.E4F9DE30]
> From: info@mindgarden.com [mailto:info@mindgarden.com]
> Sent: Tuesday, October 05, 2010 3:08 PM
> To: Nancy Baker
> Cc: info@mindgarden.com; bobnast@msn.com; mindgardeninfo@gmail.com;
> ken@mindgarden.com
> Subject: Mind Garden: Sales Receipt for Order 13829
> The following order was placed with Mind Garden, Inc. Your order
> contains at least one paper product. You will be notified via email
> when we ship that part of your order.
> We appreciate your business. If you have any questions about your
> order please contact us by either replying to this e-mail or calling
> our office at 1-650-322-6300.
Title: Use of Body-Mind-Spirit Dimensions for the Development of a Wellness Behavior and Characteristic Inventory for College Students

Author: William T. Hey, Kristine S. Calderon, Holly Carroll

Publication: Health Promotion Practice

Publisher: Sage Publications

Date: 01/01/2006

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