

2015

# Exploring Yoga as a Holistic Lifestyle for Sustainable Human and Environmental Health

Julia A. Leischner  
*Walden University*

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# Walden University

College of Health Sciences

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Julia Leischner

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Walden University  
2015

Abstract

Exploring Yoga as a Holistic Lifestyle for Sustainable Human and Environmental Health

by

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MA, University of Illinois at Springfield, 2001

BS, Middle Tennessee State University, 1994

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health Epidemiology

Walden University

February 2015

## Abstract

Improved health indicators, mental and physical health outcomes, and sustainable lifestyle practices have been found among yoga practitioners. The purpose of this study was to examine the impact of mixed styles of yoga practice on the health and behaviors of yoga practitioners. The relationship between yoga and body mass index (BMI), self-reported disease diagnosis, participation in other types of physical activity, adoption of healthy and sustainable lifestyle and dietary behaviors, perceived improvements in medical conditions that yoga was used to treat, quality of life resulting from yoga practice, and the reasons for beginning and continuing yoga were observed and tested in this study. Participants ( $N = 383$ ) were adult yoga practitioners who were recruited using systematic sampling in Facebook social media. Data were analyzed using multiple linear regression, ANOVA, McNemar Chi square, and Spearman's correlation. Mean BMI for all yoga styles were in the normal range; however, ashtanga yoga was a significant predictor of low BMI. Self-reported disease diagnosis was significantly lower after beginning yoga practice. The majority of participants also engaged in other types of physical activity and adopted many healthy lifestyle practices. However, general/hatha and other styles of yoga were associated with adopting a greater number of other physical activities and general/hatha, ashtanga, and yoga therapy styles were associated with adopting a greater number of healthy and sustainable lifestyle and dietary behaviors. Medical conditions that yoga was used to treat and quality of life were perceived to be improved as a result of yoga practice. Results of this study confirm previous research findings that demonstrate numerous positive health outcomes from yoga practice.

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## Dedication

I would like to dedicate this work to all yoga practitioners, past and present, who have transformed their lives through yoga and experienced the inner peace, unity, and balance of body, mind, and spirit that can result from regular adherence and practice of this ancient holistic healing modality.

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## Chapter 1: Introduction to the Study

Yoga is an ancient physical and spiritual practice that originated in India and has been practiced for more than 5,000 years as a pathway to achieve spiritual enlightenment and union of the mind, body, and spirit (Birdee et al., 2008; Iyengar, 1976). The mind-body practice of yoga has made great gains in popularity in the Western world, especially the United States (Kappmeier & Ambrosini, 2006). The purpose of this study was to examine the impact of mixed styles of yoga practice on the health and behaviors of yoga practitioners. Depending on the type and depth of yoga practice, practitioners may adopt a wide variety of practices and behaviors based upon yoga philosophies that elicit a positive impact on health. Yoga is a holistic practice that may provide a natural and sustainable solution to the treatment and prevention of chronic diseases and medical conditions and also a lifestyle that promotes environmental sustainability (Marlow et al., 2009; National Center for Complementary and Alternative Medicine, 2012).

This study was conducted to identify potential solutions to the unsustainable Western medical practices that have been unable to successfully treat and reduce morbidity and mortality from chronic diseases in the United States. Not only are the medical treatments unsustainable, but the dietary practices, such as convenience and processed foods, which have evolved in the western world, are also unsustainable because they are contributing to the increased prevalence of chronic diseases (Horrigan, Lawrence, & Walker, 2002). Increased use of pesticides and preservatives and consumption of meat and processed food high in saturated and trans fats, refined sugar,

and salt result in diets that are low in micronutrients and promote chronic disease development and obesity. These factors also contribute to environmental pollution, environmental degradation, and increased consumption of natural resources and energy (Horrigan et al., 2002). Due to the inextricable connection between human and environmental health, solutions to these issues must be addressed in unison.

Potential positive social change implications from this study are two-fold if results of the study support the hypotheses. The first social change recommendation is the incorporation of yoga education and practice into public health initiatives as a preventative measure for chronic disease and promotion of healthy and sustainable dietary practices. The second is increased integration of yoga practice into Western medicine as an alternative treatment for symptoms and management of chronic disease for medical system sustainability. Integration of yoga into prevention and treatment of chronic diseases has the potential capacity to alleviate symptoms of medical conditions, reduce the need for prescription drug treatments and their potential side effects, reduce medical costs, decrease morbidity and mortality, improve quality of life, and promote environmental sustainability.

Major sections of this chapter include defining and providing the background of the yoga philosophy and practice, the public health problem, the purpose and nature of the study, definition of the research questions and hypotheses, selection of the theoretical base used to examine the variables of the study, definition of terms, major assumptions, limitations, and delimitations of the study, and lastly the significance of the study.

## **Background**

Yoga is a branch of an ancient natural healing medical practice called Ayurveda (Iyengar, 1976). While there are many types of yoga, the most common type of yoga practiced in the United States is hatha yoga (NCCAM, 2012). Through a variety of practices and philosophical teachings hatha yoga brings forth a union and balance of the mind, the body, behavior, and the environment (Sharma, Chandola, Singh, & Basisht, 2007). Within hatha yoga there are numerous styles that are practiced such as Iyengar, Ashtanga, Kundalini, Bikram, Vinyasa, Sivananda, Jivamukti, and classical eclectic yoga (Kappmeier & Ambrosini, 2006). Each style of yoga adheres to various philosophies and has varying practice techniques (Kappmeier & Ambrosini, 2006). Ancient yoga philosophy includes morals and ethics that are derived from ancient texts called the Yoga Sutras (Dykema, 2011). Yoga morals and ethics include yamas, or restraints, and niyamas, or disciplines (Dykema, 2011). Yama restraints include nonviolence, truthfulness, nonstealing, continence, and greedlessness (Dykema, 2011). Niyama disciplines include purification, contentment, austerity, self-study, and devotion to the Lord (Dykema, 2011). The adoption of modern Western yoga practice in the U.S. may include a variety of yogic philosophies that incorporate many or most of the eight limbs of yoga depending on the type of yoga practiced (Kappmeier & Ambrosini, 2006). The eight limbs of yoga include (a) yama (universal moral commandments), (b) niyama (self-purification by discipline), (c) asanas (body postures), (d) pranayama (breath control), (e)

pratyahara (withdrawal of the senses),(f) dharana (concentration and cultivating inner awareness),(g) dhyana (devotion and meditation on the Divine), and(h) samadhi (union with the Divine; Dykema, 2011; Iyengar, 1976).

In general, hatha yoga philosophy and lifestyle embodies a life lived in balance, avoidance of stimulants and depressants, connectedness to a higher power, reverence to all living things, regular practice of physical practice of postures (asana) to strengthen the body and promote energy flow, breathing techniques (pranayama), detachment to bring mindfulness and reduce stress, and a balanced vegetarian diet to nourish the body (Dykema, 2011). Yoga practitioners have shown improvements in health status and use yoga to prevent and/or treat diseases and health conditions (Birdee et al., 2008; Iyengar, 1976). Therefore, yoga is an alternative lifestyle worth examining as a solution to promote healthier behaviors and mitigate chronic disease development.

Many research studies have been conducted to examine the positive health outcomes that result from yoga practice. Research studies have shown that yoga can decrease stress and anxiety, increase antioxidant status, and improve overall well-being (Agte & Chiplonkar, 2008). Yoga has also been shown to reduce stress-related disorders such as asthma, high blood pressure, heart disease, high cholesterol, irritable bowel syndrome, cancer, insomnia, anxiety, and depression and also improve psychological disorders such as anorexia, guilt, and anxiety (Brown & Gerbarg, 2009). These improved health outcomes may explain why yoga is the sixth most common form of complementary and alternative practice used by adults (NCCAM, 2012). The majority

of the research studies that have been conducted on yoga have provided evidence for positive health impacts of yoga in short term interventions. Cross sectional research has been conducted frequently on participants in the United States, who practice Iyengar style yoga and have correlated practice with improved health outcomes (Ross et al., 2013). In Australia, a national cross sectional study was conducted that examined components of varying styles of yoga practice and health outcomes (Penman, Cohen, Stevens, & Jackson, 2012).

The gap in knowledge in this area that has been identified is that there are no cross-sectional studies in the U.S. that examine correlations between disease prevention and health promotion among yoga practitioners of varying styles of yoga practice and the influence of yoga on dietary and other behavioral choices. A review of studies that compared the effects of yoga and exercise on a variety of health outcomes and health conditions only identified one research study that was conducted on mixed styles of yoga practice that examined only the impact of heart rate on practitioners (Ross & Thomas, 2010). Research interventions examining yoga often focus on incorporating the following aspects: asana and relaxation, pranayama, and meditation, which are components of three of the eight limbs of yoga (Ross & Thomas, 2010). Deeper practices incorporate more of the eight limbs of philosophical teachings such as adoption of a pure sattvic diet that includes being vegan or vegetarian, consumption of organic foods, and preference of unprocessed and natural foods, foods that are low in refined

sugar and saturated fats, as well as avoiding alcohol, tobacco, and caffeine (Iyengar, 1976).

This study was needed to examine health outcomes in yoga practitioners because yoga philosophy and practice has the potential to be one of the most effective alternative and sustainable lifestyles and preventative medicines to promote health, ease symptoms of disease naturally without drug side effects, and prevent disease through practice and the adoption of other healthier behaviors. Yoga can be adapted and performed by people of all ages and fitness levels to improve health and longevity. This study may help identify what dietary and other health promoting practices are adopted due to the influence of practice yoga and which practice components and styles of yoga are correlated with improved health, the effect yoga has on quality of life, reduced symptoms of medical conditions, and whether yoga has an impact on reducing the development of chronic disease and promoting environmental sustainability.

### **Problem Statement**

Despite all of the medical advances that have been made and are available in the richest country in the world, chronic diseases such as heart disease, stroke, cancer, diabetes, and arthritis are the greatest cause of morbidity and mortality in the United States. (Centers for Disease Control and Prevention [CDC], 2012). Seven of every 10 deaths in the United States are due to chronic diseases and more than half of these deaths are due to cardiovascular disease, stroke, and cancer (CDC, 2012). Nearly half of adults are diagnosed with at least one chronic disease (CDC, 2012). The majority of these

chronic diseases are attributed to behaviors and therefore preventable through healthy lifestyle behaviors such as regular physical activity, management of stress, proper nutrition, smoking cessation, and moderate alcohol consumption (CDC, 2012). The Healthy People initiative, including the most recent in 2020, for decades has aimed to reduce morbidity and mortality from chronic diseases through increasing physical activity and good nutrition and promoting healthy body weight (Healthy People 2020, 2013).

Dietary and behavioral choices directly impact human health but also indirectly negatively impact the environment (Horrigan et al., 2002). According to O’Kane (2012), “the current, globalized food system supplies 'cheap' food to a large proportion of the world's population, but with significant social, environmental and health costs that are poorly understood” (p. 268). Current food production and agricultural practices use fuel, water, and topsoil at unsustainable rates (Horrigan et al., 2002). Mass production of meat from large factory farms uses large quantities of grain, which could be fed to humans, and generates large amounts of waste and uses antibiotics that promote antibiotic resistance in humans (Horrigan et al. , 2002). High consumption of animal meat and fat has been correlated with the development of many chronic diseases such as cancer and cardiovascular disease (Horrigan et al., 2002). Agricultural pesticides have been associated with cancer development and endocrine disruption in consumers and workers (Horrigan et al., 2002). These current traditional food production practices are not sustainable (Horrigan et al., 2002). In fact, due to the inextricable link between human

health and the environment, Fowler and Hobbs (2003) concluded that humanity is simply not sustainable (as cited in Marlow et al., 2009).

Western medicine has attempted to treat and moderate of symptoms of chronic disease through the development of new pharmaceutical drugs and surgeries (Verkerk, 2009). With these developments Western culture has failed to use a holistic approach that recognizes of the mind-body-spirit connection (Verkerk, 2009). For thousands of years civilizations healed through dietary changes, plant products, and physical and spiritual practices to bring balance (Verkerk, 2009). Currently, when individuals in Western culture want to feel better physically and emotionally or treat or heal diseases, the medical system prescribes medication or surgery, rather than identifying the source of the ailment or imbalance or making dietary and behavioral changes to improve health (Verkerk, 2009). According to the most recent study data for 2007-2008, prescription drug use continues to increase (Gu, Dillon, & Burt, 2010). As a result, adverse drug reactions are the fourth leading cause of death and rates of medical and surgical infections and injuries continue to increase; therefore, the current state of medical treatment is not sustainable (Verkerk, 2009). Integration of mind-body-spirit practices, such as yoga, into Western medicine may hold the key to sustainable health care (Verkerk, 2009).

This study fills a gap in the literature by examining mixed yoga practice styles and how yoga philosophy and practice influence health behaviors and promote improved health in yoga practitioners. By identifying the yoga practices that are associated with

improved health outcomes and potential sustainable behaviors, I hope to guide further research and also provide recommendations for the types of yoga practices that should be integrated in health promotion and disease prevention and treatment initiatives and for sustainable environmental and human health.

### **Purpose of the Study**

Yoga philosophy and practice has the potential to be one of the most effective alternative sustainable lifestyles that can be performed by people of all ages and fitness levels to prevent disease, improve disease symptoms, and promote health, longevity, and environmental sustainability. The purpose of this study was to investigate the health indicators, attitudes, beliefs, and behavior practices of mixed styles of yoga practitioners to measure associations between these and sustainable environmental and health outcomes. Participants who practice yoga regularly typically have normal weight and body mass index (BMI; Kristal, Littman, Benitez, & White, 2005). Bijlani et al. (2005) found that in as few as 10 days, participants showed reductions in low density lipoprotein (LDL) cholesterol and increased high density lipoprotein (HDL) cholesterol while Sinha, Singh, Monga, and Ray (2007) found improved antioxidant status in those who practiced yoga. Evidence from these two studies alone show that yoga has the potential to reduce risk factors for the two leading causes of death: cardiovascular disease and cancer. It has been found that increased frequency of Iyengar yoga practice promotes health and regular home yoga practice was a more significant predictor of health than years of practice or frequency (Ross & Thomas, 2010; Ross et al., 2012).

Practical contributions of this study to scientific research include the potential to provide data from those who regularly practice mixed styles of yoga in the United States. Outside of interventions to compare with positive health impacts that have been reported in previous yoga research interventions of short term duration, cross sectional studies of Iyengar yoga participants, and the research performed in Australia. The outcomes of this study may be important for health care providers, public health, individuals, and society at large as it may provide a look at the benefits of yoga practice and the philosophies that may be suggested to be incorporated into cultural practices for optimum health outcomes in the treatment and prevention of disease, sustainable health promotion, and dietary and behavioral practices that also promote environmental sustainability.

Several gaps have been identified in the literature that can be answered by this study. First, interventions and cross sectional studies typically examine only one style of yoga. Second, there are no research studies in the U.S. that have assessed the influence of yoga practice and the relationship to the adoption of other healthy behaviors. And third, there are no research studies that investigate the link between the yogic lifestyle and sustainable human and environmental health practices. Yoga practice is broad and extensive and the practice components and the techniques are highly varied by style, making yoga a complex methodology to study (McCall, 2013). For these reasons, in order to understand how yoga works and promote practice in populations through social change, a quantitative investigation into yoga practice is needed (McCall, 2013). In this quantitative study, I examined (a) mixed yoga practice styles, comparing them to

improved health outcomes and quality of life; 2) whether yoga practice is associated with and influences the adoption of other healthy dietary and physical activity behaviors; and 3) whether yoga promotes a sustainable alternative lifestyle for human health and the environment.

### **Research Question(s) and Hypotheses**

The research questions of this study inquire about health outcomes associated with the style of yoga practiced, the perceived benefits from yoga practice, and the influence of yoga on sustainable health promotion and other dietary, physical activity, and health behaviors.

RQ1: Does the style of yoga practiced have an impact on health-related behaviors and health outcomes?

$H_{01}$ : There is no association between the style of yoga practiced and body mass index.

$H_1$ : There is an association between the style of yoga practiced and body mass index.

$H_{02}$ : There is no association between self-reported chronic disease diagnosis before and after initiating yoga practice.

$H_2$ : There is an association between self-reported chronic disease diagnosis before and after initiating yoga practice.

$H_{03}$ : There is no relationship between the style of yoga practiced and participation in other types of physical activity.

*H<sub>3</sub>*: There is a relationship between the style of yoga practiced and participation in other types of physical activity.

RQ2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?

*H<sub>04</sub>*: There is no relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

*H<sub>4</sub>*: There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

RQ3: What are the perceived benefits and cues to action of yoga practice?

*H<sub>05</sub>*: There is no relationship between yoga practice and perceived improvement in physical or mental health conditions.

*H<sub>5</sub>*: There is a relationship between yoga practice and perceived improvement in physical or mental health conditions.

*H<sub>06</sub>*: There is no relationship between yoga practice and quality of life.

*H<sub>6</sub>*: There is a relationship between yoga practice and quality of life.

*H<sub>07</sub>*: There is a relationship between the reason for beginning and continuing yoga practice.

*H<sub>7</sub>*: There is a relationship between the reason for beginning and continuing yoga practice.

Health outcomes and behaviors associated with yoga practice were examined as a sustainable alternative lifestyle not only for the prevention of disease and promotion of

health of individuals in populations but also preservation of the environment. In this study, I examined how regular yoga practice impacts human health by collecting data on the number of infections experienced each year, self-reported physical and psychological health, quality of life, and the rates of development and management of neurological, musculoskeletal, cardiovascular, gastrointestinal, respiratory, and mental health as well as chronic diseases such as cancer, diabetes, arthritis, and cardiovascular disease. These health outcomes were compared to the style of yoga practiced and how it influences other health promoting behaviors such as adoption of other physical activities, vegetarian diet, preference of natural unprocessed foods, and preference of foods that are low in refined sugar and saturated fat.

Independent variables are mixed styles of yoga practice. Dependent variables include height and weight to determine BMI, engagement in other physical activity, adoption of a healthy diet and other healthy behaviors, overall and mental quality of life, and self-reported health indicators such as improvement in medical conditions with practice, development of chronic disease following the adoption of yoga practice, and reasons for beginning and continuing yoga practice.

### **Theoretical Framework for the Study**

The theoretical framework used in this study is the health belief model (HBM). This framework provides the concepts and theoretical lens that may explain the use of yoga as a complementary and alternative preventative health behavior by yoga practitioners. The HBM was developed by Hochbaum, Leventhal, Kegeles, and

Rosenstock in the 1950s and the four original main constructs, perceived susceptibility, severity, benefits, and barriers to action, have successfully been used individually and in combination as predictors of health-related behaviors (Champion, 1984). In addition to the four original constructs, health motivation was added to HBM by Becker in 1974 and has been used to study a variety of behaviors that maintain or improve health (Champion, 1984). Benefits, motivation, barriers, susceptibility, and seriousness constructs have been used to study a variety of health behaviors such as adherence to medication to treat certain diseases and also preventative measures such as monthly breast exams (Champion, 1984). Two of the HBM constructs, perceived benefits and cues to action, were used in this study to measure the outcome variables. These constructs and how they relate to the variables of the study are discussed in greater detail in the next section and Chapter 2.

### **Nature of the Study**

In this quantitative study, I used a cross-sectional survey design to collect data. The cross sectional design is most appropriate because it provides the framework by which variables can be analyzed, research questions can be answered, and the hypotheses can be accepted or refuted. This type of design allows for collection of data on attitudes, beliefs, and practices of yoga practitioners who use mixed styles of yoga. A cross-sectional design employs a survey that provides a numeric description of trends and behavior in a sample population (Creswell, 2009). The cross-sectional design provides

the ability to examine health outcomes associated with yoga practice, perceived benefits, and behaviors associated with yoga practice.

1. Perceived benefits construct – Variables in the study that relate to participant benefits of yoga practice include the following:

- Reduction in symptoms of disease/condition (Likert scale)
  - Gastrointestinal (Irritable bowel, celiac disease, other digestive disorder)
  - Musculoskeletal (Back pain, muscular pain, joint pain, arthritis)
  - Respiratory (Asthma or other lung/respiratory disorder)
  - Cardiovascular (Heart disease, high blood pressure, high cholesterol)
  - Mental health (Anxiety, depression, sleep disorder)
  - Woman's health (Pregnancy, menopause)
  - Other (Diabetes, lose weight, etc.)
  - Other (please specify)
- Quality of life (Likert scale)
  - Physical health (fitness, muscle tone, flexibility, energy)
  - Mental Health (memory, depression, sense of purpose or meaning, positivity)
  - Emotional health (emotional stability, stress, anger, anxiety)
  - Spiritual health (sense of inner peace, happiness, relationship to higher power)
  - Relationships (quality of close friendships, family)

2. Cues to action construct

A. Motivation for beginning and continuing yoga practice:

- Trendy, in vogue
- Increase health and fitness
- Increase flexibility and/or muscle tone
- Reduce stress or anxiety
- Alleviate or treat a specific health reason or medical condition
  - Coronary or peripheral artery disease
  - High blood pressure
  - High cholesterol
  - Metabolic syndrome
  - Diabetes
  - Heart Attack
  - Stroke
  - Emphysema
  - Arthritis
  - Cancer
  - Other
- Pregnancy/childbirth
- Menopause or other woman's health issue
- Spiritual path
- Personal development
- Enhance performance in another activity

- Other

B. Cues to action from yoga practice and philosophy to initiate other sustainable dietary and behavior lifestyle choices include the following variables:

- Vegetarian
- Vegan
- Prefer organic foods
- Prefer foods low in refined sugar
- Prefer low fat/ low saturated fat foods
- Prefer natural foods that have been minimally processed
- Nonsmoker
- Non-alcoholic beverage drinker
- Do not consume caffeine (tea, coffee, soda, etc.)

3. Other health-related variables:

- Participation in other types of physical activity
- Body mass index

The methodology of this study included data collection from electronic surveys using SurveyMonkey that were administered through Facebook to yoga practitioners of mixed styles who “like” selected yoga studios and/or are “friends” of yoga selected pages. Data analysis included a variety of parametric statistical tests using SPSS such as descriptive statistics, multiple linear regression, Pearson Product Moment Correlation Coefficient, and ANOVA as well as nonparametric tests such as McNemar Chi Square. Descriptive statistics provide information on the central tendency and dispersion of

variable data and calculate the mean, median, range, mode, minimum, maximum, and standard deviation from the data set (Frankfort-Nachmias, & Nachmias, 2008). Pearson Product Moment Correlation Coefficient can provide an analysis of scale rated variables such as quality of life resulting from yoga practice and improvements of medical conditions that yoga was used to treat. Multiple linear regression can provide an analysis between the styles of yoga practiced and BMI. The one-way analysis of variance (ANOVA) test assesses the relationship between one or more factors and a dependent variable to determine whether there is a significant difference in the means among groups and can also provide the examination of several independent variables in population samples (Green & Salkind, 2010). The independent variables, 15 styles of yoga, can be compared against dependent variables including participation in other types of physical activity and the adoption of healthy dietary and other behavioral practices. The McNemar test can provide a comparison of the reasons for beginning and continuing yoga practice and self-reported disease diagnosis before and after initiating yoga practice.

### **Definitions**

*Eight limbs of yoga:* Branches of yoga practice that may be incorporated into various styles of yoga (Iyengar, 1976).

1. *Yama:* universal moral commandments (Iyengar, 1976).
2. *Niyama:* self-purification by discipline (Iyengar, 1976).
3. *Asana:* body postures (Iyengar, 1976).
4. *Pranayama:* breath control (Iyengar, 1976).

5. *Pratyahara*: withdrawal of the senses (Iyengar, 1976).
6. *Dharana*: concentration and cultivating inner awareness (Iyengar, 1976).
7. *Dhyana*: devotion and meditation on the Divine, also known as meditation (Iyengar, 1976).
8. *Samadhi*: union with the Divine (Iyengar, 1976).

*Environmental sustainability*: Practices that promote environmental health that can be sustained without undue harm to humans or the environment (Verkerk, 2009).

*Health-related quality of life*: Physical and mental health perceptions and their correlates—including health risks and conditions, functional status, social support, and socioeconomic status (CDC, 2012c).

*Organic*: Foods that have been produced without chemical pesticides, fertilizers, hormones, or GMOs (Verkerk, 2009).

*Processed foods*: Foods that have been subjected to “salting, sugaring, baking, frying, deep frying, curing, smoking, pickling, canning, and also frequently the use of preservatives and cosmetic additives, the addition of synthetic vitamins and of minerals, and sophisticated types of packaging” (Monteiro, Levy, Claro, de Castro, & Cannon, 2011, p. 7).

*Styles of yoga*: Various forms or types of hatha yoga practice (Dykema, 2011).

*Sustainability*: “Approaches that provide the best outcomes for the human and natural environments both now and into the indefinite future” (Verkerk, 2009, p. 6).

*Sustainable agriculture:* Agricultural practices that support human and environmental health and include organic, non-genetically modified organisms (GMOs; Verkerk, 2009).

*Sustainable human healthcare:* Practices that promote human health and treat disease that can be sustained without undue harm to humans or the environment (Verkerk, 2009).

*Vegan:* A plant-based diet that does not include any animal meat or meat products (Marlow et al., 2009).

*Vegetarian:* A plant-based diet that does not include animal meat (Marlow et al., 2009).

***Yoga practice:* Practice of various forms of hatha yoga that include mind-body-spirit components such as postures (asana), breathing (pranayama), and mindfulness (Dykema, 2011).**

Assumptions

It was assumed that individuals select and adopt a specific style of yoga practice for a variety of reasons and factors that may include improving or maintaining health status or achieving a spiritual connection. A second assumption was that the depth of yoga practice also varies by individual and style of yoga practice. A third assumption was that depth and style of yoga practice of an individual affects knowledge, attitudes, beliefs, and behaviors. These assumptions are necessary to explore the connections between the individual style of yoga practice and depth of practice.

**Scope and Delimitations**

The scope of this study addresses the problem of sustainable human and environmental health. This focus was chosen due to the inextricable link between the two; one cannot be obtained without the other. Because yoga is such a broad and complex practice and differs greatly not only by style, but by studio and even instructor, it is difficult to generalize completely the results of this study. The results may provide a glimpse into the health promoting nature of yoga and how the benefits from practice are perceived by participants and the health promoting behavior factors that are influenced by yoga practice.

**Limitations**

The boundaries of this study are limited to a population of adults ages 18 and older who practice yoga and have access to the Internet and Facebook. Two of the greatest limitations and threats to validity of the cross sectional study design used in this study are recall bias and self-reported health improvements from yoga practice. Another limitation was in the survey instrument, as questions might not have been comprehended the same among participants of varying depth of practice because there were no definitions of yoga terms provided.

**Significance**

Yoga is a lifestyle that can be performed by individuals of all ages and fitness levels and promotes a healthy lifestyle through the practice of postures and breathing techniques and adoption of a vegetarian diet (Iyengar, 1976). Potential implications for

social change from the results of this research study may include establishing initiatives and policies that change the culture in the United States by promoting the integration of the specific number and types of mind-body-spirit yoga practices and philosophy that resulted in the most optimum health outcomes, such as vegetarianism, meditation, asana (postures), and pranayama (breathing practices), into mainstream society. These practices should be used for preventative medicine and also integrated into health care by establishing yoga as a vital and sustainable lifestyle for children and adults of all ages, ethnicities, and income levels that not only is health-promoting but is also environmentally sound and sustainable. Bringing about social change could be accomplished through multiple level interventions that incorporate both health and environmental sustainability objectives that educate people of all ages about the health benefits of yoga practice and lifestyle philosophy and guide them through level appropriate practice (Clonan & Holdsworth, 2012).

Many European countries, such as Germany and Sweden, have already integrated health and sustainability initiatives in dietary consumption practices (Clonan & Holdsworth, 2012). Recommendations include choosing seasonal, local, and organic fruit and vegetables; consuming fewer animal products; reducing packaging; and supporting fair trade products (Clonan & Holdsworth, 2012). The U.S. should follow suit by establishing multiple-level interventions that are combined with governmental policies. Multiple-level interventions are suggested because they have been shown to elicit long lasting and effective behavioral change by targeting individual, environmental,

social, and community levels (Berkman & Kawachi, 2000). Governmental policies may include the following: 1) establishing yoga philosophy and practice in schools, the workplace, and the community for health promotion; 2) integrating yoga into health care for prevention and medical treatment; 3) reducing subsidies to corn and soybean producers that grow crops for livestock meat production and instead providing grants and subsidies for local and organic fruit and vegetable growers to bring down the costs to consumers. As a result, the U.S. population, especially individuals of low income status, will not have to choose between cheap processed fast foods and more expensive fruits and vegetables, and they can learn healthy stress management and behavioral techniques for prevention and treatment of disease.

### **Summary**

Chapter 1 provided an introduction to the study and background of the problem of unsustainable practices that effects human and environmental health. Unsustainable human behaviors are contributing to increasing chronic disease morbidity and mortality. Due to the increasing evidence of the health promoting nature of yoga in research, the purpose of this study was to investigate the attitudes, beliefs, behaviors, and health outcomes of yoga practitioners using the health belief model.

Chapter 2 presents the scope of the problem of sustainable human and environmental health, the literature search strategy, and the literature review. Major assumptions of the theoretical constructs within the health belief model are outlined. This chapter will provide examples of interventions and applications and methodologies

that have been used in previous studies and justification of the selected independent and dependent variables. Chapter 3 will present the research method and methodology. Chapter 4 will present the results of the study and hypothesis testing. Chapter 5 will present a discussion and conclusions from the study and future research recommendations.

## Chapter 2: Literature Review

### **Introduction**

Chronic diseases continue to be the greatest cause for morbidity and mortality in the United States (Xu et al., 2013). Moreover, it is projected that chronic diseases will account for about 75% of deaths worldwide by 2020 (Verkerk, 2009). Current medical and technological advances, such as early diagnostic testing and drug treatment, have failed to reduce rates of chronic diseases in the U.S. and decrease mortality rates because health behaviors contribute to the majority of these diseases (CDC, 2012; Verkerk, 2009). Public health initiatives such as Health People, initially launched in 1990 and aimed at improving health behaviors, have also been unsuccessful for decades in reducing rates of chronic disease (Xu et. al., 2013). A Healthy People 2010 surveillance report of health behaviors among states and selected territories indicated no reductions in chronic diseases and obesity, a major risk factor for chronic disease development (Xu, et. al., 2013). High stress levels that are compounded by the absence of healthy stress management techniques, improper nutrition, and physical inactivity contribute to increased risks for developing chronic diseases such as diabetes, cardiovascular disease, and cancer (CDC, 2012; Verkerk, 2009).

While national interventions are failing, yoga practice and adoption of a yogic lifestyle may be the solution to reducing many of these risks factors because yoga philosophy addresses each risk factor naturally in a holistic and healthy manner (Ross & Thomas, 2010). Multiple research studies have shown that yoga practice can improve

health in diseased individuals and also promote a healthy weight, improve nutrition, promote healthy blood glucose and lipid levels, improve antioxidant levels, and reduce stress hormone levels, making yoga a successful holistic approach for alternative preventive medicine (Bijlani et al., 2005; Kristal et al., 2005; Sinha et al., 2007). The purpose of this study was to collect data from mixed yoga styles philosophical techniques and compare these practices to health outcomes and the adoption of other healthy behaviors (vegetarianism, healthy diet, participation in other physical activities, etc.) and assess if there is a yoga style that results in greater health benefits and outcomes and reduced environmental impacts.

### **Chronic Diseases**

Chronic diseases such as cardiovascular disease, diabetes, and cancer are three leading causes of morbidity and mortality in the United States (CDC, 2009). Reducing incidence and prevalence of chronic diseases in populations is crucial to improving population health. While genetic predispositions do exist, lifestyle and behavioral factors are the most significant contributors to the development of the majority of chronic diseases (CDC, 2009). If risk factors for chronic disease were eliminated, 80% of all heart disease, stroke, and type 2 diabetes and 40% of cancers could be prevented (World Health Organization, 2005).

#### **Cardiovascular Disease**

Cardiovascular diseases include heart diseases, coronary heart disease, stroke, hypertensive disease, and heart failure (CDC, 2009). Risk factors include metabolic

syndrome, which is a cluster of three of the following conditions: abdominal obesity, high triglycerides, high LDL cholesterol, low HDL cholesterol, high blood pressure, insulin resistance, proinflammatory and prothrombotic states (Ervon, 2009), obesity, and sedentary behaviors (CDC, 2009). Cardiovascular diseases are the greatest cause of morbidity and mortality in the U.S. for both men and women, resulting in 600,000 deaths each year, or one in four deaths (CDC, 2013b). Each year 715,000 Americans suffer heart attacks (CDC, 2013b). Half of all deaths in men are due to heart disease (CDC, 2013b). Coronary artery disease is the most common type of heart disease; contributes \$108.9 billion each year in health care costs, medications, and lost productivity, and kills more than 385,000 people each year (CDC, 2013b). These statistics support the need for making treatment and prevention measures high priority in public health to promote longevity, prevent premature mortality, reduce healthcare costs, and improve quality and years of healthy life in the population (CDC, 2012a).

### **Diabetes**

Diabetes is a group of diseases distinguished by high levels of glucose in the blood and includes type 1, type 2, and gestational diabetes (CDC, 2011a). Type I diabetes mellitus is an insulin dependent disease where the pancreas does not secrete insulin due to an autoimmune disorder, is typically diagnosed in childhood, and accounts for about 5% of diabetes cases (CDC, 2011a). Type 2 diabetes mellitus is a condition that begins with insulin resistance, typically associated with older age, family history of diabetes, impaired glucose metabolism, physical activity, obesity, and race/ethnicity

(CDC, 2011a). Type 2 diabetes accounts for 90-95% of diabetes cases and has been diagnosed in 11.3% of individuals 20 years of age or older and 26.9% of individuals 65 years of age or older (CDC, 2011a). Diabetes is the seventh leading cause of death and complications of the disease include heart disease, hypertension, blindness, kidney disease, amputations, dental disease, nervous system disease, pregnancy complications, and depression (CDC, 2011a). Diabetes is an underreported cause of death; however, it was responsible directly for more than 70,000 deaths and a contributing factor for more than 160,000 deaths in 2007 (CDC, 2011a).

Depression has been found to increase risks for developing type 2 diabetes by 60.0% (CDC, 2011a). Between 2005 and 2008, 35% of adults over 20 years of age had pre-diabetes (CDC, 2011a). Pre-diabetics have an increased risk of developing type 2 diabetes, heart disease, and stroke (CDC, 2011a). Pre-diabetics who lose weight and increase physical activity can prevent or delay type 2 diabetes development (CDC, 2011a). Lifestyle interventions have proven to be more cost-effective than medication treatments in preventing type 2 diabetes with pre-diabetes (CDC, 2011a).

## **Cancer**

Cancer is the second leading cause of mortality, resulting in nearly 575,000 deaths in the U.S. in 2010 (CDC, 2013a). Cancer also accounted for 13.0% of deaths worldwide in 2004, which is roughly 7.4 million people (Lanao & Svenson, 2011). Moreover, deaths are projected to increase to 12 million by 2030 (Lanao & Svenson, 2011). Approximately 90%–95% of cancer can be prevented by reducing environmental and

lifestyle risks (Lanao & Svenson, 2011). Lifestyle factors include “tobacco use, diet, alcohol, sun exposure, environmental pollutants, infections, stress, obesity, and physical inactivity” (Lanao & Svenson, 2011, p. 1). It is estimated that diet accounts for 35.0% of cancers in the U.S. (Lanao & Svenson, 2011). Specifically, diet may be attributed to 70.0% of colorectal and prostate cancers and 50.0% of breast, endometrial, pancreatic, and gallbladder cancers (Lanao & Svenson, 2011, p. 1).

### **Factors and Behaviors That Promote Chronic Disease**

Obesity increases risks for many chronic diseases (CDC, 2011b). Managing stress is also an important factor for mitigating risks for obesity and chronic disease (Rizzolo & Sedrak, 2010). Poor diet and physical inactivity accounted for 15.2% actual causes of deaths in 2000, ranked second only to tobacco 18.1 % (Campbell & Campbell, 2012). Eating a healthy diet, getting physical activity, and practicing positive stress management techniques are important in maintaining a healthy weight and preventing or reversing obesity.

### **Overweight and Obesity**

Obesity is a major contributor to preventable chronic diseases such as coronary heart disease, type II diabetes, dyslipidemia, stroke, arthritis, and certain cancers (CDC, 2011b). Contributing factors include genetic disposition, metabolism, behavior, environment, culture, and socioeconomic status (CDC, 2012b). Behaviors such as low levels of physical activity and calorie dense diets high in fat and sugar and low in fruits and vegetables promote obesity (CDC, 2012a). Adults having a BMI between 25.0 and

29.9 are classified as overweight (CDC, 2012a). Adults with a BMI higher than 30 are classified as obese (CDC, 2012a). Children aged 2 to nineteen who are at or above 95<sup>th</sup> percentile are classified as obese (CDC, 2012a). Currently more than one in three adults (35.7%) and about one in five (17%) of children are obese (CDC, 2012a).

Approximately 67.5% of adults are classified as overweight or obese (CDC, 2012a).

Healthy People 2010 objectives were set to reduce adult obesity to 15% and childhood obesity to 5%, but neither goal was met (CDC, 2012a).

### **Stress**

While a moderate amount of stress can be beneficial, chronic stress has been shown to be a significant contributor to chronic disease development, and often goes overlooked by the medical community (Rizzolo & Sedrak, 2010). Mechanisms of chronic stress that promote chronic disease development include activation of the general adaptation syndrome which contributes to physiological exhaustion due to a continual release of the fight-or-flight stress hormones cortisol and epinephrine (Rizzolo & Sedrak, 2010). Chronic stress contributes to increased central obesity, “hyperinsulinemia, insulin resistance, and activation of the sympathetic nervous system” (Rizzolo & Sedrak, 2010, p.22). Physiological consequences of chronic stress include increased blood pressure, which increases risks for developing hypertension, stroke, and coronary atherosclerosis, increased risk for metabolic syndrome, and reduced immune function (Rizzolo & Sedrak, 2010).

### **Exercise and Physical Activity**

Being physically active is a key component to living a healthy life. Aerobic exercise and strength training are two key activities in physical activity (CDC, 2011c). It is recommended that adults receive 150-300 minutes of moderate to vigorous exercise each week and perform strength training for each muscle group twice each week (CDC, 2011c). Chronic disease indicators are tracked by the CDC (2012b) and include information on nutrition, physical activity, and overweight or obese conditions. According to the CDC (2012b), only 51% of adults had recommended physical activity (moderate physical activity for  $\geq 30$  minutes  $\geq 5$  times/week or who report vigorous physical activity for  $\geq 20$  minutes  $\geq 3$  times/week) while only 28.7% of youth met recommendations (CDC, 2012b).

### **Other Contributing Factors**

Two modifiable behaviors that contribute significantly to chronic disease morbidity and mortality are smoking and excessive alcohol consumption. According to the CDC (2009), “tobacco use is the single most avoidable cause of disease, disability, and death in the U. S.” (p. 6). One in five American adults ( $>$  than 43 million people) smoke tobacco and each year, about 443,000 people die from smoking or exposure to secondhand smoke (CDC, 2009). Smoking contributes to increased risks for the development of cancer, heart disease, and respiratory diseases. (CDC, 2009). Excessive alcohol use is also associated with many health risks such as increased the risk of cancer of the mouth, throat, esophagus, liver, breast, and colon cancers, liver and cardiovascular

disease (CDC, 2009). Excessive alcohol use is the third leading lifestyle-related cause of death in the U.S. (CDC, 2009).

### **Food Production and Consumption Practices That Impact Chronic Disease and the Environment**

There are challenges in eating a healthy and sustainable diet (Clonan & Holdsworth, 2012). Currently, mass production methods provide the bulk of the food products on the market that are consumed by Americans. (Clonan & Holdsworth, 2012). These foods have been mechanically and chemically processed and contain chemicals, additives, and preservatives (Clonan & Holdsworth, 2012). The current food system has consequences and outcomes that negatively impact the environment and human health (O’Kane, 2011).

#### **Processed Foods and Meat Consumption**

Due to the high intake of cheap, prepared and prepackaged industrial convenience foods, the typical American diet is high in meat, saturated fat, trans fats, refined sugar, preservatives, and salt (O’Kane, 2012). Ready to eat and convenience foods have added chemical preservatives, fats, sugar, and salt to retain shelf life and make them convenient to travel long distances (O’Kane, 2012). High intake of these substances contributes to obesity, cardiovascular diseases, stroke, diabetes, and certain cancers (O’Kane, 2012). Processing foods not only strips them of their micronutrient content but also requires energy and packaging and therefore produces wastes that pollute the environment (O’Kane, 2012).

### **Fruit and Vegetable Consumption**

A healthy diet is rich in fruits and vegetables and can reduce risks for many of the leading causes of death and also promote a healthy weight management (CDC, 2012a). Healthy People 2010 objectives for increasing consumption of fruits and vegetables had goals of increasing to 75% the proportion of those who daily consumption of fruit to two or more servings of fruit and to increase those who consume three or more servings of vegetables each day to 50% (CDC, 2010). No state met either target; in fact, there was a significant reduction in consumption of fruits from 34.4% in 2000 to 32.5% in 2009 (CDC, 2010). The Healthy People 2020 initiative continues to maintain goals of increasing fruit and vegetable consumption in adults and children (Healthy People 2020, 2013).

### **Vegan or Vegetarian Diet**

In 2009, only 23.4% of adults ( $\geq 18$  years of age) and 22.3% of youth ( $< 18$  years of age) ate five or more servings of fruits and vegetables each day (CDC, 2012b). A whole-foods, plant-based diet is particularly successful in reducing in metabolic diseases (Campbell & Campbell, 2012). It has been documented in many nutrition studies that a vegetarian diet can reduce blood pressure and blood cholesterol levels, as well as reduce risks for developing cardiovascular disease and diabetes (Campbell & Campbell, 2012). Adoption of a vegetarian diet can provide many health benefits and reduce health risks for many chronic diseases (Somannavar & Kodliwadmth, 2011).

A vegetarian diet protects against cancer due to intake of antioxidant and vegetarians also tend to have a lower body weight (Somannavar & Kodliwadmath, 2011). A vegetarian diet provides higher levels of antioxidants that can prevent free radical generation and provide better antioxidant status (Somannavar & Kodliwadmath, 2011). High levels of antioxidant levels in vegetarians may be due to increased and sustained consumption of fruits and vegetables, whole grains, sprouts, plant oils and seeds rich in trace minerals, “mono and polyunsaturated fatty acids, antioxidant vitamins, fibers, complex carbohydrates,” and beneficial plant compounds, called phytochemicals, such as flavonoids (Somannavar & Kodliwadmath, 2011, p. 354). Components of vegetarian and vegan diets contain more whole foods with cancer protecting properties, such as soluble fiber, carotenoids, indoles, isoflavones, and many others have, than meat-based diets (Lanao & Svenson, 2011). Moreover, phytochemicals found in vegetarian and other plant-based diets also promote higher immune function (Lanao & Svenson, 2011).

Vegetarians typically weigh 3.0%–20.0% less and are less likely to be obese than omnivores (Lanao & Svenson, 2011). Moreover, low-fat vegetarian and vegan diets have been successful in reducing body weight (Lanao & Svenson, 2011). Making dietary changes that include a low fat vegetarian diet and regular physical activity promotes a healthy weight and reduces cancer risk (Lanao & Svenson, 2011). While making dietary changes toward a vegetarian diet are not easy, workplace vegan nutrition program was successful and accepted well by workers and improved health-related quality of life as well as work productivity (Katcher, Ferdowsian, Hoover, Cohen, &

Barnard, 2010). Improvements were found in general health, physical functioning, mental health, vitality, and overall diet satisfaction in the study group (Katcher et al., 2010, p.245). Notably, the vegan group also reported a decrease in food costs and a 40–46% decrease in health-related productivity impairments at work and in their regular daily activities (Katcher et al., 2010, p. 245).

Vegetarian diets are not only healthier and less expensive but also have a less significant impact on the environment when compared to an animal-based diet (Marlow et al., 2009). A vegetarian diet consumes less water, energy, pesticides, and fertilizers than an animal-based diet (Marlow, et al., 2009). A vegetarian diet also generates less waste and does not contribute to intense land degradation as livestock production does (Marlow, et al., 2009).

### **Organic Foods**

The processes by which fruits, vegetables, and grains in a vegetarian diet are produced also have an impact on human health and the environment. Sustainable agricultural practices such as organic growing methods can address the environmental and human health harms of industrial agriculture (Horrigan et al., 2002). Consumption of organic and local foods is more sustainable for the human health and the environment (O’Kane, 2012). Organic foods have not been grown or treated with synthetic pesticides, herbicides, antibiotics, or growth hormones and do not contain genetically modified organisms or pollute the environment as conventional agricultural practices do (Horrigan et al., 2002). Pesticide residues have been shown to disrupt endocrine function and

increase risks for certain cancers (Horrigan et al., 2002). Conventional agricultural practices also result in increased risk for contaminating drinking water, soil, and food products with antibiotic residues that promote antibiotic resistance and foodborne pathogens that result in human morbidity and mortality (Horrigan et al., 2002). While there are social, cultural, and economic challenges and barriers to changing agricultural food production to provide a sustainable food supply, the evidence shows the current food production methods cannot be sustained (Clonan & Holdsworth, 2012).

Chapter 2 presents the literature review strategy for this study, the underlying theory of the health belief model and its origins, how the Health Belief Model has been used in previous studies, and how similar variables have been examined in previous studies.

### **Literature Search Strategy**

Search engines and library databases that were accessed for the literature review include Google Scholar, PubMed, Academic Search Complete, and Thoreau within the Walden University and Benedictine University Library, CDC.gov, and NIH.gov.

Key search terms included the following: *yoga philosophy, yoga health, yoga benefits, yoga chronic disease, yoga practice, vegetarian diet, chronic disease, yoga & mind body, yoga & quality of life, yoga & preventative medicine, yoga & chronic disease, vegetarian, holistic health, integrated medicine, plant based diet, chronic disease & prevention, cardiovascular diseases & behavior, religion & theology, cancer & behavior, health belief model, health belief model & yoga, health belief model & nutrition, health*

*belief model & chronic disease, health belief model & chronic disease, health belief model & health behavior, holistic health, mind body spirit, spirituality, moral, ethical, and philosophical, stress reduction, improved diet, mindfulness & yoga, sustainable food production, sustainable agriculture, environmental and human health impacts from processed foods, organic foods.*

Seminal research includes foundational research articles on the origins of the health belief model and books written on yoga practice and philosophy and Ayurveda such as the Bhagavad Gita, and the yoga sutras of Patanjali. Current peer-reviewed journals, research articles, and texts written between 2009-2013 in this area related to yoga and health, yoga philosophy, sustainable agriculture, environmental and human health, and the usefulness of yoga in treating and preventing diseases and conditions in short term interventions and cross sectional studies of iyengar yoga practitioners.

### **The Health Belief Model**

The theoretical framework used in this study is the health belief model. This framework provides the concepts and theoretical lens that may explain the use of yoga as a complementary and alternative preventative health behavior by yoga practitioners. The health belief model (HBM) was developed by Hochbaum, Leventhal, Kegeles, and Rosenstock in the 1950s with four original main constructs: perceived susceptibility, severity, benefits, and barriers to action, which have successfully been used individually and in combination to predict health-related behaviors (Champion, 1984). In addition to the four original constructs, health motivation (cues to action) was added to the HBM by

Becker in 1974 and has been used to study a variety of behaviors that maintain or improve health (Champion, 1984). Benefits, cues to action, barriers, susceptibility, and seriousness constructs have been used to study a wide range of health behaviors from adherence to medication to treat certain diseases to preventative measures such as monthly breast exams (Champion, 1984).

This study examines the influence of mixed yoga practice techniques and behaviors that impact psychological and physical health and the environment. The perceived benefits and motivation (cues to action) constructs of the HBM will measure the outcomes variables for the study. Variables in this study examined in this study include relationship to the perceived benefits construct of include quality of life (Likert scale) and reduction in symptoms of diseases and medical conditions (Likert scale). The cues to action construct examines the reasons for beginning and continuing yoga practice and if yoga practice influences healthy lifestyle behaviors such as the preference to consume organic, natural, minimally processed, and vegetarian foods or be a nonsmoker or nonalcoholic drinker.

### **Major Assumptions of the HBM Constructs**

Major assumptions of the perceived susceptibility construct include individual acceptance of a perceived risk or threat such as an illness or serious health problem (Rosenstock, 1974). Increased intensity of a perceived severity may be attributed to emotional and mental arousal to the risk of death, disability, or decreased mental and physical functioning (Rosenstock, 1974). Major assumptions of the cues to action

construct of the HBM are that these triggers to action may be internal or external (Rosenstock, 1974). Internal cues may include perceptions of bodily states, while external cues may be “interpersonal interactions, the impact of media communication, or receiving a postcard from the dentist” (Rosenstock, 1974, p. 332). Major assumptions of the perceived benefits construct of the HBM include that beliefs of the effectiveness of certain actions, not necessarily factual effectiveness, determine actions taken (Rosenstock, 1974, p. 332). These beliefs are influenced by social norms (Rosenstock, 1974, p. 332).

### **Application of the Health Belief Model in Previous Studies**

The HBM has been used by a variety of studies to examine health behaviors such as nutrition behavior following nutrition education and health beliefs of yoga practice. The HBM was used by Abood, Black, and Feral (2003) when conducting an 8-week nutrition education worksite intervention. Six constructs of the HBM model were used: health concerns, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy (Abood et al., 2003). Researchers used the HBM to help promote healthy behaviors to reduce risks for cardiovascular disease and cancer (Abood et al., 2003). The independent variables included demographic characteristics and group assignment (Abood et al, 2003, p. 260). The dependent variables examined in this study were health beliefs, nutrition knowledge, and dietary behaviors (Abood et al., 2003). The perceived benefits for health risks reduction was the only construct that showed a statistically significant change following the intervention (Abood et al., 2003).

Atkinson and Permuth-Levine (2009) used the HBM to examine the benefits, barriers, and cues to action of yoga practice in focus groups. The researchers examined the perceived benefits, barriers, and cues to action to yoga practice how the constructs differ by level of experience with yoga (Atkinson & Permuth-Levine, 2009). The focus groups consisted of participants who do and do not practice yoga (Atkinson & Permuth-Levine, 2009). Cues to action variables were found to be symptoms of mental, physical or emotion health problems and diseases, and yoga education through media and friends (Atkinson & Permuth-Levine, 2009). The perceived benefits variable categories included health promotion and wellness, disease prevention, and social and psychological benefits (Atkinson & Permuth-Levine, 2009).

### **Selection of the Health Belief Model**

Yoga practice is a physical and mental behavior that is classified as a form of preventative complementary and alternative medicine (Atkinson & Permuth-Levine, 2009). The HBM has proven to be a useful tool in identifying preventive behaviors and provides a unique interconnection among constructs that can explain physical activity behavior (Atkinson & Permuth-Levine, 2009; Baghianimoghaddam, Forghani, Zolghadr, Rahaii, & Khanib, 2010). The HBM was the selected theory of choice because yoga practice is a preventative behavior, a form of physical activity, and the perceived benefits and cues to action constructs align with the research questions that inquire about the attitudes, beliefs, and practices of participants. The perceived benefits construct can explain perceived health benefits in those who regularly practice yoga. The cues to

action construct may explain initial adoption and increased depth and regularity of yoga practice (Atkison, & Permuth-Levine, 2009). The HBM can also help understand the growing popularity and practice of yoga in the U.S. (Atkinson & Permuth-Levine, 2009).

Key concepts and assumptions of the HBM include individual perceptions and modifying factors that influence the likelihood of an action (Glanz, Rimer, & Lewis, 2002). Modifying factors such as age, gender, and socioeconomic status can influence perceived threats and individual perception such as perceived susceptibility of disease (Glanz et al., 2002). Cues to action, such as education and symptoms can inform perceived threats (Glanz et al., 2002). While the likelihood of an action is influenced by perceived benefits and barriers to change, likelihood of behavioral change is also influenced by the modifying factors (Glanz et al., 2002).

The independent variables of this study are mixed styles of yoga practice. Dependent variables used in this study for perceived benefits include quality of life, reduction in symptoms of diseases, disease prevention and disease development, body mass index, and health promotion of physical activity, dietary, and other lifestyle behaviors. The influence of yoga philosophy and yoga education will be examined as cues to action in health promoting dietary and other healthy behaviors. This study benefits from the HBM since it provides the framework for examination of participant perceived benefits of yoga practice and the relationship of yoga philosophy and education as a cue to action in promoting continued yoga practice and adoption of other healthy lifestyle practices.

The HBM has been used extensively in the literature and applied to a variety of investigations with similar concepts of health promoting behaviors such as incorporating complementary and alternative medicine use, management of a variety of chronic diseases and conditions, and intention to achieve a healthy weight. A cross sectional survey using the HBM was used to predict complementary and alternative medicine use by people with type 2 diabetes (Chang, Wallis, & Tiralongo, 2012). Results of the study found that complementary and alternative medicine use in people with type 2 diabetes is influenced by “experience, beliefs, attitudes towards complementary and alternative medicine, and their behavior towards disease management” (Chang et al., 2012, p. 1256).

Proper management of chronic diseases is crucial in increasing quality of life and decreasing mortality rates. Telecare uses distance communication to monitor those diagnosed with chronic disease and may also play a role in health promotion and disease prevention (Huang & Lee, 2013). The HBM was used to assess the intended use of telecare in patients with chronic diseases using the perceived threats, perceived benefits, perceived barriers, and cues to action (Huang & Lee, 2013).

The promotion of self-care in heart failure patients was investigated using the HBM (Baghianimoghadam et al, 2013). Perceived susceptibility, perceived threat, knowledge, perceived benefits, perceived severity, self-efficacy, perceived barriers, cues to action, and self- behavior constructs were used in a case control study (Baghianimoghadam, et al, 2013). Findings of this study and other studies show that

HBM as a potential tool that may be used to establish educational programs for individuals and communities to promote self-care (Baghianimoghadam, et al, 2013).

The HBM was also used to predict behavior and intention of weight reduction in female middle school students (Park, 2011). Constructs in this study include perceived threat, perceived benefits, perceived barriers, cues to action, self-efficacy in dietary life and exercise, and behavioral intention of weight reduction (Park, 2011). The study examined overweight, normal weight, and underweight females and results showed that the cue to action was most significant in the overweight group (Park, 2011).

#### **Studies That Have Used the Perceived Benefits and Cues to Action Constructs**

Many studies have specifically examined the perceived benefits and cues to action constructs of the HBM as these constructs explain physical activity behavior, however few have used the HBM when examining yoga (Atkinson & Permuth-Levine, 2009). Atkinson and Permuth-Levine (2009) employed the HBM to examine the benefits, barriers, and cues to action of yoga practice in a qualitative focus group study aimed at studying perceptions of those who may or who have already attended yoga classes. The benefits and barriers were used to understand how and why people begin and continue yoga, while cues to action constructs and how internal or external triggers promote these behaviors (Atkinson & Permuth-Levine, 2009). Triggers included symptoms of disease, diseases of friends or relatives, self-image, and social influences (Atkinson & Permuth-Levine, 2009). Results of the study found benefits of yoga to be health promotion, disease prevention, and social and psychological benefits (Atkinson & Permuth-Levine,

2009). Cues to action included injury prevention, physical or mental health problems, recommendations from friends, and mass media (Atkinson & Permuth-Levine, 2009). Quantitative research in this area is recommended (Atkinson & Permuth-Levine, 2009).

The cross sectional design using the HBM, used in this study, has also been used in a variety of studies examining health affecting and preventative behaviors. A cross sectional study used the HBM and constructs to examine the influence of integrated services on postpartum family planning in Senegal (Speizer, Fotso, Okigbo, Faye, & Seck, 2013). The constructs used in this study include perceived susceptibility, perceived barriers, cues to action, and self-efficacy (Speizer, et al., 2013). The cues to action construct was used to measure duration since the last birth (<6 months, 6–11 months, 12–17 months, and 18–23 months) (Speizer, et al., 2013). The researchers discuss limitations of the cross-sectional study design to include recall bias and the lack of knowledge that is present in this study type to determine the direction of causality (Speizer, et al., 2013). Strengths of the study include the findings that are consistent with HBM findings in previous studies on family planning and also findings that support the importance of self-efficacy in using family planning (Speizer et al., 2013).

A national cross sectional study using the HBM examined gender differences in predictors of colorectal cancer screening (Wong et al., 2013). All five constructs were used in this study (Wong et al., 2013). The perceived benefits construct was used to determine whether participants believed screening helped detect cancer early (Wong et al., 2013). The cues to action construct was used to determine factors that promoted

colorectal screening and included colorectal cancer information from the media, friends, doctors, and family members (Wong et al., 2013). Due to the cross-sectional nature of the study, the researchers indicated a limitation in the ability to exclude bias in the causal effect relationship of psychosocial beliefs and attitudes of colorectal screening and error from self-reporting (Wong, et al., 2013). Reported strengths of the study include a large sample with a high response rate (Wong, et al., 2013).

### **Yoga for Health Promotion and Disease Prevention**

Many research studies have uncovered the numerous health benefits of yoga in the treatment and prevention of chronic diseases such as cardiovascular diseases, cancer, and diabetes (Bijlani et al., 2005; Duraiswamy, Balasubramaniam, Subbiah, & Veeranki, 2011; Kyizom, Singh, Singh, Tandon, & Kumar, 2010). Research studies have also examined how yoga practice promotes healthy behaviors that reduce risks for disease such as positive stress management techniques, a diet rich in fruits and vegetables, and physical activity, all of which improve antioxidant status and promote a healthy weight (Herur, Kolagi, & Chinagudi, 2010; Patel, Newstead, & Ferrer, 2012). However, while several meta-analysis and systematic reviews on the effects of yoga interventions on mental and physical health found yoga to be beneficial, due to varying styles, population groups, and the nature of the study, random control trial or cross sectional study, it is difficult to pin point exactly which aspects of yoga are most beneficial (Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012).

### **Yoga for Prevention and Treatment of Cardiovascular Disease**

Short term yoga practice interventions have successfully improved tertiary cardiovascular health measures in diseased individuals. For example, a yoga intervention in as few as ten days resulted in reduced LDL cholesterol and increased HDL cholesterol (Bijlani et al., 2005). Moreover, the changes were more greatly improved in those who were hyperglycemic or had hypercholesterolemia (Bijlani et al., 2005). A 16 week yoga exercise intervention aimed at obese postmenopausal women resulted in improved levels of serum adiponectin, lipids, and other metabolic syndrome factors (Lee, Kim, & Kim, 2012). Additionally, as a means of primary prevention, yoga was effective at reducing risks for morbidity and mortality of cardiovascular disease in healthy individuals over age 30 (Herur et al., 2010). A six month yoga intervention yielded significant reductions in resting heart rate and blood pressure in participants and also improved quality of life (Herur et al., 2010).

### **Yoga for Diabetes Prevention and Management**

Yoga has been found to help manage type 2 diabetes mellitus and cause a significant decrease in levels of glucose, cortisol and malone-di-aldehyde (MDA), and an increase super oxide dismutase (SOD) activity (Duraismwamy et al., 2011). Moreover, the effects were more pronounced in subjects with poor glycemic control (Duraismwamy et al., 2011). A short, 45 day intervention using yoga pranayama and asana improved cognitive brain function and glycemic control in individuals with type 2 diabetes (Kyizom et al., 2010).

### **Yoga Increases Antioxidant Status**

Oxidative stress is correlated with cancer formation (Wang et al., 2011). Oxidative stress can contribute to the accumulation of free radicals that can promote cellular harm and also a reduction in antioxidant status (Wang et al., 2011). High antioxidant status can provide protection against the accumulation of free radicals that can promote the development of cancer (Wang, et al., 2011). Antioxidants can be produced within the body or consumed in a diet rich in fruits and vegetables (Wang, et al., 2011). Research studies have identified yoga practice results in increased or improved antioxidant status (Sinha et al., 2007). Yoga has been successfully used to increase antioxidant status and also decrease stress and anxiety and improve overall well-being (Agte & Chiplonkar, 2008).

### **Yoga Promotes Vegetarianism & Healthy Weight**

The yoga philosophy of yama ahimsa, or nonviolence, promotes vegetarianism (Chopra, 2006;Dykema, 2011). Another guiding principle of yoga nutrition is to eat small quantities of high-quality foods such as fruits, vegetables, whole grains and nuts to promote the life force (prana) in the body without producing toxins (Agte & Chiplonkar, 2007). Yoga has been linked to positive impacts on mental status and promoting good nutrition in adult practitioners, which supports the diet–mind inter-relationship concept of yoga (Agte & Chiplonkar, 2007). Because of the mind-body connection, yoga has also been successful in treating individuals with eating disorders (Dittmann & Freedman, 2009). Those who practice yoga regularly typically have a normal BMI and improved

food choices (Herur et al., 2010). These factors may also help to explain why yoga practitioners also have lower fasting glucose levels, normal triglyceride levels, and decreased blood pressure (Herur et al., 2010). Yoga practice for four or more years was found to result in attenuated weight gain in middle age (Kristal et al., 2005).

### **Yoga Improves Quality of Life and Reduces Stress**

According to the CDC (2012), "health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (para. 4). Yoga has the ability to elicit physical and mental well-being. A meta-analysis and systematic review of small randomized controlled trials of yoga subjects  $\geq$ age 60, found that the benefits of yoga exceed other types of exercise interventions for improving quality of life, self-rated health status, aerobic fitness, and strength in elderly people (Patel et al., 2012). Larger studies are recommended to define the "populations, settings, and interventions in which yoga is most beneficial" (Patel et al., 2012, p. 206).

Clinical aspects of yoga and mindfulness have been examined to explain the benefits of practice (Salmon, Lush, Jablonski, & Sephton, 2009). Yoga inhibits the stress response of the hypothalamic pituitary adrenal (HPA) axis and activates the parasympathetic nervous system (PNS; Salmon, et al., 2009). These actions result in a relaxation effect that reduces heart rate and blood pressure (Salmon et al., 2009). Yoga has been successfully used to decrease stress and anxiety and improve overall well-being (Agte & Chiplonkar, 2008). Moreover, even short-term yoga-based lifestyle interventions have resulted in a reduction in stress markers and inflammation in as little

as 10 days in patients diagnosed with chronic diseases (Yadav, Magan, Mehta, Sharma, & Mahapatra, 2012).

Yoga has been found to be more effective than walking to improve mood, reduce anxiety, and increase brain GABA levels (Streeter et al., 2010). Yoga was found to be as good or better than other forms of exercise in reducing the hypothalamus-pituitary-adrenal (HPA) axis and sympathetic nervous system (SNS) in healthy and diseased individuals (Ross & Thomas, 2010). See Figure 3 for an illustration of the biological mechanisms that promote disease development as a result of chronic stress. Yoga breathing reduces physical and mental stress and is helpful in the treatment of depression, anxiety, posttraumatic stress disorder, and for those involved in disasters (Brown & Gerbarg, 2009). Yoga practice during early breast cancer treatment was found to reduce stress and anxiety (Rao et al., 2009).

Mind-body practices, such as yoga, have shown to have a positive effect on psychological, physiological, and biological processes that result in stress reduction, reduced heart rate and blood pressure, and improved relaxation response (Chaoul & Cohen, 2010). As a result, integration of these practices with modern medicine has been considered standard care for many diseases (Chaoul & Cohen, 2010). Yoga has been proven to be an effective alternative therapy for stress management (Rizzolo & Sedrak, 2010). Yoga has also been shown to reduce stress related disorders such as asthma, high blood pressure, heart disease, high cholesterol, irritable bowel syndrome, cancer,

insomnia, anxiety, and depression, and also improved psychological disorders such as anorexia, guilt, and anxiety (Brown & Gerbarg, 2009).

Balaji, Varne, and Ali (2012) performed a meta-analysis of the physiological effects of yogic practices and transcendental meditation in health and disease. Numerous health benefits, including improved cognition and respiration, reduced cardiovascular risk, body mass index, blood pressure, and diabetes, as well as improved immunity and a reduction in joint disorders (Balaji et al., 2012). The potential underlying mechanisms that explain how yoga works for disease prevention and treatment include beneficial changes to the many hormones (McCall, 2013). For example, regular practice of yoga has the ability to positively impact health by decreasing secretions of the stress hormone cortisol and increasing serotonin and melatonin levels (McCall, 2013). Many of the psychological, behavioral, religious, or physical effects of yoga appear to be overlooked or the evidence is discounted in the literature (McCall, 2013). There are several emerging theories need further investigation such as how yoga impacts immune function biomarkers, oxidative stress, and facilitation of nerve conduction to relieve pain and stress (McCall, 2013).

### **Related Yoga Studies**

Iyengar yoga practitioners have been studied frequently in research and correlations have been made between years of practice, philosophical adherence, and BMI, nutrition and optimum health status (Ross et al., 2012). A national cross sectional study of iyengar yoga practitioners found obesity and smoking rates were lower while

fruit and vegetable consumption was higher than national norms (Ross et al., 2012). Moreover, while 60.0% of participants reported at least one chronic disease or serious health condition, most reported very good (46.3%) or excellent (38.8%) general health. While participants reported high rates of depression (24.8%), moderate mental health was reported more than half (55.2%). Participants believed yoga improved energy (84.5%), happiness (86.5%), social relationships (67.0%), sleep (68.5%), and weight (57.3%), and the results did not differ greatly by race or gender (Ross, et al., 2012). Increased yoga practice, in years or frequency of class or home practice, resulted in an increased belief that yoga improved health (Ross, et al., 2012).

In Australia, a national web-based research study was conducted in 2006 that examined many of the independent and dependent variables selected for this study (Penman et al., 2012). Results of yoga influence on diet in this study found that yoga practitioners preferred organic foods (49%), low fat foods (64%), a vegetarian diet (22%), and one third of vegetarians chose these lifestyle practices due to the influence of yoga practice (Penman et al., 2012). Results of yoga influence on behavior in this study found that yoga practitioners were more likely to engage in other forms of physical activity than the general population, 83.5% were nonsmokers, and had reduced alcohol consumption (Penman et al., 2012). The lack of a holistic approach in western medicine has promoted people to look outside this field for health care in an attempt to self-prescribe yoga for health issues, resulting in 95% of conditions improved with practice, a reduction in stress levels, and improved quality of life (Penman, et al., 2012). The

authors report substantial benefits to health of individuals and society from yoga practice and recommend further research (Penman et al., 2012). Sections of the Australian research survey by Penman et al. (2012) serve as a template for this research survey to assess mixed yoga practitioners in the U.S.

### **Summary and Conclusions**

Major themes in the literature indicate that even short term yoga practice can lower LDL levels and increase HDL levels, reduce blood pressure and heart rate, improve antioxidant status, decrease stress and cortisol levels, and improve blood glucose levels in diseased individuals (Bijlani et al., 2005; Chaoul, A. & Cohen, L., 2010; Herur et al., 2010; Sinha et al., 2007). Yoga also promotes a healthy weight, improved food choices, and quality of life. Moreover, yoga practice can also reduce risk factors for chronic disease such as obesity, stress, and metabolic syndrome (Brown & Gerbarg, 2009; Herur et al., 2010; Lee et al., 2012).

### **How This Study Fills a Gap in the Literature**

Many short term yoga interventions, cross sectional studies among iyengar yoga practitioners, and yoga practitioners in Australia have provided a glimpse of the powerful health promoting nature of yoga. Since yoga practice and techniques are broad, extensive, and highly varied by style, these factors make yoga a complex methodology to study (McCall, 2013). For these reasons, in order to understand how yoga works and promote practice in populations through social change, a quantitative investigation into yoga practice is needed (McCall, 2013). There are no current cross sectional research

studies in the U.S. that examine mixed styles of yoga practice and the link between using yoga as a natural, holistic, self-empowering and sustainable lifestyle to alleviate medical conditions, prevent chronic disease, and promote healthy sustainable dietary practices. Most interventions and cross sectional studies examine only the incorporation only of asana, pranayama, and relaxation aspects of yoga practice (Lin, Hu, Chang, Lin, & Tsauo, 2011). In this his study I examined correlations between health outcomes and behaviors that are influenced by yoga such as eating vegan or vegetarian, avoiding processed foods, refined sugar, alcohol, or tobacco, or participation in other physical activity. Moreover, these practices are not only health promoting but also environmentally sustainable by promoting conservation of resources and mitigating environmental pollution and degradation.

This study fills a literature gap by collecting data using a cross sectional survey from U.S. yoga practitioners of mixed styles of yoga. Independent variables are 15 yoga practice styles. This study examines the relationship between the following dependent variables: self-reported chronic disease development, the impact on disease and condition symptoms from yoga practice, quality of life, dietary behaviors, BMI, and other healthy lifestyle choices. Knowledge from the results of the study can be extended in this discipline to include health outcomes experienced from mixed styles of yoga practice which may indicate which specific styles of practice and philosophy may be more effective in health promotion, disease prevention, and promote a sustainable lifestyle for individuals as well as promoting health of the environment.

This cross sectional study measures the variables described to investigate health outcomes associated with yoga practice among practitioners of different styles of practice. A survey was used to collect data and information from yoga practitioners that provide the type of yoga practiced, the perceived benefits of practice, and how yoga impacts dietary and other behaviors that impact health. Chapter 3 will present the research methods used in this study that includes the sampling strategy and data analysis plan.

## Chapter 3: Research Method

### **Introduction**

The purpose of this study was to investigate the attitudes, beliefs, and behaviors of mixed styles of yoga practitioners to measure associations between these and sustainable environmental and health practices and outcomes.

Major sections of Chapter 3 include an introduction to the cross sectional research design and rationale and an outline of the methodology that was used in the study. The target population and recruitment plan are described. The sampling strategy and procedures explaining how the data was collected is provided. This chapter will also present the origin of the instrument and how it was developed, address validity and reliability, and address how the instrument can answer the research questions. Operationalization of each variable will be provided, and a data analysis plan will be described. Finally, threats to validity and ethical considerations will be addressed.

### **Research Design and Rationale**

The independent variables are mixed styles of yoga practice. Yoga styles selections include ashtanga, vinyasa, yin, jivamukti, integral, iyengar, iripalu, kundalini, sivananda, bhakti, yoga therapy, general/hatha, thai yoga, acroyoga, and other style(s). Dependent variables include: 1) health status (body mass index, presence of health/medical conditions before/after adoption of yoga, quality of life), 2) perceived benefits (improved symptoms if medical conditions, quality of life), and 3) lifestyle factors (dietary and behavior practices, participation in other physical activity).

The cross sectional design used in this study provides data collection at one point in time. This design is appropriate to answer the research questions that inquire about behaviors, attitudes, beliefs, and self-reported health status. The cross sectional design is a very low cost research design and takes minimal time and resources to collect data, making it an optimal design for this dissertation (Frankfort-Nachmias, & Nachmias, 2008). The cross sectional design can advance knowledge in this discipline and is a good design choice because it is consistent with the research design by allowing for the collection of survey data at one point in time from participants regarding their lifestyle and resulting health behaviors and health status (Frankfort-Nachmias, & Nachmias, 2008).

### **Methodology**

An electronic survey was created utilizing selected yoga-specific questions from an existing survey in Australia and certified demographic questions from the SurveyMonkey database. The selected questions from the Yoga in Australia survey by Penman et al. (2012) were converted to electronic format using SurveyMonkey. The survey was developed using questions from previous international yoga studies in the literature and was validated using pilot testing over many months using yoga teachers (Penman et al, 2012). The survey was administered to yoga practitioners through Facebook social media. Selected yoga participants who are "friends" of or are "talking about" the designated yoga teachers and yoga organization Facebook pages were sent a private message that includes an invitation to complete the survey online and a hyperlink

to access the survey. The Walden institutional review board (IRB) approval number is 07-30-14-0153982.

### **Population**

The target population is adult yoga practitioners of any age who practice or have practiced various styles of yoga in the past 12 months who are Facebook users who “follow” selected yoga pages. According to a 2012 market study by *Yoga Journal*, approximately 8.7% of U.S. adults, or 20.4 million people, practice yoga, up 29% from 2008, and 62.8% of yoga practitioners are between 18-44 years of age (*Yoga Journal*, 2012). Facebook social media is highly widespread, with 1.09 billion users (Facebook, 2014). The largest group of Facebook users is ages 35-54 (56 million users), and the number of users 55 years and over has increased 80% since 2011 (28 million users) (Facebook, 2014). Because one in two adults is diagnosed with a chronic disease (CDC, 2012a), utilizing Facebook to reach these individuals seems likely. However, the approximate total population size for yoga practitioners on Facebook is unknown.

### **Sampling and Sampling Procedures**

Systematic sampling was used to collect data from yoga practitioners. This type of sampling was chosen for the ease of obtaining a sample from this population and low cost. In order to reach a target population of mixed style practice yoga participants, eight personal, public, or group Facebook pages of regionally, nationally, and globally known yoga teachers, yoga schools, and yoga associations of varying styles who receive hundreds to thousands of comments to their weekly posts about yoga were selected

nonrandomly. Personal Facebook pages of and their number of “friends,” group pages and the number of members, or public pages and the number of individuals “talking about” the page each week as of May 2, 2014, were used to calculate sample size and are found in parentheses. Sample group selections are as follows: Patrick & Carling Yoga (3,262), Kathryn Budig (2,221), Zeina Smidi (2,667), Seane Corn (2,166), Moses Love (4,994), Indu Arora (2,407), I Love Yoga (3,981), and Thai Yoga Massage (4,313). The total population size from the selected groups is 25,961. Sampling from within those groups was conducted using systematic sampling. Every third individual who is on the friend list of the personal Facebook page, writes a post on a page, or “likes” the yoga postings from those listed above was selected and sent a personal invitation to complete the survey.

The sample was drawn from Facebook users who are yoga practitioners of mixed practices styles and “follow” selected yoga pages. Inclusion criteria include individuals who currently practice or have practiced yoga in the past 12 months. The survey is self-selecting and invited yoga practitioners to complete the survey, participants were excluded if they did not complete the entire survey. The sample size was calculated using the table developed by Krejcie and Morgan (1970). This table was based on the following formula:  $s = X^2NP(1-P)/d^2(N-1)+X^2P(1-P)$  where  $s$  is the required sample size,  $X^2$  is the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841),  $N$  is the population size,  $P$  is the population proportion (assumed to be .50 because this would provide the maximum sample size), and  $d$  is the degree of accuracy

expressed as a proportion (.05;Krejcie & Morgan, 1970). The population of 25,961 was rounded up to the next corresponding population size on the table, which was 30,000.

With this population size the necessary sample size is 379.

### **Procedures for Recruitment, Participation, and Data Collection**

Participants were recruited through postings on Facebook social media pages that they follow. Individuals who are friends of, “like,” or comment on pages and/or postings made by regional, national, and globally known yoga teachers, yoga schools, and yoga associations that have pages in Facebook, listed in the first stage cluster, were sent an invitation within Facebook to complete the study. The data collection time frame was a minimum period of one week; yoga practitioners were invited through messages to their accounts to complete the survey. If 379 surveys had not been completed at the end of one week, data collection would have continued until the minimum number was obtained. Responses collected over 379 were to be included in the analysis to increase the power of the study.

Data were collected through a survey that was provided as a URL link attached to the invitation. The link took respondents to the SurveyMonkey website where the survey was completed electronically and anonymously online. An informed consent notification was provided on the first page of the survey that explains the study aim, types of questions that were to be asked, benefits to completing the study, anonymous nature of completion, the voluntary nature of the study, lack of risks involved with participation, and right of the participant to withdraw from the study at any time. Participants exited

the survey following completion online. Debriefing occurred after the final survey question, prior to submission. Debriefing included a statement about the aim of the research study. Following the debriefing there was a final question that asked whether the respondent would like to submit the survey. Respondents could select “yes” (“I would like to submit this survey”), or “no” (“I would like to withdraw my responses”). This question, and all questions in the survey, required an answer to continue to the following questions and submit the survey.

### **Instrumentation and Operationalization of Constructs**

Demographic questions, including zip code or country, age, gender, marital status, education level, income level, race/ethnicity, and occupation, were selected from SurveyMonkey electronic databases. These questions have been pretested and certified and are accessible to subscribers for use. SurveyMonkey methodologist developed their certified question database by randomly sampling questions made by customers, grouping them by construct, and then rewriting them to remove error and bias by modifying language of questions and response selections that may be interpreted differently among people (SurveyMonkey, 2011). The questions were pilot tested, organized by construct, and placed in the certified question banks for users (SurveyMonkey, 2011). If a user attempts to modify a certified question in their survey a notification pop-up alerts the user to the risks of the action (SurveyMonkey, 2011).

The remaining questions were selected from the Yoga in Australia survey, developed by Penman et al. (2012) in 2005, which was used in the largest survey of yoga

that has been conducted worldwide to date. The questions that were selected for this study were developed, pretested, and used in a national web-based survey of yoga practitioners in Australia in 2008 (Penman et al., 2012). Permission for use of this instrument can be found in Appendix A.

The authors of the Yoga in Australia study developed their survey by reviewing survey questions in previous yoga studies found in the literature, consulting with senior yoga experts such as yoga teacher associations and groups, medical doctors, and experts in yoga philosophy and techniques (Penman et al., 2012). Psychometric validity of the survey instrument was performed and included face validity and content validity. Face validity was achieved through peer review and pilot testing (Penman et al., 2012). Peer review was performed by yoga professionals (Penman et al., 2012). Various drafts of the survey were pilot tested using several focus groups of yoga teachers over several months. Feedback and troubleshooting resulted in the final draft of the survey (Penman et al., 2012). In order to keep the survey a manageable size and improve response rate, only five quality of life domains (physical, spiritual, emotional, mental, and relationships) were selected that allow for responses in a single question rather than using the long Assessment of Quality of Life (AQoL) questionnaire (Penman et al., 2012). The Authors report that content validity may have been compromised somewhat but validity is sufficient for the study and the questions correlate with yoga and the "results of the quality of life question would likely inform future research, at which time it might be considered appropriate to use the more rigorous construct" (Penman et al., 2012, p. 91).

Because quality of life is not a main hypothesis in this study and I too want to improve responses rates by keeping the survey short, I have chosen to keep the modified quality of life questions provided in the original yoga survey. A discussion of the effect to the study from this decision is provided in Chapter 5.

The survey collected data on the following sections: demographics, vital statistics and health status, yoga and meditation practice, how yoga impacts lifestyle, and a final qualitative question that asks for any other comments the respondent may have about how has yoga impacted or influenced health or lifestyle. See Appendix B for the survey questionnaire.

Demographic questions included age, gender, marital status, ethnicity/race, education level, income level, and occupation. Vital statistics and health status questions include height and weight to assess body mass index (BMI). Yoga and meditation practice questions include the reasons for beginning and continuing yoga and meditation practice, number of years of practice, styles of yoga and meditation practiced regularly and in the past 12 months, type of yogic philosophy aspect practiced and its importance for practice (Not sure (little to no knowledge of this aspect), Unimportant (do not incorporate), Not very important (incorporate less than monthly), Somewhat important (incorporate monthly), Important (incorporate weekly), Very important (incorporate daily), time devoted to each aspect yoga practice per session (Do not practice, Less than 5 minutes, 5-15 minutes, 20-35 minutes, 40-55 minutes, 60-75 minutes, More than 80 minutes), location of yoga practice, other physical activities practiced and frequency.

How yoga impacts lifestyle questions include questions about healthy dietary and lifestyle and behaviors and if yoga impacts the behavior, medical conditions and if the diagnosis was prior to or after the adoption of yoga practice, medical conditions yoga has been used to treat or alleviate symptoms for the condition and the outcome and how yoga practice has affected quality of life (Much better, Better, A little better, Same, A little worse, Worse Much worse). A qualitative question asks for any other comments the participant would like to add about how yoga has impacted or influenced their health or lifestyle.

### Operationalization

Operationalization of variables can be found in Table 1.

Table 1

#### *Variables in the Study*

Variables	Hypothesis	Operational definition	Scale of measurement	Calculation	Examples
<u><i>Demographics</i></u>					
Zip code or country		5 digit postal code or name of country	Nominal	Geographic Location	Illinois, New York, Canada
Age range		Chronologic age	Ordinal	N/A	40-49
Ethnicity		Ethnic group	Nominal	N/A	Hispanic American, White/Caucasian
Marital status		Whether the person is married	Nominal	N/A	Never married, married
Gender		Sexual Identity	Nominal	N/A	Female, Male
Education level		Years of education	Ordinal	N/A	Associate degree, Bachelor degree
Annual household income		Combined household income per year	Ordinal	N/A	\$150,000-174,999, \$175,000-199,999
<u><i>Overall health</i></u>					
Height	H1	Physical stature in feet and inches	Ratio	BMI Lbs/ht (in) <sup>2</sup> *703	120/(5 ft 4 in) <sup>2</sup> *703=20.6
Weight	H1	Body weight in pounds	Ratio	BMI Lbs/height (in) <sup>2</sup> *703	120/(5 ft 4 in) <sup>2</sup> *703=20.6

Reason for beginning yoga practice	H7	Rationale for initiating yoga practice	Nominal	N/A	Increase health and fitness, Increase flexibility and/or muscle tone
Reason for continuing yoga practice		Rationale for continuing to practice	Nominal		Reduce stress or anxiety
Style of yoga practiced regularly	H1	Type of yoga performed regularly	Nominal	N/A	Ashtanga, Hatha, Integral.
Participation in other physical activities	H3	Other physical activities practiced in addition to yoga and the frequency	Nominal	N/A	Cycling, running, weight lifting
<u><i>How yoga impacts lifestyle/perceived benefits</i></u>					
Dietary & behavior choices	H4	Foods and beverages preferred and avoided	Nominal	N/A	Prefer organic foods, avoid processed foods
Diagnosis of medical conditions prior to adoption of yoga	H2	Medical conditions acquired before the adoption of yoga	Nominal	N/A	Coronary or peripheral artery disease
Diagnosis of medical conditions after adoption of yoga		Medical conditions acquired after the adoption of yoga	Nominal		High blood pressure Stroke Emphysema Arthritis
Medical condition oga has been used to treat or alleviate symptoms	H5	Physical or mental conditions in which yoga has been used to self treat/whether or not yoga improved condition	Ordinal	N/A	Gastrointestinal (Irritable bowel, celiac disease, other digestive disorder)/ Better, much better
How yoga impacts quality of life	H6	Overall sense of well-being	Ordinal	N/A	Mental Health (memory, depression, sense of purpose or meaning, positivity)/much better, a little better

### Pilot Study

A pilot study using the survey questionnaire was performed with yoga practitioners at the Bob Friesen YMCA in Jacksonville, IL. Participants were recruited

randomly from a list of yoga class participants. The purpose of the pilot study was to see if the Australian study had face validity and construct validity in the United States, to determine the time needed to complete the survey, and to ensure the URL link and survey are functioning properly.

### **Data Analysis Plan**

SPSS 21 was used for data analysis. Data cleaning and screening procedures can be performed with SPSS and included consistency check. Consistency checks located data that were out of range, inconsistent, or had extreme values (Wilson, 2009). Responses were required for each question in the survey to continue to the next question in order to eliminate missing data.

The research questions and hypotheses, variables measured, and statistical tests that were used to analyze the data to test the hypotheses are found in Table 1.

Survey data was exported from SurveyMonkey to Excel. Data was coded in Excel and imported to SPSS for analysis. Descriptive statistics such as measures of central tendency, frequency distribution and dispersion were used to generate participant profiles. Frequency distributions were generated with categorical (nominal or ordinal) data, such as for age, ethnicity, gender, education, household income, geographic location, and BMI. Measures of central tendency and dispersion were used with continuous (interval) variables, such as participation in the number of other physical activities.

## Statistical Analysis Plan

All of the survey questions were quantitative with the exception of one qualitative question. The survey data was coded and research questions and hypotheses were tested using inferential statistics with an alpha level of .05. Table 2 contains the research questions and hypotheses, variables, and the statistical analyses that will be used to address the research question.

Table 2

### *Statistical Analysis Plan*

Research question	Variables	Statistical analysis
I: Does the style of yoga practiced have an impact on health related behaviors and health outcomes?	Independent Variables (IV): Styles of yoga Dependent Variables (DV): Dietary preferences Health behaviors Health Outcomes	
H <sub>1</sub> : There is an association between the style of yoga practiced and body mass index H <sub>01</sub> : There is no association between the style of yoga practiced and body mass index.	(IV): Yoga styles: Ashtanga, Vinyasa , Yin, Jivamukti, Integral, Iyengar, Kripalu, Kundalini, Sivananda, Bhakti, Yoga, Therapy, General/Hatha, Thai Yoga, AcroYoga, Other  (DV): Body Mass Index (BMI)	Multiple Linear Regression
H <sub>2</sub> : There is an association between self-reported chronic disease diagnosis before and after initiating yoga practice? H <sub>02</sub> : There is no association between self-reported chronic disease diagnosis before and after initiating yoga practice?	IV): Yoga Practice Yoga styles: Ashtanga, Vinyasa , Yin, Jivamukti, Integral, Iyengar, Kripalu, Kundalini, Sivananda, Bhakti, Yoga, Therapy, General/Hatha, Thai Yoga, AcroYoga, Other  (DV): Chronic diseases: Coronary or peripheral artery disease, High blood pressure, High cholesterol, Metabolic syndrome, Diabetes, Heart Attack, Stroke, Emphysema, Arthritis, Cancer, Other	McNemar Chi Square
H <sub>3</sub> : There is a relationship between the style of yoga practiced and participation in	(IV): Yoga styles: Ashtanga, Vinyasa , Yin, Jivamukti, Integral, Iyengar, Kripalu, Kundalini, Sivananda, Bhakti, Yoga, Therapy,	ANOVA

Research question	Variables	Statistical analysis
<p>other types of physical activity.</p> <p>H<sub>03</sub>: There is no relationship between the style of yoga practiced and participation in other types of physical activity.</p> <p>2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?</p> <p>H<sub>4</sub>: There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.</p> <p>H<sub>04</sub>: There is no relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.</p> <p>3: What are the perceived benefits and cues to action of yoga practice?</p>	<p>General/Hatha, Thai Yoga, AcroYoga, Other</p> <p>(DV): Walking, Aerobics, Swimming, Golf ,Tennis , Cycling , Running/jogging, Fishing, Tai chi , Pilates, Crossfit , Zumba/dance , Strength training, Martial art , Hockey, Basketball, Baseball, Soccer, Climbing, Other</p> <p>(IV) Yoga styles: Ashtanga, Vinyasa , Yin, Jivamukti, Integral, Iyengar, Kripalu, Kundalini, Sivananda, Bhakti, Yoga, Therapy, General/Hatha, Thai Yoga, AcroYoga, Other</p> <p>(DV): Vegetarian, Vegan,, Prefer organic foods, Prefer foods low in refined sugar, Prefer low fat/ low saturated fat foods, Prefer natural foods that have been minimally processed, Nonsmoker, Nonalcoholic beverage drinker, Do not consume caffeine (tea, coffee, soda, etc., Other</p> <p>Independent Variables (IV): Yoga practice Dependent Variables (DV):</p> <p>Disease/medical condition improvement</p> <p>Quality of Life</p>	<p>ANOVA</p>
<p>H<sub>5</sub>: There is a relationship between yoga practice and perceived improvement in physical and mental health conditions.</p> <p>H<sub>05</sub>: There is no relationship between yoga practice and perceived improvement in physical and mental health conditions.</p>	<p>(IV): Yoga practice</p> <p>(DV): Gastrointestinal (Irritable bowel, celiac disease, other digestive disorder)</p> <p>Musculoskeletal (Back pain, muscular pain, joint pain, arthritis)</p> <p>Respiratory (Asthma or other lung/respiratory disorder)</p> <p>Cardiovascular (Heart disease, high blood pressure, high cholesterol)</p> <p>Mental health (Anxiety, depression, sleep</p>	<p>Spearman's Correlation</p> <p>(table continues)</p>

Research question	Variables	Statistical analysis
	disorder)	
	Woman's health (Pregnancy, menopause)	
	Other (Diabetes, lose weight, etc.)	
	Other (please specify)	
H <sub>6</sub> : There is a relationship between yoga practice and quality of life.	(IV): Yoga practice (DV): Physical health (fitness, muscle tone, flexibility, energy)	Spearman's Correlation
H <sub>06</sub> : There is no relationship between yoga practice and quality of life.	Mental Health (memory, depression, sense of purpose or meaning, positivity) Emotional health (emotional stability, stress, anger, anxiety) Spiritual health (sense of inner peace, happiness, relationship to higher power) Relationships (quality of close friendships, family)	
H <sub>7</sub> : There is a relationship between the reason for beginning and continuing yoga practice.	(IV): Yoga Practice (DV): Trendy, in vogue Increase health and fitness Increase flexibility and/or muscle tone Reduce stress or anxiety	McNemar Chi Square
H <sub>07</sub> : There is no relationship between the reason for beginning and continuing yoga practice.	Alleviate or treat a specific health reason or medical condition Pregnancy/childbirth Menopause or other woman's health issue Spiritual path Personal development Enhance performance in another activity Other	

### **Threats to Validity**

Potential sources of bias and internal validity relating to the delivery of the survey instrument online and the recruitment method effects to external validity were explained earlier in discussion of the original instrument. Threats to external validity in this study should be minimized because simple random sampling was employed. Since definitions of yoga terms were not provided in the survey, participants may have had different interpretations the terms.

Threats to internal validity include the selection of participants who practice or had practiced yoga and so it can be assumed they are mostly "pro-yoga." Additionally, responses of participants are assumed to be representative of real life experience, however, participant recall and self-report bias cannot be ignored.

### **Ethical Procedures**

There are no ethical concerns in this study since it is voluntary survey that can be completed in private. Data was collected anonymously online through SurveyMonkey. Data was downloaded and stored electronically on an external hard drive, archived by password protection and saved for at least three years in a locked fire safe cabinet. No conflict of interest exists.

### **Summary**

The method of inquiry in this study is a cross sectional design utilizing an electronic survey developed in SurveyMonkey administered online through URL links

provided on Facebook to yoga practitioners. The cross sectional design is a cost effective method that allows for data collection at one point in time. Data was collected to investigate the associations between yoga practice and sustainable human and environmental health.

Chapter 4 provides results of the data collection, statistical data analysis, and results of the study.

## Chapter 4: Results

### **Introduction**

The purpose of this study was to examine the impact that varying styles of yoga practice have on human and environmental health. Health outcomes, such as disease diagnosis, BMI, quality of life and perceived improvement of health conditions as a result of yoga practice, healthy lifestyle and dietary behaviors, and reasons for beginning and continuing yoga practice were examined.

### **Research Questions**

Three research questions were asked in this study and seven hypotheses were examined to address the research questions.

RQ1: Does the style of yoga practiced have an impact on health related behaviors?

$H_1$ : There is an association between the style of yoga practiced and body mass index.

$H_2$ : There is an association between self-reported chronic disease development diagnosis before and after initiating yoga practice.

$H_3$ : There is a relationship between the style of yoga practiced and participation in other types of physical activity and health outcomes?

RQ2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?

*H*<sub>4</sub>: There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

RQ3: What are the perceived benefits and cues to action of yoga practice?

*H*<sub>5</sub>: There is a relationship between yoga practice and perceived improvement in improved physical or mental health conditions.

*H*<sub>6</sub>: There is a relationship between yoga practice and quality of life.

*H*<sub>7</sub>: There is a relationship between the reason for beginning and continuing yoga practice.

Chapter 4 provides the results of the pilot study, the data collection procedures that were undertaken for the full study, and the results of the study data analysis.

### **Pilot Study**

A pilot study was conducted using yoga practitioners at a local YMCA. Thirty yoga practitioners were identified and were invited by private message through Facebook to complete the online survey. Ten respondents submitted the survey for a response rate of 33.3%.

### **Pilot Study Descriptive Statistics**

All pilot study respondents were from Illinois. Most respondents were 30-39 years of age ( $n = 4$ , 40%), followed by 60 and older ( $n=3$ , 30%), 50-59 ( $n=2$ , 20%), and 40-49 ( $n=1$ , 10%). The majority of respondents were female ( $n=9$ , 90.0%). Ten percent ( $n=1$ ) were male. More than three quarters of respondents reports being married ( $n=8$ , 80.0%), while 10% reported never being married ( $n=1$ ) or divorced ( $n=1$ , 10%). All

respondents ( $n=10$ ) reported ethnicity/race as White/Caucasian. Most respondents had a college degree, either a bachelor's degree ( $n=4$ , 40%) or graduate degree ( $n=4$ , 40%). Annual income level ranges with the highest responses were \$50,000-74,999 ( $n=4$ , 40%), and \$150,000-174,999 ( $n=4$ , 40%). Table 3 provides the demographic frequencies of the pilot study participants.

Table 3

*Pilot Study Demographics (N=10)*

Demographics	Number	Percent
U.S. State		
IL	10	100
Age		
17 or younger		
18-20		
21-29		
30-39	4	40
40-49	1	10
50-59	2	20
60 or older	3	30
Gender		
Male	1	10
Female	9	90
Marital status		
Married	8	80
Widowed		
Divorced	1	10
Separated		
Never married	1	10
Partnered		
Race		
White/Caucasian	10	100
Hispanic American		

*(table continues)*

Demographics	Number	Percent
Black or African American		
Asian/Pacific Islander		
American Indian or Alaskan Native		
Multiple ethnicity/other		
<hr/>		
Education level		
Less than High School Degree		
High School/GED		
Some College but no Degree	1	10
Associate Degree	1	10
Bachelor Degree	4	40
Graduate Degree	4	40
<hr/>		
Annual income		
\$0-24,999		
\$25,000-49,999	1	10
\$50,000-74,999	4	40
\$75,000-99,999		
\$100,000-124,999	1	10
\$125,000-149,999		
\$150,000-174,999	4	40
\$175,000-199,999		
\$200,000 and up		

### Pilot Study Results

Pilot study participants were asked to report the styles of yoga they regularly practice from a list of 14 styles and also could report “other style.” Participants practiced five of the 15 yoga styles. Style practice frequencies of ashtanga ( $n=3$ , 17.6%), vinyasa ( $n=6$ , 35.5%), yin 43 ( $n=2$ , 11.8%), general/hatha ( $n=5$ , 29.4%), and other style(s) ( $n=1$ , 5.9%) were reported. The majority of the respondents practiced multiple styles of yoga. The most frequently practiced styles were vinyasa (35.5%) and general/hatha (29.4%).

BMI was calculated from reported height and weight. BMI was calculated using the following formula: pounds/height (inches)<sup>2</sup>\*703. Calculated BMI scores were categorized into underweight (<18.5), normal weight (18.6-24.9), overweight (25-29.9), and obese (>30). Mean BMI was 22.1. Results of the BMI range frequencies can be found in Table 4. All respondents were normal weight ( $n=10$ , 100%).

Table 4

#### *Pilot Study BMI Range Frequencies*

BMI range	Frequency	Percent
Underweight (<18.5)		
Normal Weight (18.6-24.9)	10	100
Overweight (25-29.9)		
Obese (>30)		
Total	10	100

Those subjects who reported practicing other and yin styles of yoga had mean BMI's in the lower normal range. Table 5 provides frequencies for yoga practice styles and mean BMI by style.

Table 5

*Pilot Study Yoga Practice Style and Mean BMI*

Yoga style	Frequency	Percent	Mean BMI
Ashtanga	3	17.6	21.5
Vinyasa	6	35.3	21.3
Bhakti			
Yoga therapy			
Sivananda			
Yin	2	11.8	20.4
Kundalini			
General/hatha	5	29.4	21.9
Jivamukti			
Integral			
Iyengar			
Thai yoga			
Kripalu			
Acro yoga			
Other style	1	5.9	19.9
Total	17	100.0	22.1

*Note.* The sum of the number of different styles of yoga that were practiced was calculated per case ( $n=17$ ). Cases exceed the number of participants of the study ( $n=10$ ) because many respondents reported practicing multiple styles of yoga.

All respondents of the survey practiced yoga and provided self-reported chronic diseases prior to and after beginning yoga practice. Chronic diseases included coronary or peripheral artery disease, high blood pressure, high cholesterol, metabolic syndrome, diabetes, heart attack, stroke, emphysema, arthritis, cancer, and other. Respondents had the option to report the other diseases that were diagnosed prior to and after initiating

yoga practice. One other diagnosed condition prior to yoga practice was multiple sclerosis.

Diseases were combined into two composite variables, disease prior to yoga practice and disease after beginning yoga practice, and were coded 1=yes, 0=no. Table 6 provides the frequencies of self-reported chronic diseases diagnosed before and after beginning yoga practice. Disease diagnosis prior to yoga practice was reported by 20% of participants while 10% reported disease diagnosis after beginning yoga practice.

Table 6

*Pilot Study Disease Diagnosis Prior to and After Beginning Yoga Practice*

Disease diagnosis	Prior to practice		After practice	
	Frequency	Percent	Frequency	Percent
Yes	2	20	1	10
No	8	80	9	90
Total	10	100	10	100

A total of 15 yoga practice styles, ashtanga, vinyasa , yin, jivamukti, integral, iyengar, kripalu, kundalini, sivananda, bhakti, yoga therapy, general/hatha, thai yoga, acro yoga, and other styles, were examined to evaluate whether a particular style, or styles, participated in a greater number of other physical activities in addition to yoga practice. Physical activities were divided into 20 categories and included walking, aerobics, swimming, golf, tennis, cycling, running/jogging, fishing, tai chi, pilates, crossfit, zumba/dance, strength training, martial arts, hockey, basketball, baseball, soccer, climbing, and other activity. Yoga styles were coded numerically 1-15, and physical

activities were combined into composite variable, physical activity 1=yes, 0=no.

Respondents had the option to provide an explanation of the other physical activities they participated in. One other physical activity that was reported was chi ball.

The physical activities with the highest frequencies were swimming (90%) and walking (80%). Physical activity frequencies are presented in Table 7.

Table 7

*Pilot Study Frequencies of the Type of Physical Activities Performed*

Type of physical activity	Frequency	Percent
Walk	8	80
Aerobics	4	40
Swim	9	90
Golf	2	20
Tennis	2	20
Cycling	5	50
Run	4	40
Fishing	1	10
Tai Chi	1	10
Pilates	7	70
Cross Fit	2	20
Zumba	3	30
Strength training	7	70
Martial arts	1	10
Hockey	1	10
Basketball	1	10
Baseball	1	10
Soccer	1	10
Climbing	1	10
Other	2	20

All of the yoga style participants reported participating in other physical activities.

Yoga styles that had the highest reported frequency of participation in the number of

other physical activities included general/hatha ( $n=15$ ), vinyasa ( $n=13$ ), ashtanga ( $n=9$ ), and other style ( $n=8$ ).

Respondents were asked about their participation in healthy, sustainable dietary and behavioral choices. They were asked if they were vegetarian, vegan, prefer organic foods, prefer foods low in refined sugar, prefer natural foods that have been minimally processed, and if they were a nonsmoker, a nonalcoholic beverage drinker, and whether they consumed caffeine (tea, coffee, soda, etc.), and if they practiced another lifestyle or behavioral choice. Respondents reported being vegetarian ( $n=1$ , 10%), preferred organic foods ( $n=2$ , 20%), low sugar ( $n=7$ , 70%), low fat/low saturated fat foods ( $n=8$ , 8%), natural foods ( $n=8$ , 80%), were a nonsmokers ( $n=7$ , 70%), did not consume alcohol ( $n=1$ , 10%), caffeine ( $n=2$ , 20%), and other lifestyle or behavioral choices ( $n=2$ , 20%).

Table 8 presents the frequencies of healthy diet and behavioral choices and other lifestyle behaviors selected. Diet and behavioral choices were combined into a composite variable, healthy diet/behavior, coded 1=yes, 0=no, and evaluated.

Table 8

*Pilot Study Frequencies of Healthy and Sustainable Diet and Lifestyle Behavioral Choices*

Healthy diet or behavior	Frequency	Percent
Vegetarian	1	10
Vegan		
Organic	2	20
Low sugar	7	70
Low fat	8	80
Natural foods	8	80
Nonsmoker	7	70
No alcohol	1	10
No caffeine	2	20
Other	2	20

Healthy and sustainable diet and lifestyle behavior options were available for respondent to select from 10 options which included being a vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior. All of the respondents reported practicing some of the healthy dietary or lifestyle behaviors. The highest percentage of respondents adopted four to five healthy, sustainable dietary or lifestyle behaviors. Respondents reported practicing 2 to 5 behaviors, each at rates of 20-30%. Table 9 presents the frequencies of the number of healthy diet and other behaviors practiced.

Table 9

*Pilot Study Frequencies of the Number of Healthy Diet and Other Behaviors Practiced*

Number of healthy diet or behaviors	Frequency	Percent
0		
1		
2	2	20
3	3	30
4	2	20
5	3	30
6		
7		
8		
9		

*Note.* Healthy diet or lifestyle behaviors were vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior.

The 15 yoga practice styles were compared to the number of healthy diet and other behaviors that were adopted by the respondents. The mean number of healthy diet and behaviors reported by yoga style were very similar for ashtanga (3.7), vinyasa (4.2), yin (4.0), and general/hatha (4.0). Other styles had the lowest number of reported healthy behaviors (2.0). Table 10 presents the frequencies of the number of healthy diet and other behaviors practiced by yoga style.

Table 10

*Pilot Study Number of Healthy Diet and Other Behaviors Practiced by Yoga Style*

Yoga style	Frequency	Mean behaviors
Ashtanga	3	3.7
Vinyasa	6	4.2
Yin	2	4.0
Jivamukti		
Integral		
Iyengar		
Kripalu		
Kundalini		
Sivananda		
Bhakti		
Yoga therapy		
General/hatha	5	4.0
Thai yoga		
Acro yoga		
Other style	1	2.0

*Note.* Healthy diet or lifestyle behaviors were vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior.

Respondents were asked to provide the health and medical conditions that yoga was used to treat and to rate the improvement of the condition. Condition selections included gastrointestinal (irritable bowel, celiac disease, other digestive disorder), musculoskeletal (back pain, muscular pain, joint pain, arthritis), respiratory (asthma or other lung/respiratory disorder), cardiovascular (heart disease, high blood pressure, high cholesterol), mental health (anxiety, depression, sleep disorder), woman's health (pregnancy, menopause), and other condition.

Medical and health conditions could be rated as *much better*, *better*, *little better*, *same*, *little worse*, *worse*, *much worse* and coded 0 to 6, with 6 being *much better* and 0

being *much worse*. Mean responses found respondents reported all conditions that yoga was used to treat as better or a little better. Table 11 presents the frequencies for ratings of health and medical conditions that yoga was used to treat.

Table 11

*Pilot Study Frequencies for Ratings of Health and Medical Conditions That Yoga was Used to Treat*

Health/medical condition	<i>N</i>	Mean	Std. deviation
Gastrointestinal condition	1	5.0	
Muscular condition	5	5.2	.45
Respiratory condition			
Cardiovascular condition			
Mental condition	6	5.0	.63
Women's health condition	2	4.0	1.41
Other condition	2	5.0	0.00

Participants were asked to rate how yoga has impacted their quality of life.

Quality of life was divided into five categories including physical health (fitness, muscle tone, flexibility, energy), mental health (memory, depression, sense of purpose or meaning, positivity), emotional health (emotional stability, stress, anger, anxiety), spiritual health (sense of inner peace, happiness, relationship to higher power), and relationships (quality of close friendships, family). Quality of life categories were rated on a scale of *much better*, *better*, *little better*, *same*, *little worse*, *worse*, *much worse* and coded 0 to 6, with 6 being *much better* and zero being *much worse*. Mean responses found respondents reported all aspects of quality of life as *better* or *a little better* due to yoga practice. Table 12 presents the frequencies for quality of life ratings

Table 12

*Pilot Study Frequencies for Quality of Life Ratings*

Quality of life category	<i>N</i>	Mean	Std. deviation
Physical health	10	5.80	.422
Mental health	10	4.80	1.033
Emotional health	10	4.80	1.135
Spiritual health	10	4.60	1.174
Relationships	10	4.20	1.229

Participants were asked to provide the reasons or beginning and continuing yoga practice. Health and fitness and flexibility and muscle tone were the highest reported reason for beginning ( $n=8$ , 80%) and reason for continuing ( $n=8$ , 80%), followed by reducing stress or anxiety (reason for beginning and reason for continuing  $n=70$ , 70%).

Table 13 provides frequencies for reasons for beginning and continuing yoga practice.

Table 13

*Pilot Study Frequencies for Reasons for Beginning and Continuing Yoga Practice*

	<u>Begin</u>		<u>Continue</u>	
	Frequency	Percent	Frequency	Percent
Trendy			1	10
Health & fitness	8	80	8	80
Flexibility & muscle tone	8	80	8	80
Reduce stress or anxiety	7	70	7	70
Treat medical condition	2	20	1	10
Pregnancy			1	10
Women's health	1	10		
Spiritual path			2	20
Personal development	4	40	5	50
Enhance another activity	1	10	2	20
Other				

A final qualitative question was asked at the end of the study for the potential to glean information that was not asked in the survey, “Do you have any other comments on how yoga impacted or influenced your lifestyle?” Responses included the following: “The more often I practice yoga the more often I want to practice yoga. It's helped in my overall confidence level, my body image, muscle strength and helped me prioritize physical health overall.” And “It has improved my balance due to my deafness.”

### **Pilot Study Research Questions and Hypothesis Testing**

The first research question in this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Three hypotheses were tested using a statistical significance level of .05.

RQ1: Does the style of yoga practiced have an impact on health related behaviors and health outcomes?

$H_{01}$ : There is no association between the style of yoga practiced and body mass index.

$H_1$ : There is an association between the style of yoga practiced and body mass index.

The first hypothesis tested if there was an association between the style of yoga practiced and body mass index. Multiple linear regression was used to evaluate how well yoga styles predicted BMI using dichotomous coded variables. The predictors were 15 yoga styles, while the criterion variable was BMI. Respondents reported practicing five

of the 15 yoga styles. The linear combination of the five yoga styles was not significantly related to BMI,  $R^2 = .85$ , adjusted  $R^2 = .67$ ,  $F(5, 4) = 4.6$ ,  $p = .08$ .

Table 14 provides indices to indicate the relative strength of the individual predictors. Negative bivariate correlations and significant results were found in two of the 2 indices. Vinyasa was found to have a negative correlation with BMI ( $R = -.48$ ) and a regression slope ( $B = -.68$ ) at the .05 level. Other style was also found to have a negative correlation with BMI ( $R = -.41$ ) and a regression slope ( $B = -.85$ ) at the .05 level. While the mean BMI for participants for all yoga styles were in the normal range, interpretation of the results of this analysis shows vinyasa and other yoga styles are correlated with lower BMI scores, accounting for 23% ( $R^2 = .23$ ) and 17% ( $R^2 = .17$ ) of the variance of BMI respectively.

Table 14

*Pilot Study Multiple Linear Regression: Bivariate and Partial Correlations of the Predictors of BMI*

Predictors	Correlation between each predictor and BMI	Correlation between each predictor and BMI controlling for all other predictors
Ashtanga	-.19	-.13
Vinyasa	-.48*	-.83
Yin	-.48	-.60
General/hatha	-.03	-.44
Other style	-.41*	-.88
R	.92	
$R^2$	.86	
<i>F</i> ratio	4.60	
DF	5, 4	
Sig	.08	

\* $p < .05$

The second hypothesis examined whether there is an association between self-reported chronic disease development diagnosis before and after initiating yoga practice.

$H_{02}$ : There is no association between self-reported chronic disease diagnosis before and after initiating yoga practice.

$H_2$ : There is an association between self-reported chronic disease diagnosis before and after initiating yoga practice.

Disease diagnosis prior to yoga practice was reported by 20% of participants while only 10% reported disease diagnosis after beginning yoga practice, as shown in Table 7. These percentages are not significantly different ( $p < .05$ ) from each other based upon the McNemar Chi Square test of dependent proportions,  $p = 1.0$ . The incidence of new disease diagnosis was slightly lower after beginning yoga practice than prior to beginning practice. The results suggest that there is no difference between the incidence of disease development before and after beginning yoga practice. Table 15 shows the results of the McNemar Chi Square test.

Table 15

*Pilot Study McNemar Chi Square Test: Frequencies of Disease Development Prior to Yoga and After Beginning Yoga*

	<i>N</i>	Asymp. sig.
Disease prior to/ after beginning yoga	10	1.0

$p < .05$

The third hypothesis examined whether there was a relationship between the style of yoga practiced and participation in other types of physical activity.

$H_{03}$ : There is no relationship between the style of yoga practiced and participation in other types of physical activity.

$H_3$ : There is a relationship between the style of yoga practiced and participation in other types of physical activity.

A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and participation in other physical activities. The independent variables were 15 yoga styles, while the dependent variable was the number of other physical activities that were also participated in. Respondents practiced five of the 15 yoga styles. The ANOVA was found not to be significant among the five styles,  $p < .05$ .

Table 16 presents the results of the analysis.

Table 16

*Pilot Study One-way Analysis of Variance: The Relationship Between Yoga Styles and Participation in Other Physical Activities*

Yoga style	F	Sig.
Ashtanga	2.935	.162
Vinyasa	1.826	.248
Yin	.494	.521
Jivamukti		
Integral		
Iyengar		
Kripalu		
Kundalini		
Sivananda		
Bhakti		

Yoga therapy		
General/hatha	5.267	.083
Thai yoga		
Acro yoga		
Other style	.638	.469
<hr/>		
p < .05		

The second research question this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Hypothesis four examined whether there is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

RQ2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?

*H<sub>04</sub>*: There is no relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

*H<sub>4</sub>*: There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and the healthy, sustainable dietary and lifestyle behaviors choices that were adopted. The independent variables were 15 yoga styles, while the dependent variable was the number of healthy, sustainable dietary and lifestyle behavior choices that were adopted. Respondents reported practicing five of the 15 yoga styles. The ANOVA was not found to be significant for any of the five yoga styles. Table 17 presents the results of the analysis.

Table 17

*Pilot Study One-way Analysis of Variance: The Relationship Between Yoga Styles and Healthy, Sustainable Dietary and Lifestyle Behaviors*

Yoga style	F	Sig.	Partial eta squared
Ashtanga	1.127	.348	.220
Vinyasa	2.891	.164	.420
Yin	.000	.986	0.00
Jivamukti			
Integral			(table continues)
Iyengar			
Kripalu			
Kundalini			
Sivananda			
Bhakti			
Yoga therapy			
General/hatha	2.030	.227	.337
Thai yoga			
Acro yoga			
Other style	.121	.746	.029

P < .05

The third research question this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Three hypotheses were tested, hypotheses five through seven.

RQ3: What are the perceived benefits and cues to action of yoga practice?

*H*<sub>05</sub>: There is no relationship between yoga practice and perceived improvement in physical or mental health conditions.

*H*<sub>5</sub>: There is a relationship between yoga practice and perceived improvement in physical or mental health conditions.

Hypothesis five examined whether there was a relationship between yoga practice and perceived improvement in improved physical or mental health conditions.

Spearman's correlation was used to examine scale variables of rated improvement of health conditions that yoga was used to treat. Correlation coefficients were analyzed among seven the medical condition improvements scales. Bonferroni was used to control Type I error across the 14 correlations, a p values of less than .004 ( $.5/14 = .004$ ) was required for significance. Results of the correlation are found in Table 18 and show that 1 of the 14 correlations were statistically significant at  $p = .01$ , but not the required .004, and shows a positive correlation of 1. The other correlations could not be computed due to the low number of variables. Results of the correlation analysis suggest that yoga practice may provide perceived improvements among muscular and woman's health conditions simultaneously.

Table 18

*Spearman's Correlation: Improvements of Health and Medical Conditions That Yoga has Been Used to Treat*

	Gastrointestinal	Respiratory	Muscular	Cardiovascular	Mental	Women's health
Respiratory						
Muscular						
Cardiovascular						
Mental						
Women's health						1.0*
Other						

\* $p < .01$   
\*\* $p < .004$

Hypothesis six examined whether there was a relationship between yoga practice and quality of life.

$H_{06}$ : There is no relationship between yoga practice and quality of life.

$H_6$ : There is a relationship between yoga practice and quality of life.

Spearman's correlation was computed among the five quality of life scales. Bonferroni was used to control Type I error across the 10 correlations, a p values of less than .005 ( $.5/10 = .005$ ) was required for significance. Results of the correlation analysis are presented in Table 19 and show that two of the 10 correlations were statistically significant. A positive correlation was found between mental and emotional health (.87,  $p=.001$ ) and also mental health and relationships (.80,  $p=.005$ ). The results suggest that

there is a positive correlation between yoga practice and mental and emotional quality of life and mental health and relationships.

Table 19

*Spearman's Correlation: Quality of Life Resulting From Yoga Practice*

	Physical health	Mental health	Emotional health	Spiritual health
Mental health	.00			
Emotional health	.00	.87*		
Spiritual health	.27	.22	.33	
Relationships	.91	.80*	.55	.26

\* $p < .005$

Hypothesis seven examined whether there was a relationship between the reason for beginning and continuing yoga practice.

$H_{07}$ : There is a relationship between the reason for beginning and continuing yoga practice.

$H_7$ : There is a relationship between the reason for beginning and continuing yoga practice.

The McNemar Chi Square test was used to examine the relationship between 11 categories of reasons for beginning and reasons for continuing yoga practice.

Respondents reported only six of the 11 reasons for beginning and continuing practice.

Results of the McNemar chi square test of dependent proportions found percentages for health and fitness and flexibility and muscle tone reasons for beginning and continuing yoga practice were significantly different ( $p < 0.05$ ) from each other ( $p = 0.03$ ) as

presented in Table 20. Results indicate that yoga practitioners begin practicing for one reason but may continue for a different reason.

Table 20

*Pilot Study McNemar Chi Square: Reasons for Beginning and Continuing Yoga Practice*

Reason for beginning/continuing	<i>N</i>	Exact sig. (2-
Health & fitness	6	.03*
Flexibility & muscle tone	6	.03*
Reduce stress or anxiety	5	.06
Treat medical condition	1	1.0
Personal development	2	0.50
Enhance another activity	1	1.0

\* $p < .05$

No significant changes were made to the survey as a result of the pilot study.

Respondents were able to successfully complete and submit the survey online with the link provided. A few collective comments were detected. Since this was a small and homogeneous sample of yoga practitioners, several participants noted that they were not familiar with all of the styles of yoga and the terms associated with the styles that were asked of them. Additionally, since the survey requires each question to be answered to help prevent missing data, several also commented that they did not like that they could not skip certain questions that they did not desire to answer. Some changes were made to the original data analysis plan due to recoding of some of the variable data into composite variables and a reexamining the research questions that were to be answered. The statistical test for hypothesis two was changed from multivariate multiple regression to McNemar chi square. Tests for hypothesis five and six were changed from MANOVA to

Pearson product moment correlation. The test for hypothesis seven was changed from MANOVA to McNemar chi square. The remaining proposed hypothesis tests did not change.

### Study Data Collection

Data collection for the study was conducted for four weeks. The original data collection plan timeframe was one week. This timeframe was extended to one month in order to achieve the minimum required sample size of 378. A total of 1,413 participants were recruited and invited to complete the survey online through Facebook social media. Of the 435 surveys attempted in SurveyMonkey, 52 were incomplete. This resulted in 383 completed surveys, providing a response rate of 27.1%.

### Description of the Sample

Study participants provided demographic information. Demographic responses were summarized by frequency distributions. Table 21 provides the results of the frequency analysis.

Table 21

#### *Study Sample Demographics (N=383)*

Demographics	Frequency	Percent
U.S. State		
MA	7	1.83
RI	1	0.26
NH	1	0.26
ME	1	0.26
CT	2	0.52
PA	8	2.09
DC	3	0.78
DE	2	0.52

(table continues)

Demographics	Frequency	Percent
VA	4	1.04
NC	3	0.78
SC	1	0.26
GA	3	0.78
AL	1	0.26
TN	6	1.57
KY	1	0.26
OH	1	0.26
MI	6	1.57
IA	3	0.78
WI	4	1.04
MN	7	1.83
IL	113	29.5
MO	1	0.26
LA	1	0.26
OK	1	0.26
TX	2	0.52
CO	6	1.57
WY	1	0.26
ID	1	0.26
UT	1	0.26
AZ	8	2.09
CA	11	2.87
HI	1	0.26
OR	5	1.31
WA	4	1.04
Country		
Argentina	2	0.52
Aruba	1	0.26
Australia	7	1.83
Austria	2	0.52
Belgium	1	0.26
Canada	17	4.44
Colombia	1	0.26
England	2	0.52
France	4	1.04
Germany	1	0.26
Greece	2	0.52
Hungary	1	0.26
Iceland	1	0.26
India	2	0.52
Ireland	2	0.52
Israel	2	0.52
Malaysia	2	0.52

(table continues)

Demographics	Frequency	Percent
Mexico	1	0.26
New Zealand	2	0.52
Panama	1	0.26
Portugal	2	0.52
Romania	1	0.26
Spain	1	0.26
Sweden	3	0.78
Switzerland	1	0.26
Thailand	1	0.26
The Netherlands	1	0.26
United Kingdom	15	3.92
<hr/>		
Age		
17 or younger	1	.3
18-20	8	2.1
21-29	59	15.4
30-39	96	25.1
40-49	87	22.7
50-59	76	19.8
60 or older	56	14.6
<hr/>		
Gender		
Male	42	11.0
Female	341	89.0
<hr/>		
Marital status		
Married	206	53.8
Widowed	13	3.4
Divorced	39	10.2
Separated	7	1.8
Partnered	1	0.3
<hr/>		
Race		
White/Caucasian	326	85.1
Hispanic American	18	4.7
Black or African American	8	2.1
Asian/Pacific Islander	10	2.6
American Indian or Alaskan Native	1	0.3
Multiple ethnicity/other	19	5.0
Missing 1		

(table continues)

Demographics	Frequency	Percent
Education level		
Less than High School Degree	2	.5
High School/GED	23	6.0
Some College but no Degree	44	11.5
Associate Degree	27	7.0
Bachelor Degree	148	38.6
Graduate Degree	139	36.3
Annual income		
\$0-24,999	45	11.7
\$25,000-49,999	68	17.8
\$50,000-74,999	75	19.6
\$75,000-99,999	63	16.4
\$100,000-124,999	45	11.7
\$125,000-149,999	24	6.3
\$150,000-174,999	16	4.2
\$175,000-199,999	15	3.9
\$200,000 and up	30	7.8
Missing 2		

Survey responses were collected through Facebook and respondents from 30 countries completed the survey. Of the total responses ( $n=383$ ) collected, there were 303 (79.1%) responses from 38 U.S. States and 80 (20.9%) international responses from 29 other countries. The United Kingdom ( $n=15$ , 3.9%) and Canada ( $n=17$ , 4.4%) provided the highest number of international responses. The age group with the highest responses was 30-39 ( $n=96$ , 25.1%), followed by 40-49 ( $n=87$ , 22.7%), 50-59 ( $n=76$ , 19.8%), 21-29 ( $n=59$ , 15.4%) 60 or older ( $n=56$ , 14.6%), 18-20 years ( $n=8$ , 2.1%), and 17 or younger 1 (0.3%). The majority of respondents were female gender ( $n=341$ , 89.0%). Eleven percent ( $n=42$ ) were male. More than half of respondents reports being married ( $n=206$ , 53.8%), while 30.5% reported never being married ( $n=117$ ). Eighty five percent ( $n=326$ )

reported ethnicity/race as White/Caucasian. Most respondents had a college degree, either a bachelor's degree ( $n=148$ , 38.6%) or graduate degree ( $n=139$ , 36.3%). Annual income level ranges with the highest responses were \$50,000-74,999 ( $n=75$ , 19.6%), \$25,000-49,999 ( $n=68$ , 17.8%), and \$75,000-99,999 ( $n=63$ , 16.4%).

### **Descriptive Statistics**

Participants reported regular practice of 14 styles of yoga and also could report "other style." Style practice frequencies of ashtanga ( $n=97$ , 29.0%), vinyasa ( $n=166$ , 46.9%), bhakti ( $n=16$ , 4.8%), yoga therapy ( $n=29$ , 8.7%), sivananda ( $n=10$ , 3.0%), yin ( $n=43$ , 12.8%), kundalini ( $n=21$ , 1.2%), general/hatha ( $n=148$ , 44.2%), jivamukti ( $n=4$ , 1.2%), integral ( $n=9$ , 2.7%), iyengar ( $n=40$ , 11.9%), thai yoga ( $n=7$ , 2.1%), kripalu ( $n=11$ , 3.3%), acro yoga ( $n=4$ , 1.2%), and other style(s) ( $n=74$ , 22.1%) were reported. Nearly half of respondents (49%) practiced multiple (two or more) styles, practicing an average of 2 styles, up to as many as 10 styles regularly. The most frequently practiced styles were vinyasa (46.9%), general/hatha (44.2%), and ashtanga (29.0%).

Respondents had the option to provide an explanation of their yoga practice style or styles. Other yoga styles that were reported included Kids Yoga teacher, Mantra and meditation, Wall yoga, Hot Yoga, Anusara, Barkan Method, Baptiste Power Yoga, an eclectic blend of Ananda, Anusara, Iyengar and Vinyasa styles, Forest yoga, Yoga sculpt, viniyoga, "Don't know what I do," Kunga Yoga, meditation and contemplative prayer, Kriya, Yantra (tibetan oral tradition), Mudras, Street Yoga, HolyYoga, "Not sure," P9X 3 DVD's, Forrest and Budokon Styles, Para yoga, Svastha Yoga -Viniyoga-Vinyasa-

Krama, Yoga nidra, Restorative yogagente, kids(family), Japa Mala meditation , yoga nutrition, “Hatha from Iyengar but influenced by embodiment,” E. Mayer, Donna Farhi, scaravelli, Chair yoga, Suspension, Raja yoga, svaroop, “yoga vital it is its own system here in Argentina and I am taught directly by the creator of the technique,” Satyananda, Pranakriya Yoga, Power Yoga, ViniYoga, karma and raja yoga, Sufi meditation, Drikung Kagyu, Tibetan, Inner fire, Mysore, Five element awakening yoga (Tibetan energy yoga), Restorative, aerial yoga, and Bikram.

BMI was calculated from reported height and weight. BMI was calculated using the following formula: pounds/height (inches)  $2 \times 703$ . Calculated BMI scores were categorized into underweight (<18.5), normal weight (18.6-24.9), overweight (25-29.9), and obese (>30). Mean BMI was 23.4. Results of the BMI range frequencies can be found in Table 22. BMI results included 23(6%) participants being classified as underweight, 251 (65.5%) were normal weight, 78 (20.4%) were overweight, and 31 (8.1%) were obese. Those subjects who reported practicing kundalini (25.8%) and kripalu (25.5%) styles of yoga had mean BMIs in the overweight category, the remaining yoga practice styles had mean BMIs that were categorized in the normal range. Those subjects practicing Jivamukti style of yoga had the lowest mean BMI (19.4%). Table 23 provides frequencies for yoga practice styles and mean BMI by style.

Table 22

*BMI Range Frequencies*

BMI range	Frequency	Percent
Underweight (<18.5)	23	6.0
Normal weight (18.6-24.9)	251	65.5
Overweight (25-29.9)	78	20.4
Obese (>30)	31	8.1
Total	383	100.0

Table 23

*Yoga Practice Style and Mean BMI*

Yoga style	Frequency	Percent	Mean BMI
Ashtanga	97	14.3	22.2
Vinyasa	166	24.4	23.0
Bhakti	16	2.4	23.8
Yoga therapy	29	4.3	23.4
Sivananda	10	1.5	23.4
Yin	43	6.3	23.2
Kundalini	21	3.1	25.8
General/hatha	148	21.8	23.8
Jivamukti	4	0.6	19.4
Integral	9	1.3	23.2
Iyengar	40	5.9	23.5
Thai yoga	7	1.0	24.7
Kripalu	11	1.6	25.5
Acro yoga	4	0.6	22.8
Other style	74	10.9	23.4
Total	679	100.0	23.4

*Note.* The sum of the number of different styles of yoga that were practiced was calculated per case ( $n=679$ ). Cases exceed the number of participants of the study ( $n=383$ ) because many respondents reported practicing multiple styles of yoga.

All respondents of the survey practiced yoga and provided self-reported chronic diseases prior to and after beginning yoga practice. Chronic diseases included coronary or peripheral artery disease, high blood pressure, high cholesterol, metabolic syndrome, diabetes, heart attack, stroke, emphysema, arthritis, cancer, and other.

Respondents had the option to report the other diseases that were diagnosed prior to and after initiating yoga practice. Other diagnosed conditions included multiple sclerosis, atrial fibrillation, spinal curvature, tendonitis, situational anxiety and GERD, candida and endometriosis, bipolar depression, sinusitis, spine injury, migraine, herniated disc and sciatica - before yoga, lower back issues, asthma, interstitial cystitis onset prior to adoption of yoga, bile reflux onset prior to adoption of yoga, rheumatism real reason for taking up yoga in 1st place at age of over 25, nerve pain, celiac disease, IBS, Panic Anxiety Disorder, and PTSD, cerebral palsy, sciatica, fibromyalgia, high BP and cholesterol due to weight gain, HIV and hepatitis C, migraine, environmental allergies, anxiety disorder and panic, rheumatic disease, carcinoid tumor removal, fibromyalgia, hypothyroid, Sarcoidosis, Epilepsy, Lyme disease, degenerative disc disease, osteoporosis and breast cancer, epilepsy, osteopenia, leaky gut, and IBS, eczema, depression, overweight, and MS, high blood pressure, herniated disk, stress, inflammatory bowel disease, pinched nerve, and thyroid disease.

Diseases were combined into two composite variables, disease prior to yoga practice and disease after beginning yoga practice, and were coded 1=yes, 0=no. Table 24 provides the frequencies of self-reported chronic diseases diagnosed before and after beginning yoga practice. Disease diagnosis prior to yoga practice was reported by 25.3% of participants while only 7.3% reported disease diagnosis after beginning yoga practice.

Table 24

*Disease Diagnosis Prior to and After Beginning Yoga Practice*

Disease diagnosis	Prior to practice		After practice	
	Frequency	Percent	Frequency	Percent
yes	97	25.3	28	7.3
no	285	74.4	355	92.7
Missing	1			
Total	383	99.7	383	100

Fifteen yoga practice styles, ashtanga, vinyasa , yin, jivamukti, integral, iyengar, kripalu, kundalini, sivananda, bhakti, yoga therapy, general/hatha, thai yoga, acro yoga, other styles, were examined to evaluate whether a particular style, or styles, also participated in a greater number of other physical activities. Twenty physical activity categories included, walking, aerobics, swimming, golf, tennis, cycling, running/jogging, fishing, tai chi, pilates, crossfit, zumba/dance, strength training, martial arts, hockey, basketball, baseball, soccer, climbing, other activity. Yoga styles were coded numerically 1-15, and physical activities were combined into composite variable, physical activity 1=yes, 0=no.

Respondents had the option to provide an explanation of the other physical activities they participated in. Other physical activities that were reported included BOSU, babysitting small great grandchild, gardening, NIA, kayaking, dancing, cross country skiing, ice-skating, hula hooping, cleaning, home repair, Curves, scuba diving, hiking, body worker, stand up paddle boarding, Spinning, P90X3, backpacking, therapeutic exercises and activities, classical ballet, volleyball, housework, bicycling, kick boxing, gazelle, chi gong, aqua aerobics, kayaking, snowshoeing, obedience dog training, cross fit, diving, surfing, skiing, sailing, horseback riding, Power lifting, weight training, and free diving.

The physical activity with the highest frequencies was walking (90%), followed by cycling (47.8%), swimming (46%), and strength training (42%). Physical activity frequencies are presented in Table 25.

Table 25

*Frequencies of the Type of Physical Activities Performed*

Type of physical activity	Frequency	Percent
Walk	340	90.0
Aerobics	144	37.6
Swim	176	46.0
Golf	100	26.1
Tennis	81	21.1
Cycling	183	47.8
Run	146	38.1
Fishing	85	22.2
Tai chi	89	23.2
Pilates	145	37.9
Cross Fit	85	22.2
Zumba	120	33.2

*(table continues)*

Strength training	161	42.0
Martial arts	78	20.4
Hockey	74	19.3
Basketball	78	20.4
Baseball	72	18.8
Soccer	74	19.3
Climbing	86	22.5
Other	64	16.7

Participants of all yoga styles reported a large percentage (97.0 -100.0%) of participation in other types of physical activities. Yoga styles that had the highest percentage of participation in the number of other physical activities (16-20 other types of physical activities) included yin (50.0%), jivamukti (30.2%), and other style (29.2%). Table 26 presents the percentages of other types of physical activities performed by yoga style.

Table 26

*Percentage of Other Types of Physical Activities Performed by Yoga Style*

Yoga style	Other physical activity	1-5 Other activities	6-10 Other activities	11-15 Other activities	16-20 Other activities
Ashtanga	99.0	69.8	9.4		20.8
Vinyasa	99.4	71.5	9.1	0.6	18.8
Yin	100.0	65.1	4.7		30.2
Jivamukti	100.0	50.0			50.0
Integral	100.0	77.8			22.2
Iyengar	100.0	72.5	7.5		20.0
Kundalini	100.0	66.7	19.0		14.3
Sivananda	100.0	60.0	20.0		20.0
Bhakti	100.0	68.8	18.8		12.5
Yoga therapy	100.0	69.0	13.8		17.2

(table continues)

Acro yoga	100.0	25.0	50.0		25.0
Thai yoga	100.0	57.1	28.6		14.3
General/hatha	98.6	63.7	10.3	0.7	25.3
Kripalu	100.0	72.7	18.2		9.1
Other style	97.3	63.9	6.9		29.2

Respondents were asked about their participation in healthy, sustainable dietary and behavioral choices. They were asked if they were vegetarian, vegan, prefer organic foods, prefer foods low in refined sugar, prefer natural foods that have been minimally processed, and if they were a nonsmoker, a nonalcoholic beverage drinker, and whether they consumed caffeine (tea, coffee, soda, etc.), and if they practiced another lifestyle or behavioral choice. Respondents reported being vegetarian ( $n=114$ , 29.8%), vegan ( $n=35$ , 9.1%), preferred organic foods ( $n=229$ , 59.8%), low sugar ( $n=232$ , 60.6%), low fat/low saturated fat foods ( $n=183$ , 47.8%), natural foods ( $n=290$ , 75.7%), were a nonsmokers ( $n=292$ , 76.2%), did not consume alcohol ( $n=108$ , 28.2%), caffeine ( $n=60$ , 15.7%), and other lifestyle or behavioral choices ( $n=20$ , 5.2%).

Respondents had the option to provide an explanation of their other dietary and lifestyle choices. Other behavior and lifestyle choices included gluten-free, no grains or dairy, only drink distilled water or juice made directly from the fruit or vegetable, “low meats lots of fresh fruits n vegetables,” no wheat, little dairy, “try to eat locally,” “not quite 100% vegetarian yet, but I eat less four-legged animal meat than several years ago,” “I feel as though I make better choices in all aspects of life and my relationships because of yoga practice,” “intake of minerals/electrolytes and juicing,” “Ayurvedic practices

while eating,” “drink occasional caffeine in my tea or coffee,” no soda in 8+ years,”  
“restricted foods that are not good for me or the baby,” supplements, vinegar, & honey,  
“eating more ‘clean’”, no dairy, “no over the counter, prescription drugs or supplements,”  
“quit refined sugar completely a little over a year ago to eliminate headaches and  
depression caused by the sugar blues, it worked, and I lost five pounds without trying,”  
“frequently eat vegetarian meals,” “the majority of my meals are vegetarian,” “very  
rarely drink alcohol now due to yoga,” “drink alcohol with friends about two times per  
month but yoga has influenced me so it has become a lot less,” “I always cook vegan for  
myself but for friends/family I cook and eat vegetarian food,” “stay away from GMO  
foods & processed food,” “traditional, whole foods diet,” “only buy from sustainable,  
local & organic farmers and ranchers, try to stay within a 250 mile radius with our food  
choices so we are eliminating a lot of foods that need to be shipped in from out of state  
and out of country,” “eat junk food and meat, sorry,” “only consume meat once a week-  
fish or grass fed beef,” “intuitive eating, all of the healthy choices of diet or behavior are  
preferred,” “do not eat beef or pork,” low-carb, high-fat, “eat more balanced, less over  
eating,” “enjoy a variety of foods in moderation,” “consume only green tea- no coffee or  
sodas and I eat small quantities of meat every 10-12 days,” “I believe humans have  
incisor teeth and were meant to eat and digest meat,” and “eat mostly vegetarian and  
raw.”

Table 27 presents the frequencies of diet and behavioral choices and other lifestyle behaviors selected. Diet and behavioral choices were combined into a composite variable, healthy diet/behavior, coded 1=yes, 0=no, and evaluated.

Table 27

*Frequencies of Healthy and Sustainable Diet and Lifestyle Behavioral Choices*

Healthy diet or behavior	Frequency	Percent
Vegetarian	114	29.8
Vegan	35	9.1
Organic	229	59.8
Low sugar	232	60.6
Low fat	183	47.8
Natural foods	290	75.7
Nonsmoker	292	76.2
No alcohol	108	28.2
No caffeine	60	15.7
Other	20	5.2

Ten healthy and sustainable diet and lifestyle behavior options were available for respondent to select and included being a vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior. The number of healthy, sustainable dietary lifestyle behaviors that were adopted by respondents ranged from 0 to 9. The highest percentage of respondents adopted four to five healthy, sustainable dietary or lifestyle behaviors. Thirty-one (8.1%) of the respondents reported adopting none of the healthy dietary or lifestyle behaviors, 18 (4.7%) adopted one behavior, 37 (9.7%) adopted two healthy behaviors, 56 (14.6%) adopted three or more behaviors, 74 (19.3%) adopted four healthy behaviors, 72 (18.8%) adopted five behaviors, 54 (14.1%) of respondents

adopted six behaviors, 27 (7.0%) adopted seven behaviors, 12 (3.1%) adopted eight behaviors, and 2 (0.5%) adopted nine behaviors. Table 28 presents the frequencies of the number of healthy diet and other behaviors practiced.

Table 28

*Frequencies of the Number of Healthy Diet and Other Behaviors Practiced*

Number of healthy diet or behaviors	Frequency	Percent
0	31	8.1
1	18	4.7
2	37	9.7
3	56	14.6
4	74	19.3
5	72	18.8
6	54	14.1
7	27	7.0
8	12	3.1
9	2	0.5

*Note.* Healthy diet or lifestyle behaviors were vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior.

The 15 yoga practice styles were compared to the number of healthy diet and other behaviors that were adopted by the respondents. The mean number of healthy diet and behaviors reported by yoga style were very similar, ashtanga (4.4), vinyasa (4.2), yin (4.0), jivamukti (4.0), integral (4.3), iyengar (4.2), kripalu (3.6), kundalini (4.4), sivananda (4.2), bhakti (3.9), yoga therapy (3.3), general/hatha (4.2), thai yoga (3.0), acro yoga (3.8), and other styles (3.6). Table 29 presents the frequencies of the number of healthy diet and other behaviors practiced by yoga style.

Table 29

*Number of Healthy Diet and Other Behaviors Practiced by Yoga Style*

Yoga style	N	Number of healthy diet and other behaviors										Sum	Mean
		0	1	2	3	4	5	6	7	8	9		
Ashtanga	97	5	4	8	17	16	14	17	10	6	0	425	4.4
Vinyasa	166	10	5	13	25	35	39	25	10	4	0	693	4.2
Yin	43	4	1	4	8	7	8	6	4	1	0	173	4.0
Jivamukti	4	0	1	0	0	1	1	1	0	0	0	16	4.0
Integral	9	1	0	1	1	3	1	0	0	1	1	39	4.3
Iyengar	40	3	1	5	4	6	11	6	3	1	0	167	4.2
Kripalu	11	2	0	1	1	4	1	1	0	1	0	40	3.6
Kundalini	21	0	1	3	3	5	4	1	2	1	1	93	4.4
Sivananda	10	1	0	2	0	2	2	1	2	0	0	42	4.2
Bhakti	16	1	2	3	0	2	4	3	0	0	1	63	3.9
Yoga therapy	29	2	3	3	6	9	4	1	1	0	0	96	3.3
General/hatha	148	7	6	12	22	28	35	25	11	2	0	626	4.2
Thai yoga	7	1	0	1	2	2	1	0	0	0	0	21	3.0
Acro yoga	4	0	0	0	1	3	0	0	0	0	0	15	3.8
Other style	74	9	4	8	11	14	14	9	3	2	0	270	3.6
Total	679	46	28	64	101	137	139	96	46	19	3		

*Note.* Healthy diet or lifestyle behaviors were vegetarian or vegan, choosing organic, low sugar, low fat, and natural foods, being a nonsmoker, nonalcoholic drinker, avoiding caffeine, or other healthy diet or lifestyle behavior.

Respondents were asked to provide the health and medical conditions that yoga was used to treat and rate the improvement of the condition. Condition selections included gastrointestinal (irritable bowel, celiac disease, other digestive disorder), musculoskeletal (back pain, muscular pain, joint pain, arthritis), respiratory (asthma or other lung/respiratory disorder), cardiovascular (heart disease, high blood pressure, high cholesterol), mental health (anxiety, depression, sleep disorder), woman's health (pregnancy, menopause), and other condition.

Respondents had the option to report the other conditions that they used yoga to treat. Other conditions that yoga was used to treat included blood pressure, balance issues, chronic migraine, pregnancy, labor, and delivery, “increase mobility following a broken femur and repaired torn meniscus,” bulimia, “pain in spine/neck,” “post-cancer treatment to regain flexibility and stimulate lymphatic system,” “weight loss and muscle gain,” “deal with death of husband and memory loss,” weight loss, auto-immune disease, MS, and stress, Lyme arthritis and PMS, osteopenia, “back pain and joints and stress,” pregnancy, “vertigo and to heal a broken leg.”

Medical and health conditions were rated *much better*, *better*, *little better*, *same*, *little worse*, *worse*, *much worse* and coded 0 to 6, with 6 being *much better* and 0 being *much worse*. Mean responses found respondents reported gastrointestinal conditions were a little better ( $n=99$ , 4.87, sd 1.01, range 3-6), muscular conditions were better ( $n=216$ , 5.41, sd 1.13, range 1-6), respiratory conditions were a little better ( $n=64$ , 4.88, sd 1.15, range 2-6), cardiovascular conditions were a little better ( $n=48$ , 4.5, sd 1.22,

range 3-6), mental conditions were better ( $n=205$ , 5.38, sd 0.86, range 2-6), women's health conditions were a little better ( $n=73$ , 4.79, sd 1.14, range 2-6), and other Conditions were a little better ( $n=59$ , 4.86, sd 1.12, range 2-6). Table 30 presents the frequencies for ratings of health and medical conditions that yoga was used to treat.

Table 30

*Frequencies for Ratings of Health and Medical Conditions that Yoga was used to Treat*

Health/medical condition	<i>N</i>	Mean	Std. deviation
Gastrointestinal	99	4.87	1.01
Muscular	216	5.41	1.13
Respiratory	64	4.88	1.15
Cardiovascular	48	4.5	1.22
Mental	205	5.38	0.86
Women's health	73	4.79	1.14
Other	59	4.86	1.12

Participants were ask to rate how yoga has impacted their quality of life. Quality of life was divided into five categories including physical health (fitness, muscle tone, flexibility, energy), mental health (memory, depression, sense of purpose or meaning, positivity), emotional health (emotional stability, stress, anger, anxiety), spiritual health (sense of inner peace, happiness, relationship to higher power), and relationships (quality of close friendships, family). Quality of life categories were rated on a scale of *much better, better, little better, same, little worse, worse, much worse* and coded 0 to 6, with 6 being *much better* and 0 being *much worse*. Mean responses found respondents reported all aspects of quality of life as *better* due to yoga practice, with the exception of relationships which was *a little better*. Physical health ( $n=383$ , 5.51, sd 0.75, range 3-6),

mental health ( $n=383$ , 5.21, sd 1.00, range 1-6), emotional health ( $n=383$ , 5.26, sd 0.95, range 2-6), spiritual health ( $n=383$ , 5.11, sd 1.15, range 0-6), and relationships ( $n=383$ , 4.83, sd 1.21, range 1-6). Table 31 presents the frequencies for quality of life ratings

Table 31

*Frequencies for Quality of Life Ratings*

Quality of life category	<i>N</i>	Mean	Std. deviation
Physical health	383	5.51	0.75
Mental health	383	5.21	1.00
Emotional health	383	5.26	0.95
Spiritual health	383	5.11	1.15
Relationships	383	4.83	1.21

Participants were asked to provide the reasons for beginning and continuing yoga practice. Health and fitness was the highest reported reason for beginning ( $n=284$ , 74.2%) and reason for continuing ( $n=277$ , 72.3%), followed by flexibility and muscle tone (reason for beginning 242, 63.2%, reason for continuing 270, 70.5%), as shown in Table 15. Trendy (reason for beginning 21, 5.5%, reason for continuing 9, 2.2%) and pregnancy (reason for beginning 10, 2.6%, reason for continuing 22, 5.7%) were the least selected reason for beginning and continuing practice. The highest percent change from reason for beginning to reason for continuing was found in spiritual path (reason for beginning 104, 27.2%, reason for continuing 216, 56.4%), personal development (reason for beginning 141, 36.8%, reason for continuing 251, 65.5%), and reducing stress or anxiety (reason for beginning 201, 52.5%, reason for continuing 269, 70.2% continue), showed the highest percent increases when comparing reasons for beginning to

continuing practice. Table 32 provides descriptive statistics for reasons for beginning and continuing yoga practice.

Table 32

*Frequencies for Reasons for Beginning and Continuing Yoga Practice*

	Begin frequency	Begin percent	Continue frequency	Continue percent	Percent change
Trendy	21	5.5	9	2.2	-3.3
Health & fitness	284	74.2	277	72.3	-1.9
Flexibility & muscle tone	242	63.2	270	70.5	7.3
Reduce stress or anxiety	201	52.5	269	70.2	17.7
Treat medical condition	90	23.5	97	25.3	0.2
Pregnancy	10	2.6	22	5.7	3.1
Women's health	12	3.1	34	8.9	5.8
Spiritual path	104	27.2	216	56.4	29.2
Personal development	141	36.8	251	65.5	28.7
Enhance another activity	63	16.4	96	25.1	8.7
Other	22	5.7	16	4.2	-1.5

A final qualitative question was asked at the end of the study for the potential to glean information that was not asked in the survey, “Do you have any other comments on how yoga impacted or influenced your lifestyle?” Several themes from the responses were detected. Overwhelmingly, the majority of respondents noted how yoga was a lifestyle, their way of life or way of being, a part of who they were. Yoga allowed many to be better, happier, and less stressful person. Yoga provided many with a connection to a higher purpose, improves relationships and physical and mental states. Yoga is seen by many as a tool to promote health of body, mind, and spirit – a successful treatment for several addictions and disorders. A practice that can be performed throughout the

lifespan, many reported practicing for decades. Yoga provides for many, a sense of community and connectedness. Responses to this question are provided in Appendix D.

Demographic characteristics of this sample are very similar to a 2012 market study by yoga Journal. Yoga Journal reported that of the approximately 8.7% of U.S. adults, or 20.4 million people, who practice yoga, 62.8% are between 18-44 years of age compared to 65.3% in this this between 18-49 years 18-49 (Yoga Journal, 2012). Yoga journal reported female gender as 82.2% while they comprised 89% in this study. Slight differences in these percentages may be influenced by the fact that only 79.1% responses to this study were from U.S. and 20.9% were international responses from 29 other countries.

### **Research Questions and Hypothesis Testing**

The first research question in this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Three hypotheses were tested using a statistical significance level of .05.

RQ1: Does the style of yoga practiced have an impact on health related behaviors and health outcomes?

$H_{01}$ : There is no association between the style of yoga practiced and body mass index.

$H_{11}$ : There is an association between the style of yoga practiced and body mass index.

The first hypothesis tested if there was an association between the style of yoga practiced and body mass index. Multiple linear regression was used to evaluate how well yoga styles predicted BMI using dichotomous coded variables. The predictors were 15 yoga styles, while the criterion variable was BMI. The linear combination of yoga styles was significantly related to BMI,  $F(15, 367) = 1.81, p = .032$ . The sample multiple correlation coefficient was significant ( $R = .26$ ) and approximately 7% ( $R^2 = .07$ ) (adjusted  $R^2 = .03$ ) of the variance of BMI can be accounted for by the linear combination of yoga styles.

Table 33 provides indices to indicate the relative strength of the individual predictors. There were positive and negative bivariate correlations and significant results ( $p < .05$ ) found in two of the 15 indices. Ashtanga was found to have a negative correlation ( $R = -.16$ ) with BMI and a regression slope ( $B = -.16$ ) at the .01 level, while kundalini had a positive correlation ( $R = .11$ ) with BMI and a regression slope ( $B = .13$ ) at the .01 level. While the mean BMI for participants for all yoga styles were in the normal range, interpretation of the results of this analysis suggests ashtanga yoga practice may predict lower BMI scores, accounting for 3% ( $R^2 = .03$ ) of the variance of BMI, while kundalini yoga practice may predict higher BMI scores, accounting for 1% ( $R^2 = .01$ ) of the variance of BMI.

Table 33

*Multiple Linear Regression: Bivariate and Partial Correlations of the Predictors of BMI*

Predictors	Correlation between each predictor and BMI	Correlation between each predictor and BMI controlling for all other predictors
Ashtanga	-.16*	-.15
Vinyasa	-.10	-.10
Yin	-.02	-.04
Jivamukti	-.09	-.09
Integral	-.01	-.01
Iyengar	-.00	-.01
Kripalu	.07	.07
Kundalini	.11*	.13
Sivananda	-.03	-.07
Bhakti	.01	-.01
Yoga therapy	-.01	-.04
General/hatha	.04	.06
Thai yoga	.03	.03
Acro yoga	-.02	.00
Other style	-.01	-.03
R	.26	
R <sup>2</sup>	.07	
F ratio	1.81	
DF	15, 367	
Sig	.032	

\* $p < .05$ 

The second hypothesis examined whether there is an association between self-reported chronic disease development diagnosis before and after initiating yoga practice.

$H_{02}$ : There is no association between self-reported chronic disease diagnosis before and after initiating yoga practice.

$H_2$ : There is an association between self-reported chronic disease diagnosis before and after initiating yoga practice.

Disease diagnosis prior to yoga practice was reported by 25.3% of participants while only 7.3% reported disease diagnosis after beginning yoga practice, as shown in Table 7. These percentages are significantly different ( $p < .05$ ) from each other based upon the McNemar Chi Square test of dependent proportions,  $p = .00$ . The incidence of new disease diagnosis was lower after beginning yoga practice than prior to beginning practice. The results suggest that yoga may reduce the incidence of the development and provide protection against the development of many chronic diseases. Table 34 shows the results of the McNemar Chi Square test.

Table 34

*McNemar Chi Square Test: Frequencies of Disease Development Prior to Yoga and After Beginning Yoga*

	<i>N</i>	Chi-Square	Sig.
Disease prior to/ after beginning yoga	383	4.66	.000*

\* $p < .05$

The third hypothesis examined whether there was a relationship between the style of yoga practiced and participation in other types of physical activity.

$H_{03}$ : There is no relationship between the style of yoga practiced and participation in other types of physical activity.

$H_3$ : There is a relationship between the style of yoga practiced and participation in other types of physical activity.

A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and participation in other physical activities. The independent variables were 15 yoga styles, while the dependent variable was the number of other physical activities that were also participated in. The ANOVA was found to be significant for two of the 15 styles. General/hatha yoga,  $F(97, 285) = 8.22$ ,  $p = .004$  and .other style  $F(97, 285) = 4.78$ ,  $p = .03$  were significantly related to the participation in other physical activities. Table 35 presents the results of the analysis. While the results were significant for these yoga styles, the strength of the relationship, or effect size, was small for general/hatha ( $n^2 = .02$ ) and other style ( $n^2 = .01$ ). Post hoc tests were not performed because the variables have only two levels, three or more levels are needed to make multiple comparisons.

Table 35

*One-way Analysis of Variance: The Relationship Between Yoga Styles and Participation in Other Physical Activities*

Yoga style	F	Sig.	Partial eta squared
Ashtanga	.717	.398	.002
Vinyasa	1.765	.185	.005
Yin	2.561	.110	.007
Jivamukti	3.283	.071	.009
Integral	.262	.609	.001
Iyengar	.835	.361	.002
Kripalu	.614	.434	.002
Kundalini	.010	.922	.000
Sivananda	.118	.731	.000
Bhakti	.403	.526	.001
Yoga therapy	.511	.475	.001
General/hatha	8.221	.004*	.022
Thai yoga	.513	.474	.001
Acro yoga	1.922	.166	.005

Other style	4.781	.029*	.013
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\*p = .05

The second research question this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Hypothesis four examined whether there is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

RQ2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?

$H_{04}$ : There is no relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

$H_4$ : There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and the healthy, sustainable dietary and lifestyle behaviors choices that were adopted. The independent variables were 15 yoga styles, while the dependent variable was the number of healthy, sustainable dietary and lifestyle behavior choices that were adopted. The ANOVA was found to be significant for three of the 15 styles. General/hatha yoga,  $F(97, 285) = 4.10$ ,  $p = .04$ , ashtanga  $F(97, 285) = 4.20$ ,  $p = .04$ , and yoga therapy  $F(97, 285) = 4.42$ ,  $p = .04$  were significantly related to healthy, sustainable dietary and lifestyle behaviors that were adopted. Table 36 presents the results of the analysis. While the results were significant for these yoga styles, the strength of the

relationship, or effect size, was small for each style ( $n^2 = .01$ ). Post hoc tests were not performed because the variables have only two levels, three or more levels are needed to make multiple comparisons.

Table 36

*One-way Analysis of Variance: The Relationship Between Yoga Styles and Healthy, Sustainable Dietary and Lifestyle Behaviors*

Yoga style	F	Sig.	Partial eta squared
Ashtanga	4.208	.041*	.011
Vinyasa	.074	.785	.000
Yin	.026	.872	.000
Jivamukti	.008	.929	.000
Integral	1.323	.251	.004
Iyengar	.948	.331	.003
Kripalu	.011	.915	.000
Kundalini	1.415	.235	.004
Sivananda	.048	.827	.000
Bhakti	.332	.565	.001
Yoga therapy	4.421	.036*	.012
General/hatha	4.103	.044*	.011
Thai yoga	1.139	.287	.003
Acro yoga	.157	.693	.000
Other style	1.651	.200	.004

\*p = .05

The third research question this study was whether the style of yoga practiced had an impact on health related behaviors and health outcomes. Three hypotheses were tested, hypotheses five through seven.

RQ3: What are the perceived benefits and cues to action of yoga practice?

$H_{05}$ : There is no relationship between yoga practice and perceived improvement in physical or mental health conditions.

$H_5$ : There is a relationship between yoga practice and perceived improvement in physical or mental health conditions.

Hypothesis five examined whether there was a relationship between yoga practice and perceived improvement in improved physical or mental health conditions.

Spearman's correlation was used to examine scale variables of rated improvement of health conditions that yoga was used to treat. Correlation coefficients were computed among seven the medical condition improvements scales. Bonferroni was used to control Type I error across the 14 correlations, a p values of less than .004 ( $.5/14 = .004$ ) was required for significance. Results of the correlation are found in Table 37 and show that 15 of the 21 correlations were statistically significant,  $p = .000$ , and show positive correlations greater than or equal to .41. The highest correlations were found between cardiovascular conditions and women's health (.72), gastrointestinal and respiratory conditions (.71), mental and other conditions (.71), and cardiovascular and respiratory (.70). The overall results of the correlation analysis suggest that yoga practice can provide perceived improvements among multiple health conditions simultaneously.

Table 37

*Spearman's Correlation: Improvements of Health and Medical Conditions that Yoga has Been Used to Treat*

	Gastrointestinal	Respiratory	Muscular	Cardiovascular	Mental	Women's health
Respiratory	.71** (.000)					
Muscular	.41* (.045)	.56** (.000)				
Cardiovascular	.68** (.000)	.70** (.000)	.39* (.01)			
Mental	.49** (.000)	.41** (.003)	.51** (.000)	.33* (.035)		
Women's health	.60** (.000)	.64** (.000)	.54** (.000)	.72** (.000)	.47** (.000)	
Other	.40* (.044)	.59* (.001)	.58** (.000)	.69** (.002)	.71** (.000)	.52* (.004)

Note: R

(*p* value)

\**p* < .05

\*\**p* < .004

Hypothesis six examined whether there was a relationship between yoga practice and quality of life.

*H*<sub>06</sub>: There is no relationship between yoga practice and quality of life.

*H*<sub>6</sub>: There is a relationship between yoga practice and quality of life.

Spearman's correlation was computed among the five quality of life scales. Bonferroni was used to control Type I error across the 10 correlations,  $p$  values of less than .005 ( $.5/10 = .005$ ) was required for significance. Results of the correlation analysis are presented in Table 38 and show that all 10 correlations were statistically significant,  $p = .000$ , and show a positive correlation of greater than or equal to .48. The highest correlations were between emotional and mental health (.88). The overall results suggest that yoga practice can increase quality of life in all five categories simultaneously since there were found to be high correlations among improvements in quality of life among each category tested.

Table 38

*Spearman's Correlation: Quality of Life Resulting From Yoga Practice*

	Physical health	Mental health	Emotional health	Spiritual health
Mental health	.65*			
Emotional health	.60*	.88*		
Spiritual health	.48*	.68*	.71*	
Relationships	.49*	.67*	.68*	.72*

\* $p < .005$ 

Hypothesis seven examined whether there was a relationship between the reason for beginning and continuing yoga practice.

$H_{07}$ : There is a relationship between the reason for beginning and continuing yoga practice.

$H_7$ : There is a relationship between the reason for beginning and continuing yoga practice.

The McNemar Chi Square test was used to examine the relationship between 11 categories of reasons for beginning and reasons for continuing yoga practice. Results of the McNemar chi square test of dependent proportions found percentages for health and fitness, flexibility and muscle tone, reduce stress or anxiety, treat medical condition, spiritual path, personal development, and enhance another activity reasons for beginning and continuing yoga practice were significantly different ( $p < 0.05$ ) from each other ( $p = 0.00$ ), women's health ( $p = 0.008$ ), and other reason ( $p = 0.002$ ), as presented in Table 39. Trendy and pregnancy were found not to be significantly different. Results indicate that yoga practitioners begin practicing for one reason but continue for a different reason.

Table 39

*McNemar Chi Square: Reasons for Beginning and Continuing Yoga Practice*

Reason for beginning & continuing	<i>N</i>	Chi-square	Asymp. sig.	Exact sig. (2-tailed)
Health & fitness	229	227.004	.000*	
Flexibility & muscle tone	199	197.005	.000*	
Reduce stress or anxiety	162	160.006	.000*	
Treat medical condition	57	55.018	.000*	
Pregnancy	2			.500
Women's health	8			.008
Spiritual path	88	86.011	.000*	
Personal development	109	107.009	.000*	
Enhance another activity	43	41.023	.000*	
Other	10			.002

*Note.* Trendy was not included in the analysis due to the lack of respondents selecting it for reasons for both beginning and continuing.

\* $p < .05$

### Summary

A total of 383 participants completed survey through Facebook, providing a response rate of 27.1%. The majority of participants were Caucasian females between 30 and 39 years of age from the United States. The highest percentage of participants held a bachelor or graduate degree with an annual household income between \$50,000 and \$74,999.

The most frequent styles of yoga practiced were vinyasa and general/hatha, however nearly half of participants reported practicing multiple styles of yoga. More than 70% of participants were classified as either underweight or normal weight. Mean BMI's for all but two yoga practice styles were in the normal range. One quarter of

participants reported disease diagnosis prior to beginning yoga practice, while only 7.3% reported disease diagnosis after beginning yoga practice. The most frequent type of activity reported was walking. General/hatha, vinyasa, ashtanga, and other styles reported participation in up to 18 other types of physical activities. Nearly 30% participants were vegetarian and did not consume alcohol. Nearly half preferred low fat foods, more than half preferred organic and low sugar foods, and nearly three quarters preferred natural foods and were nonsmokers. The highest percentage of participants adopted 4 to 5 healthy, sustainable dietary or other lifestyle behaviors. The mean number of healthy dietary and lifestyle behaviors among the yoga practice styles was very similar, ranging from 3 to 4. All of the health and medical conditions that participants used yoga to treat were a little better or better. Participants reported all aspects of quality of life were better due to yoga practice, with the exception of relationships was rated as a little better. Health and fitness was the highest reported reason for beginning and continuing yoga practice.

Seven hypotheses were developed for the study. Each of these hypotheses was tested using inferential statistics with a criterion level of .05 or lower.

The first hypothesis examined whether there was an association between the style of yoga practiced and BMI. While the mean BMI for all yoga styles was in the normal range, multiple linear regression analysis found statistically significant predictors of BMI were found in two of the 15 yoga styles. Ashtanga was found to have a negative correlation (-.16) with BMI and was correlated with lower BMI scores which accounted

for 3% of the variance. Kundalini had a positive correlation (.11) with BMI and was correlated with higher BMI scores, accounting for 1% of the variance.

The second hypothesis examined whether there was an association between self-reported chronic disease diagnosis before and after initiating yoga practice. The McNemar Chi Square test of dependent proportions was used to examine the incidence of self-reported disease diagnosis before and after beginning yoga practice. Disease diagnosis prior to beginning yoga practice was reported by 25.3% of participants while only 7.3% reported disease diagnosis after initiating yoga practice. These percentages were found to be statistically significant, suggesting that yoga practice may provide a reduction in the incidence of disease development following practice.

The third hypothesis examined whether there was a relationship between the style of yoga practiced and participation in other types of physical activity. While 90% of participants reported walking, four yoga styles (general/hatha, vinyasa, ashtanga, and other style) reported participation in up to 20 other types of physical activities in addition to yoga practice. A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and participation in other physical activities. Two of the 15 styles were found to be statistically significant. General/hatha and other style were found to be significant and have a small effect size. These results suggest that individuals who practice general/hatha and other styles of yoga may be more likely to also participate in a high number of other physical activities.

The fourth hypothesis examined whether there was a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices. A one-way analysis of variance was conducted to evaluate the relationship between yoga styles and the healthy, sustainable dietary and lifestyle behaviors choices that were adopted. Three of the 15 yoga styles were found to be statistically significant. General/hatha, ashtanga, and yoga therapy were found to be significant with a small effect size. These results suggest that individuals who practice general/hatha, ashtanga, and other styles of yoga may be more likely to adopt healthy, sustainable dietary and behavioral choices.

The fifth hypothesis examined whether there was a relationship between yoga practice and perceived improvement in physical or mental health conditions. Spearman's correlation was used to examine scale variables of rated improvement of health conditions that yoga was used to treat. Results of seven medical condition improvement scales found that 15 of the 21 correlations of perceived improvements of health conditions were statistically significant at a level of .004 with positive correlations. Mean responses in all conditions that yoga was used to treat were found to have been rated better or a little better. The highest correlations were found between cardiovascular conditions and women's health, gastrointestinal and respiratory conditions, mental and other conditions, and cardiovascular and respiratory. These results suggest that yoga practice may provide perceived improvements among multiple health conditions simultaneously.

The sixth hypothesis examined whether there was a relationship between yoga practice and quality of life. Spearman's correlation was computed among the five quality of life scales. Results of five categories of quality of life improvement scales found that all ten of the correlations were found to be statistically significant at .005 with positive correlations. The highest correlations were found between emotional and mental health. These results suggest that yoga practice may provide improvements in all aspects of quality of life.

The seventh hypothesis examined whether there was a relationship between the reason for beginning and continuing yoga practice. The McNemar Chi Square test was used to examine the relationship between 11 categories of reasons for beginning and reasons for continuing yoga practice. Seven of the 10 reasons for beginning and continuing yoga practice that were analyzed were found to be statistically significant and different from each other. These results suggest yoga practitioners begin yoga practice for one reason; however, they continue for a different reason.

Chapter 5 provides a discussion of the results, interpretation of the results and conclusions of the study. This chapter will also provide recommendations for future research and implications for social change.

## Chapter 5: Discussion, Conclusions, and Recommendations

### **Introduction**

The purpose of this study was to investigate the attitudes, beliefs, and behavior practices of mixed styles of yoga practitioners to measure associations between these and sustainable environmental and health outcomes. Many interventions and cross sectional studies have been conducted using various individual styles of yoga and results have shown to improve health parameters of the participants. This study was undertaken in an effort to determine whether similar results could be found among mixed styles of practice outside interventions and whether a particular style or styles provide greater health benefits.

### **Summary**

Three research questions and seven hypotheses were addressed in this study. Each hypothesis was tested using inferential statistics with a significance level of .05 or smaller.

### **Hypotheses**

The following seven hypotheses were tested the answer three research questions in this study.

RQ1: Does the style of yoga practiced have an impact on health related behaviors and health outcomes?

$H_{01}$ : There is no association between the style of yoga practiced and body mass index.

$H_1$ : There is an association between the style of yoga practiced and body mass index.

Results of a multiple linear regression analysis found two of the 15 styles of yoga to be statistically significant and the null hypothesis was rejected. Ashtanga yoga practice was found to have a negative correlation on BMI and kundalini yoga was found to have a positive correlation on BMI. Mean BMI's for all 15 yoga styles were in the normal range.

$H_{02}$ : There is no association between self-reported chronic disease diagnosis before and after initiating yoga practice.

$H_2$ : There is an association between self-reported chronic disease diagnosis before and after initiating yoga practice.

Results of the McNemar chi square test of dependent proportions found a statistical significance in disease diagnosis before and after beginning yoga practice and the null hypothesis was rejected. Rates of disease diagnosis were lower after beginning yoga practice than before practice.

$H_{03}$ : There is no relationship between the style of yoga practiced and participation in other types of physical activity.

$H_3$ : There is a relationship between the style of yoga practiced and participation in other types of physical activity.

Results of a one-way analysis of variance found two of the 15 yoga styles to be statistically significant and the null hypothesis was rejected. General/hatha and other styles of yoga were significantly related to participation in a higher number of other physical activities.

RQ2: What influence does yoga have on sustainable environmental and human health through dietary and other lifestyle behaviors?

$H_{04}$ : There is no relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

$H_4$ : There is a relationship between the style of yoga practiced and healthy, sustainable dietary and behavioral choices.

Results of a one-way analysis of variance found three of the 15 yoga styles to be statistically significant and the null hypothesis was rejected. General/hatha, ashtanga, and yoga therapy were significantly related to adoption of healthy, sustainable dietary and behavioral choices.

RQ3: What are the perceived benefits and cues to action of yoga practice?

$H_{05}$ : There is no relationship between yoga practice and perceived improvement in physical or mental health conditions.

$H_5$ : There is a relationship between yoga practice and perceived improvement in physical or mental health conditions.

Results of a Spearman's correlation coefficient that examined scale rated perceived improvements in health conditions that yoga was used to treat found 15 of the 21 correlations to be statistically significant and the null hypothesis was rejected. All conditions that yoga was used to treat were reported as better or a little better.

$H_{06}$ : There is no relationship between yoga practice and quality of life.

$H_6$ : There is a relationship between yoga practice and quality of life.

Results of a Spearman's correlation that examined scale rated quality of life resulting from yoga practice found all 10 correlations to be statistically significant and the null hypothesis was rejected. All quality of life categories were reported as better or a little better due to yoga practice.

$H_{07}$ : There is no relationship between the reason for beginning and continuing yoga practice.

$H_7$ : There is a relationship between the reason for beginning and continuing yoga practice.

McNemar chi square test results found the relationship between seven of the 11 categories for reasons for beginning and continuing yoga practice to be statistically significant and different from each other and the null hypothesis was rejected. Yoga practitioners begin yoga practice and continue to practice yoga for different reasons.

### **Interpretation of the Findings**

The first research question was positively confirmed, yoga practice has an impact on health related behaviors and health outcomes. Results of the study confirm previous research that yoga practice has a positive impact on health related behaviors and health outcomes. Hypothesis 1 confirmed there was an association between the style of yoga practiced and BMI. Moreover, the ashtanga yoga style was shown to result in lower BMIs while kundalini was shown to result in higher BMIs. These differences may be due to the physically vigorous nature of the ashtanga style, compared to the kundalini style that focuses more on meditation and chanting. Results of this study also demonstrated that 70% yoga practitioners were underweight or normal weight that also aligns with previous findings that reported participants who regularly practice yoga have normal weight and BMI (Kristal et al, 2005).

Hypothesis 2 confirmed a statistical significance between self-reported chronic disease development before and after beginning yoga practice. Reductions in rates of self-reported diagnosis of chronic diseases after beginning yoga practice that were demonstrated in this study supports results of earlier research intervention that indicated yoga practice reduces chronic disease and indicators of chronic disease. In previous research yoga practice was shown to provide reductions in LDL cholesterol, increased HDL cholesterol and improved antioxidant (Bijlani, et al., 2005; Sinha, et al., 2007).

Hypothesis 3 confirmed that there was a statistical significance in the style of yoga practiced and participation in other types of physical activity. Two of the 15 styles,

genera/hatha and other style, were significantly related to participation in a higher number of physical activities with a small effect size. Descriptive statistic results of this study were similar to the Yoga in Australia study, where the majority of participants reported walking (90%) and overall participation in other types of physical activity of was reported above the national level (Penman et al, 2012).

The second research question was also positively confirmed, yoga practice may have an influence on sustainable environmental and human health through dietary and other lifestyle behaviors. Rates of participants that reported healthy behaviors such as being a nonsmoker, nonalcoholic drinker, vegetarian or vegan, and preferred organic foods that were found in this study were similar to the Yoga in Australia study. Natural foods were preferred by a large percentage (76.2%) of participants. This preference is highly beneficial to environmental sustainability due to the lack of processing and also health promoting. Moreover, more than one third (38.9%) of participants reported being vegetarian or vegan. This dietary behavior is also highly health promoting, promoting a healthy weight, increased intake of fruits, vegetables, and antioxidants, and also consumes less energy, emits less pollution than a diet that includes meat, and reduce health risks for many chronic diseases (Somannavar & Kodliwadmath, 2011). Organic foods were preferred by 59.8% of participants. Because pesticide residues have been shown to disrupt endocrine function, increase risks for certain cancers and contamination of drinking water, soil, and food products, and promote antibiotic resistance and foodborne pathogens that result in human morbidity and mortality, avoiding this exposure

through intake of organic foods in highly sustainable (Horrigan et al., 2002). Hypothesis 4 confirmed that there was a statistically significant relationship between three of the 15 styles of yoga that practiced and healthy, sustainable dietary and behavioral choices. General/hatha, ashtanga, and yoga therapy practitioners were found to be significant with a small effect size.

The third research question inquired about the perceived benefits and cues to action from yoga practice and hypotheses 5 through 7 relate to the Health Belief Model perceived benefits and cues to action constructs. Perceived benefits included improvements in medical conditions that yoga was used to treat and improved quality of life due to yoga practice. Both of these perceived benefits may provide cues to action for beginning and continuing yoga practice. Hypothesis 5 confirmed that there was a statistical significance between yoga practice and perceived improvement in physical or mental health conditions that yoga was used to treat. Participants reported perceived improvements, rated better or a little better, in all conditions that yoga was used to treat. These findings are similar to the results found in interventions that provided significant improvements in resting heart rate and blood pressure, improved quality of life, cancer and diabetes management, and reduced risks for morbidity and mortality of cardiovascular disease (Duraiswamy et al., 2011; Herur et al., 2010; Lin et al., 2011). These results suggest that yoga may be a beneficial complementary or alternative treatment to be integrated into western medicine for disease and medical condition symptom management.

Hypothesis 6 confirmed that there was a statistical significance between yoga practice and improved quality of life. Similar to results of a short term intervention by Herur et al. (2010) that improved quality of life of participants, results of this study found that yoga had a positive impact on all five quality of life categories. Similar findings were also found in the Yoga in Australia study, physical health was rated as most improved due to yoga practice, followed by emotional, mental, and spiritual health, and relationships (Penman et al, 2012).

Hypothesis 7 confirmed a statistically significant difference between the reasons for beginning and reasons for continuing yoga practice. Results of this study are similar to the results found in the Australian study which found the most common reasons for beginning and continuing yoga practice are to improve health and fitness and increase flexibility and muscle tone and found the highest increases for continuing practice were personal development and a spiritual path (Penman et al, 2012). The results also align with the perceived benefits found by Atkinson and Permuth-Levine (2009) which included health promotion and wellness, disease prevention, and social and psychological benefits.

In summary, regular practice of mixed styles of yoga, when compared to outcomes that have been reported in previous yoga research interventions of short term duration, those conducted on the iyengar yoga style, cross sectional studies of yoga participants, as well as the research performed in Australia, demonstrates similar positive health impacts. The outcomes of this study are important for health care providers,

public health, individuals, and society at large as they provide a glimpse of the benefits of yoga practice. These findings are supported by the literature and highlight the potential for yoga to be incorporated into cultural practices for optimum health outcomes in the sustainable treatment and prevention of disease, sustainable health promotion, and also sustainable dietary and behavioral practices that also promote environmental.

### **Limitations of the Study**

Limitations and threats to validity of this study might have resulted due to the nature of the cross sectional study design, the sampling procedures, and survey. This type of study design might have resulted in responses to the survey that were subject to recall bias. Self-reported health improvements from yoga practice are perceived and disease diagnosis may also be subject to bias. The boundaries of this study are limited to a population of mostly female adults ages 18 and older who practice yoga and have access to the Internet and Facebook. Also, there was an unexpected participant response rate (20.9%) from countries outside of the United States and therefore generalizability to the U.S. population may not be entirely possible. Another limitation was in the survey instrument. Survey questions might not have been comprehended the same among participants of varying depth of practice or country of origin because there were no definitions of yoga terms provided. In fact, several respondents reported not knowing what style of yoga they practiced, while many others could report another specific style or styles not represented on the survey. Lastly, evaluation and results of factors

associated with individual styles of yoga may be confounded since most participants practiced multiple styles.

### **Recommendations**

Findings of this research study and other research studies in the literature review report that yoga is most often practiced by wealthier, higher educated, Caucasian women. Because of these factors several gaps in yoga research continue to exist. It is recommended that future yoga research be conducted on men and children to see whether similar benefits are demonstrated in these groups. Since the origins of yoga in India were a male-dominated practice, social and cultural perceptions about yoga should be examined to see why so few men in the United States practice. Since yoga has shown to provide the tools and skills for stress management, proper diet, and deeper connections to higher purpose and meaning, perhaps the greatest impact would be to teach yoga to children early in life. Organizations such as K-12Yoga.org are working to bring yoga practice into more schools. Future research should evaluate school yoga programs.

Since most yoga practitioners are Caucasian and wealthy, yoga research is needed in underrepresented groups and individuals of low socioeconomic status who are at the highest risk for morbidity and mortality from chronic diseases. These individuals are in need of disease prevention interventions through yoga but since the average yoga class costs \$10-\$20 most cannot afford to take part. There is a movement taking place in the yoga community, more yoga studios are becoming donation-based and take payment for classes based upon ability to pay. Some yoga studios, such as I Love Yoga in Dania

Beach, Florida, are donation based and also use energy exchange, where yoga practitioners can trade time working in the studio as compensation for classes. There are also yoga teachers and organizations, such as Off the Mat, Into the World, who donate their time and devote their teachings and seva, or service, to low income groups, as well as abused and victimized individuals in the United States and around the world. These types of practices are in need of study to determine the efficacy of their efforts and how well they reach the populations in need.

Yoga is already being used as a complementary treatment in cancer and cardiac patients in a few medical facilities. One example is the Side by Side Cancer Wellness Center at the Simmons Cancer Institute in Springfield, Illinois. This treatment center uses yoga and many other alternative therapies to help patients and their care takers cope with the disease and treatment. Increased research and funding should be provided for these types of programs to study their efficacy and promote increased awareness in the medical community.

Moreover, due to the large number of participants in this study selecting general/hatha, vinyasa, and other styles, which seem to be a “catch all” for vague practice styles without specific practice information, future studies of mixed yoga styles should examine the specific practice components, such as asana, breathing, philosophy, and meditation, to gain a deeper understanding of each type of practice and the most suitable style for a particular intervention, prevention, or treatment of specific typed of diseases.

### **Implications for Positive Social Change**

Implications for positive social change as a result of the findings of this study include increased integration of yoga as a technique for primary disease prevention and western medical treatment for disease symptom treatment and management. These integrations would require integrating yoga practice into middle and high school curriculum, the workplace, public health department programs, and medical treatment centers to make yoga practice accessible to individuals of all ages, genders, and levels of socioeconomic status. These actions would require yoga education and training in medical and nursing schools as well as elementary and high school teacher curriculum. These integrations have the potential to provide individuals and health care providers with the tools and practices to promote healthy behavior practices that can prevent disease and also enhance medical treatments that may result in a reduction of expensive pharmacological and surgical treatments. Consequences of these actions include the ability to reduce healthcare and medical costs and promote a sustainable and affordable self-care healthcare system in the United States.

### **Conclusion**

Unhealthy diet and lifestyle behaviors are contributing to an increased incidence of obesity and chronic disease. Unsustainable food production practices contribute to deteriorating environmental conditions. Both of these factors contribute to healthcare costs that continue to skyrocket in an unsustainable manner. Alternative, healthy and sustainable practices must be examined. Results of this study found that a holistic yogic

lifestyle can be preventative and alternative medicine that can provide perceived improvements in many health conditions and quality of life, as well as promote a healthy weight, dietary and lifestyle choices. Yoga education and practice should be accessible to all people regardless of age, gender, and socioeconomic status. Findings of this study can be used to inform future research and provide evidence for the implementation of positive cultural and social change interventions across multiple levels, including individual, organizational, and societal avenues. Yoga practice can be more than merely exercise; it can be a way of life that guides actions such as lifestyle and dietary choices.

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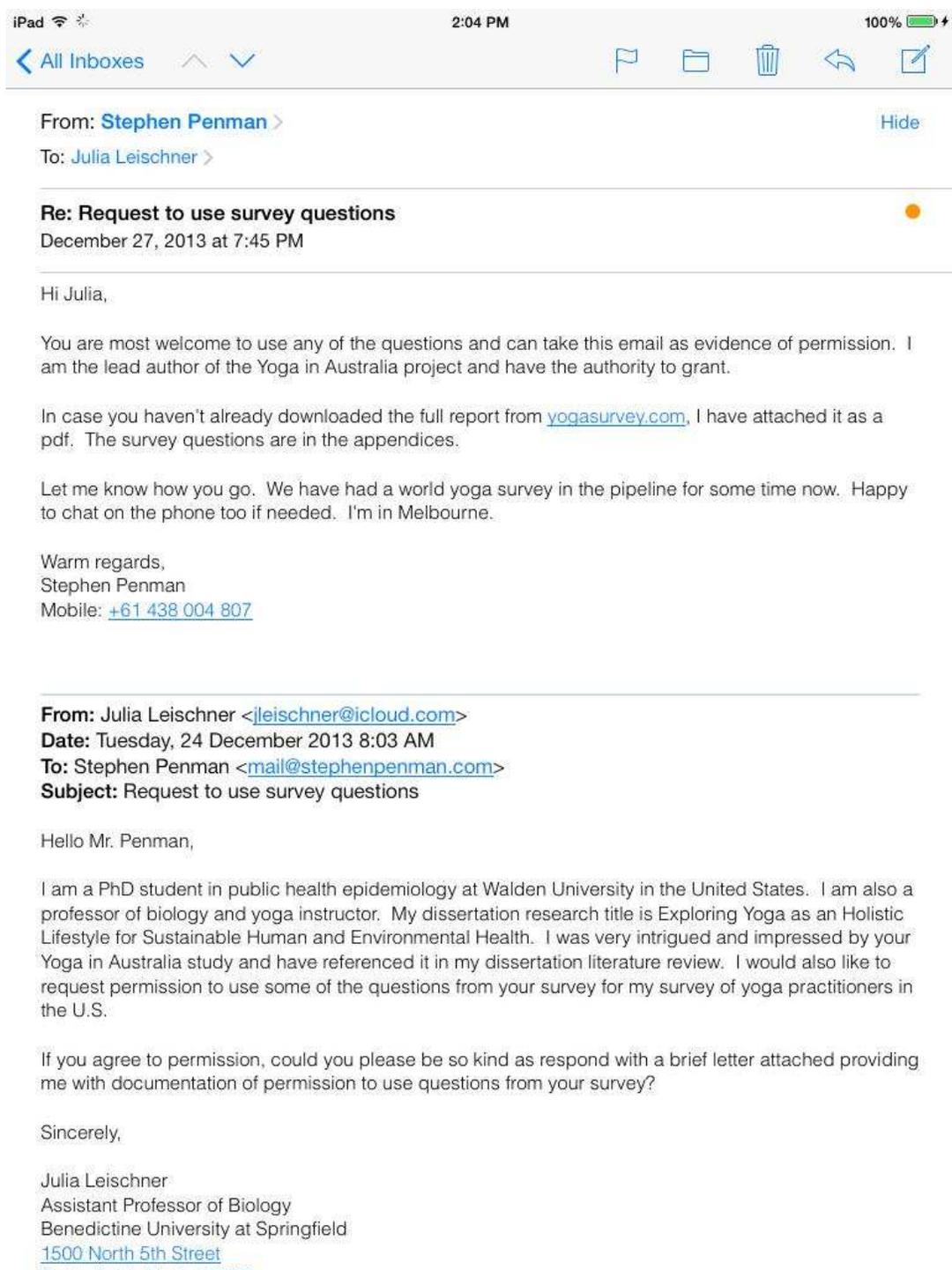
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## Appendix A: Permission to Use Yoga Survey





## Appendix B: Yoga Survey

### Informed Consent

You have been selected to participate in a research study by completing a survey about your yoga practice. You have been selected because you have commented on or are friends with a yoga related Facebook page.

#### Purpose of the Study:

The aim of this study is to investigate the attitudes, beliefs, practices, and health status of mixed styles of yoga practitioners and examine yoga as a holistic lifestyle for sustainable human and environmental health.

#### Survey:

Completion of this survey is completely voluntary and no compensation will be provided for completing this survey questionnaire. The survey will take about 15 minutes to complete and will include questions about your yoga and meditation practice, how often you practice, your type of practice, and lifestyle habits. Other questions will address perceptions of your overall physical and mental health as well as any health conditions you may have.

#### Benefits of this Study:

You will be contributing to knowledge about the impact that yoga practice has on human and environmental health.

#### Risks or discomforts:

No risks or discomforts are anticipated from taking part in this study. You may withdraw from the study altogether, even after completion. If you decide to quit at any time before you have finished the questionnaire, your answers will NOT be recorded.

#### Confidentiality and Anonymity:

Your responses will be anonymous. We will NOT know your IP address when you respond to the Internet survey. After data collection and analysis have been completed a summary will be posted to provide the study results.

Questions about the research can be addressed to Julia Leischner by submitting an email to [julia.leischner@waldenu.edu](mailto:julia.leischner@waldenu.edu). You may contact the Walden University Research Participant Advocate (612) 312-1210 or email to [irb@waldenu.edu](mailto:irb@waldenu.edu) to learn more about your rights as a participant in this study. Walden University's approval number for this study is 07-30-14-0153982 and it expires on July 29, 2015. Please keep/print a copy of the consent form.

Thank you for participating!

Julia Leischner  
Doctoral Researcher  
Walden University



**<p>Yoga Research Survey</p><p> </p>**

**Your Demographic Information**

**\* 1. In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)**  
**If residing outside the U.S., in what country is your home located?**

**\* 2. Are you male or female?**

Male

Female

**\* 3. Which category below includes your age?**

17 or younger

18-20

21-29

30-39

40-49

50-59

60 or older

**\* 4. What year were you born?**

**\* 5. Are you now married, widowed, divorced, separated, or never married?**

Married

Widowed

Divorced

Separated

Never married



**<p>Yoga Research Survey</p><p> </p>**

**\*6. Which race/ethnicity best describes you? (Please choose only one.)**

American Indian or Alaskan Native

Asian / Pacific Islander

Black or African American

Hispanic American

White / Caucasian

Multiple ethnicity / Other (please specify)

**\*7. What is the highest level of school you have completed or the highest degree you have received?**

Less than high school degree

High school degree or equivalent (e.g., GED)

Some college but no degree

Associate degree

Bachelor degree

Graduate degree

**\*8. What is your approximate average household income?**

\$0-\$24,999

\$25,000-\$49,999

\$50,000-\$74,999

\$75,000-\$99,999

\$100,000-\$124,999

\$125,000-\$149,999

\$150,000-\$174,999

\$175,000-\$199,999

\$200,000 and up

Number of wage earners in the household



**Yoga Research Survey**

**\*9. Which of the following best describes your current occupation?**

- Personal Care and Service Occupations
- Community and Social Service Occupations
- Office and Administrative Support Occupations
- Computer and Mathematical Occupations
- Management Occupations
- Healthcare Practitioners and Technical Occupations
- Life, Physical, and Social Science Occupations
- Installation, Maintenance, and Repair Occupations
- Farming, Fishing, and Forestry Occupations
- Building and Grounds Cleaning and Maintenance Occupations
- Sales and Related Occupations
- Legal Occupations
- Architecture and Engineering Occupations
- Protective Service Occupations
- Arts, Design, Entertainment, Sports, and Media Occupations
- Business and Financial Operations Occupations
- Education, Training, and Library Occupations
- Food Preparation and Serving Related Occupations
- Construction and Extraction Occupations
- Healthcare Support Occupations
- Production Occupations
- Transportation and Materials Moving Occupations
- Other (please specify)



**Yoga Research Survey**

**Your Vital Statistics & Overall Health**

**\* 10. What is your height in feet and inches?**

Feet

Inches

**\* 11. What is your current weight in pounds?**

**\* 12. How physically healthy are you?**

Extremely healthy

Very healthy

Moderately healthy

Slightly healthy

Not at all healthy

**\* 13. How many infections or illnesses (colds, flus, or other acute infectious viral or bacterial infections) have you had in the past 12 months?**

None

1-2

3-4

More than 5

Other (please specify)

**\* 14. In general, how would you rate your overall mental or emotional health?**

Excellent

Very good

Good

Fair

Poor



**Yoga Research Survey**

**\*15. In general, how would you rate your overall health?**

- Excellent
- Very good
- Good
- Fair
- Poor



<p>Yoga Research Survey</p><p> </p>

Your Yoga Practice

**\*16. How often in the past 12 months have you practiced yoga or meditation on average? (include classes and private practice)**

- 7 or more sessions per week
- 5-6 sessions per week
- 3-4 sessions per week
- 1-2 sessions per week
- Less than weekly
- Less than monthly
- Not at all

If you have not practiced in the past year please specify why.

**\*17. What is the average length of your practice session?**

- Less than 15 minutes
- 15-25 minutes
- 30-40 minutes
- 45-55 minutes
- 60-70 minutes
- 75-85 minutes
- 90-100 minutes
- More than 100 minutes



**Yoga Research Survey**

**\* 18. Please select the reason (or reasons) that prompted you to begin yoga or meditation practice, and if different, the reason you continue to practice.**

	Reasons for beginning	Reasons for continuing
Trendy, in vogue	<input type="checkbox"/>	<input type="checkbox"/>
Increase health and fitness	<input type="checkbox"/>	<input type="checkbox"/>
Increase flexibility and/or muscle tone	<input type="checkbox"/>	<input type="checkbox"/>
Reduce stress or anxiety	<input type="checkbox"/>	<input type="checkbox"/>
Alleviate or treat a specific health reason or medical condition	<input type="checkbox"/>	<input type="checkbox"/>
Pregnancy/childbirth	<input type="checkbox"/>	<input type="checkbox"/>
Menopause or other other woman's health issue	<input type="checkbox"/>	<input type="checkbox"/>
Spiritual path	<input type="checkbox"/>	<input type="checkbox"/>
Personal development	<input type="checkbox"/>	<input type="checkbox"/>
Enhance performance in another activity	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**\* 19. How long have you been practicing yoga or meditation?**

0 - 6 months

7 months - 1 year

2 - 4 years

5 - 7 years

8 - 10 years

10 - 15 years

16-20 years

More than 20 years



**Yoga Research Survey**

**\*20. Which styles or lineages of yoga have you practiced in the last 12 months and which do you practice regularly? (Note: not all styles are listed, if you practice a blend, select multiple)**

	Practiced in past 12 months	Practice regularly
Ashtanga	<input type="checkbox"/>	<input type="checkbox"/>
Vinyasa	<input type="checkbox"/>	<input type="checkbox"/>
Yin	<input type="checkbox"/>	<input type="checkbox"/>
Jivamukti	<input type="checkbox"/>	<input type="checkbox"/>
Integral	<input type="checkbox"/>	<input type="checkbox"/>
Iyengar	<input type="checkbox"/>	<input type="checkbox"/>
Kripalu	<input type="checkbox"/>	<input type="checkbox"/>
Kundalini	<input type="checkbox"/>	<input type="checkbox"/>
Sivananda	<input type="checkbox"/>	<input type="checkbox"/>
Bhakti	<input type="checkbox"/>	<input type="checkbox"/>
Yoga therapy	<input type="checkbox"/>	<input type="checkbox"/>
General/Hatha	<input type="checkbox"/>	<input type="checkbox"/>
Thai Yoga	<input type="checkbox"/>	<input type="checkbox"/>
AcroYoga	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**Yoga Research Survey**

**\*21. Please indicate which of the following aspects that you incorporate into your yoga practice, meditation practice, or daily life and rate the importance in relation to your practice.**

	Not sure (little to no knowledge of this aspect)	Unimportant (do not incorporate)	Not very important (incorporate less than monthly)	Somewhat important (incorporate monthly)	Important (incorporate weekly)	Very important (incorporate daily)
Kriyas (purification, cleansing, and/or energy stimulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bandhas (muscular/energy locks or neurological and prana redirection techniques)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mudras (gestures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Study of yogic texts and philosophy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attend yoga workshops or retreats on yoga or meditation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yama (universal moral commandments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Niyama (self-purification by discipline)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asanas (body postures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pranayama (breath control)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pratyahara (withdrawal of the senses)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dharana (concentration and cultivating inner awareness)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dhyana (devotion and meditation on the Divine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Samadhi (union with the Divine)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)	<input type="text"/>					



**Yoga Research Survey**

**\*22. Which styles of meditation have you practiced in the last 12 months and which do you practice regularly? (Note: not all styles are listed, if you practice a blend, select multiple)**

	Practiced in the past 12 months	Practice regularly
Buddhist meditation	<input type="checkbox"/>	<input type="checkbox"/>
Christian meditation	<input type="checkbox"/>	<input type="checkbox"/>
General meditation (chakra, sound, mantra, visualization)	<input type="checkbox"/>	<input type="checkbox"/>
Raja yoga	<input type="checkbox"/>	<input type="checkbox"/>
Transcendental meditation	<input type="checkbox"/>	<input type="checkbox"/>
Vipassana meditation	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**\*23. Please select the meditation practices you use.**

- Do not meditate
- Breath
- Mantra
- Visualization
- Prayer
- Movement
- Sound
- Focus on deity or guru
- Other

Other (please specify)



**<p>Yoga Research Survey</p><p> </p>**

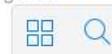
**\*24. Please estimate the amount of time devoted to each aspect of your practice per session**

	Do not practice	Less than 5 minutes	5-15 minutes	20-35 minutes	40-55 minutes	60-75 minutes	More than 80 minutes
Asana [postures]	<input type="checkbox"/>						
Pranayama [breathing to direct life force energy]	<input type="checkbox"/>						
Meditation [mental focus or mindfulness]	<input type="checkbox"/>						
Vinyasa [dynamic sequences]	<input type="checkbox"/>						
Relaxation [yoga nidra/guided relaxation]	<input type="checkbox"/>						
Other practices	<input type="checkbox"/>						
Other (please specify)	<input type="text"/>						

**\*25. Please indicate the locations you have practiced yoga in the past 12 months.**

- Yoga studio
- Ashram
- Workplace
- School or university
- Fitness center or gym
- Medical center
- Home
- Church or community center

Other (please specify)



**Yoga Research Survey**

**\*26. Please select the physical activities (other than yoga) you have participated in during the past 12 months and indicate how often you participated.**

	Daily	5 - 6 days per week	3 - 4 days per week	1 - 2 days per week	Less than weekly	Less than monthly
Walking	<input type="checkbox"/>					
Aerobics	<input type="checkbox"/>					
Swimming	<input type="checkbox"/>					
Golf	<input type="checkbox"/>					
Tennis	<input type="checkbox"/>					
Cycling	<input type="checkbox"/>					
Running/jogging	<input type="checkbox"/>					
Fishing	<input type="checkbox"/>					
Tai chi	<input type="checkbox"/>					
Pilates	<input type="checkbox"/>					
Crossfit	<input type="checkbox"/>					
Zumba/dance	<input type="checkbox"/>					
Strength training	<input type="checkbox"/>					
Martial arts	<input type="checkbox"/>					
Hockey	<input type="checkbox"/>					
Basketball	<input type="checkbox"/>					
Baseball	<input type="checkbox"/>					
Soccer	<input type="checkbox"/>					
Climbing	<input type="checkbox"/>					
Other	<input type="checkbox"/>					
None	<input type="checkbox"/>					

Other (please specify)



**Yoga Research Survey**

**How Yoga Impacts Your Life**

**\*27. Please indicate your current dietary and behavior choices and if your yoga practice has influenced you to make this choice.**

	Dietary or behavior choice	Influenced by yoga
Vegetarian	<input type="checkbox"/>	<input type="checkbox"/>
Vegan	<input type="checkbox"/>	<input type="checkbox"/>
Prefer organic foods	<input type="checkbox"/>	<input type="checkbox"/>
Prefer foods low in refined sugar	<input type="checkbox"/>	<input type="checkbox"/>
Prefer low fat/ low saturated fat foods	<input type="checkbox"/>	<input type="checkbox"/>
Prefer natural foods that have been minimally processed	<input type="checkbox"/>	<input type="checkbox"/>
Non-smoker	<input type="checkbox"/>	<input type="checkbox"/>
Non-alcoholic beverage drinker	<input type="checkbox"/>	<input type="checkbox"/>
Do not consume caffeine (tea, coffee, soda, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**Yoga Research Survey**

**\*28. Please select the medical conditions that you have been diagnosed with and indicate if the diagnosis was prior to or after the adoption of yoga practice.**

	Diagnosis prior to adoption of yoga	Diagnosis after the adoption of yoga
Coronary or peripheral artery disease	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure	<input type="checkbox"/>	<input type="checkbox"/>
High cholesterol	<input type="checkbox"/>	<input type="checkbox"/>
Metabolic syndrome	<input type="checkbox"/>	<input type="checkbox"/>
Diabetes	<input type="checkbox"/>	<input type="checkbox"/>
Heart Attack	<input type="checkbox"/>	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>
Emphysema	<input type="checkbox"/>	<input type="checkbox"/>
Arthritis	<input type="checkbox"/>	<input type="checkbox"/>
Cancer	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

**<p>Yoga Research Survey</p><p> </p>**

**\*29. Please select the medical conditions that you have used yoga to treat or alleviate symptoms for the condition and describe the outcome.**

	Much better	Better	A little better	Same	A little worse	Worse	Much worse
Gastrointestinal (irritable bowel, celiac disease, other digestive disorder)	<input type="checkbox"/>						
Musculoskeletal (Back pain, muscular pain, joint pain, arthritis)	<input type="checkbox"/>						
Respiratory (Asthma or other lung/respiratory disorder)	<input type="checkbox"/>						
Cardiovascular (Heart disease, high blood pressure, high cholesterol)	<input type="checkbox"/>						
Mental health (Anxiety, depression, sleep disorder)	<input type="checkbox"/>						
Woman's health (Pregnancy, menopause)	<input type="checkbox"/>						
Other (Diabetes, lose weight, etc.)	<input type="checkbox"/>						
None	<input type="checkbox"/>						
Other (please specify)	<input type="text"/>						

**\*30. Please indicate how yoga practice has affected your quality of life.**

	Much better	Better	A little better	The Same	A little worse	Worse	Much worse
Physical health (fitness, muscle tone, flexibility, energy)	<input type="checkbox"/>						
Mental Health (memory, depression, sense of purpose or meaning, positivity)	<input type="checkbox"/>						
Emotional health (emotional stability, stress, anger, anxiety)	<input type="checkbox"/>						
Spiritual health (sense of inner peace, happiness, relationship to higher power)	<input type="checkbox"/>						
Relationships (quality of close friendships, family life, friends, sex life)	<input type="checkbox"/>						
Other (please specify)	<input type="text"/>						



**Yoga Research Survey**

**31. Any other comments? How has yoga impacted or influenced your health or lifestyle?**



**Thank you for completing this questionnaire, Namaste.**

**32. The purpose of this study is to examine yoga as a holistic lifestyle for sustainable human and environmental health.**

**Questions about this study can be emailed to [Julia.leischner@waldenu.edu](mailto:Julia.leischner@waldenu.edu).**

**Questions about your rights as a participant in this study can be answered by calling the Walden University Research Participant Advocate (612) 312-1210 or by email to [irb@waldenu.edu](mailto:irb@waldenu.edu)**

**\*33. Do you consent to submit this survey?**

Yes

No, I would like to withdraw my responses



## Appendix C: Responses to Qualitative Survey Question

“I feel there is a branch of yoga that is emerging that is not so much into praying for miracles and magic thinking techniques (i.e. you think it and it happens).”

“Improved energy and focus”

“Instructor has guided me through my journey - asking questions, giving suggestions.”

“Yoga is the only exercise type activity that I feel better when I finish when I started. It gives me more energy.”

“I've been a weight lifter, a long distance runner and a martial artist at different times in my life. Yoga at this time seems to be a good fit for my age. I look forward to becoming more flexible as I age rather than less.”

“Yoga is a versatile tool that can be incorporated with one thing and with all things.

Experiencing this I have set out to share this gift with the world.”

“Try to carry yoga practice and mindfulness into daily life. Yoga is by far some of the most difficult exercise - practice I have done.”

“Teaching Yoga to children has been a shift in how I teach---love the community, giving them the power of their breath, teaching Earthcare, and they love the meditation---they crave quiet!!! It has been one of the most incredible powerful things I do---love it”

“Yoga in the mass media coverage needs some serious change, in my opinion. Yoga journal doesn't have to be a Cosmopolitan copycat, which, unfortunately, seems to be the case lately. I especially do not like it when someone tries to deify yoga and some of the

celebrity teachers like rock stars. Too much emphasis is put on "appeal to the mass factor" in American yoga industry. Now Yoga is becoming another part of McSpirituality fad here in the States, which I find very odd, to say the least. For me, yoga is one of the useful wellness tools I can always rely on to uplift myself both physically and emotionally one-on-one, just like I rely on and work with my own selected spiritual and self-help book and CD library. A tool, no more, no less: definitely not a booster to someone else's ego or business. After a few disappointing experiences with so-called New Age teachings and the gurus, I no longer see yoga as my religion, nor give too much authority to my yoga teachers, either. Rather, I see them as my fellow travelers or tour guides, perhaps with a little more experience than I. They, too, are mere mortals, just like you and me. With that view in mind, I now have much more fulfilling yoga experience because I don't expect very much of my teachers at my local studio. It is an irony that I ended up with a few great teachers (Leslie Ellis of Heartsong Yoga is one of 'em) locally, always humbly working on themselves and for us students with sincerity...couldn't ask for more. Yoga is, has always been, and always will be about YOU and only yourself, just like a good psychotherapy is supposed to be so. Who cares what asanas a next person is perfecting? Who cares what that girl on the front row wears to the class? It's about time we stopped commercializing yoga any further and going back to its very essence...working on yourself with the Devine. So, first off, let us begin with eliminating all the yoga-ish dance exercise programs and all the aerobics-teacher-branching-out kind of instructors from major fitness gyms and "yoga studios"? Thanks

for doing research on yoga and speaking up on behalf of all of us who are genuinely in love with the practice!”

“Yoga keeps me limber so that I can be extremely active and rarely injure myself; it helps me improve my posture; it reduces general aches and pains of aging and aches and pains resulting from doing excessive amounts of yard work or housework or playing with/lifting grandchildren, etc it keeps me in balance, makes me less grumpy, easier to be around”

“Yoga is a constant influence in my personal and professional life. As a wife, mother, yogi, yoga teacher and psychotherapist an integrative approach that includes yoga and meditation is life enhancing.”

“It has helped my lower back aches due to arthritis, and my bone density test improved slightly.”

“I think it is important to remember that some of my answers --ie: how important is it to my practice? are influenced not by an actual ranking of their importance, but I answered as to how often I incorporate or do them....in other words, it might be interesting next time to ask how important do you think it is? and separately, how often do you do it? because there are areas that are very important, but I don't necessarily practice it as often as I wish I did....ie: attending yoga workshops, or bandhas, etc. In general, yoga has radically altered my life for the better --in every sphere, and the more I mindfully practice, the more it influences my life.”

“Prior to yoga, I engaged in a series of self-harming activities. I often started smoking

during times of high stress and would over consume alcohol if I felt rejected or unwanted. Through my practice with yoga, I've been able to see these patterns and address them. Over time, my desire to smoke and drink to excess has dissipated. My default reactions are now to use my breath to calm my mind, use asana to work the stress from my body, and find peace and acceptance from inside.”

“From the demographic questions: I am "partnered, which was not an option. Yoga helped me move through disordered eating issues and I've recovered from neck injuries, a torn meniscus, and injuries of the pelvis, none of which were caused by yoga”

“It has made me feel much better and my balance is better”

“When I came home from the hospital on oxygen I decided yoga might help me regain breathing control. I ordered a DVD from amazon and lucked out with just what I needed to help improve my ability to breath.”

“I now live near a major yoga center where thousands of people visit each year. I enjoy being part of a community with many people who practice yoga of all kinds.”

“I think I would not have lived as long as I have (in other words, I'd be dead), if I hadn't started practicing yoga. I gave up tobacco and drugs and that stuff was killing me. Also, I am a happier person, less likely to drink to excess and act crazy, which also might have killed me. With the lifestyle I had, I doubt my wife would have wanted to marry me.

Yoga changed my life for the 5, no doubt about it.”

“Before doing yoga I was very unfit physically and had high amounts of anxiety. After a few years, I was able to become physically active and became substantially relaxed and

relieved of anxiety.”

“It's been an integral part of my lifestyle for so long that I'm sorry I can't answer some of your questions. Yoga is how I maintain my very good level of health - in mind, body, heart, and soul”.

“As I read and respond, I am aware that this would be very good for my physical, emotional and spiritual health”

“Hard to say, as these practices have shaped my life since my teens- for over 40 years- long before yoga came into vogue. (In fact- in those days, many people considered it to be something "weird"!)

With the significant stressors over the course of my life, I think my health has been exceptional- I have been told I appear 10-15 years younger than my age- and attribute this to the continuous practice of yoga/ meditation. I would also say that as my capacity to "hold" is enormous, I have tended to over estimate that capacity- to forget that human beings are not limitless vessels- and thus have had difficulty accepting limits (i.e. overloading myself)”

“It is my life's work to share this practice with children and families to facilitate physical, emotional, mental and spiritual balance.”

“I was healed thru Yoga in the 70's. I knew then, that this was my calling and I have been teaching since 1978.”

“Thank you”

“I'm just so thankful God gave me the tool of yoga to have as a form of exercise that benefits me so many ways; helping others, relieving tension and stress, relieving muscle

pains and injuries, builds strength and flexibility, community, intention and brings me closer to God as well.”

“I like to do hot yoga. I always feel cleansed from the inside out after practice. I crave it if I have gone a few days since my last practice. It also makes me calm.”

“I hope to bring my yoga practice to the next level this year by learning to meditate. My mind is swirling with thoughts all the time. Overall it's a beautiful journey. Especially now my husband is following with me on the yoga path.”

“Making time for yoga helps make time for a calming focus on myself. The gym workouts are good for fitness and finding determination but yoga helps me calm and focus on things in my head whilst working on my body's fitness. It's more holistic.”

“When I get to my weekly yoga class (es), I am a 6, more balanced, person. Every aspect of my day changes if I have attended a yoga class. Positivity, outlook on life, creativity, spirituality, sex life, etc. If I make time for myself to practice weekly yoga classes, I am a happier person and a better wife, mother, daughter, sister, friend, teacher, etc.”

“I enjoy the hour of peacefulness because sometimes it is the only quiet time I ever get!”

“I have met some incredible people through yoga and they inspire me to keep going.”

“I love the challenges of new postures. I'm amazed at the strength and flexibility I have developed through yoga. I've learned the importance of incorporating breathe with movements. I plan on continuing being a student of yoga and practicing the duration of my life.”

“Yoga has changed my life! I had just connected with yoga and meditation within a

couple of months of my father dying unexpectedly. My practice kept me safe for the first 6 months and gave me something to look forward to--especially with such a nasty winter. Additionally, my yoga practice has over time, layer by layer, helped to bringing healing from a long bout with disordered eating.”

“Yoga has definitely helped reduce/control my anger and stress in my day-to-day life.”

“Yoga has helped me strengthen not only my body but my mind as well. Yoga helps me relax and helps clear my mind when I'm stressed out. I think that is has been a good experience and I definitely recommend it to anyone especially my volleyball teammates. Our personal trainer for the team does yoga and told us that's the best way to help your muscles and joints then just simple stretching.”

“I know myself, trust my intuition and have reversed the aging process cause I look and feel younger than I did a decade ago.”

“I like the feeling of strength it gives me when I do yoga postures.”

“Yoga is my way of life. It is my foundation. I feel great when I wake up in the morning and look forward to asana practice in the morning & before bed. I meditate before bed at night & look forward to that time of centering and peace. Yoga is relevant to my relationships to all other beings. I work to hold myself to the standards of the yamas & niyamas.”

“It has turned back my biological clock and it has changed my outlook on life with major life changes for the 5. I am Grateful to have found Yoga:))”

“Yoga has helped with an under active thyroid. Has completely fixed an intolerance to

dairy.”

“My consciousness is much better, positive thinking and health also.”

“I wouldn't be who I am without yoga”

“I've practiced, off and on, for nearly 30 years, but roughly nine years ago I committed to a regular practice; started teaching 7 years ago and attained my 200 HR. R.Y.T. in 2012. Became a Certified Holistic Health Coach in 2011. Opened my own yoga studio/wellness collaborative in 2013. While I may not have used yoga for treatment of many conditions for myself (aside from arthritis and post-accident recovery), I have recommended and assisted many in dealing with their illnesses and physical and emotional challenges through yoga - including depression, arthritis, injuries and accidents, irritable bowel syndrome, etc. My own mental and physical health has really never been much better and I know it's yoga and meditation that makes the difference for me. I celebrate my 60th birthday in a couple weeks and look forward to many more years of yoga - teaching and learning and retreating - and, with luck, additional certification, such as 300 or 500 R.Y.T. Thanks for your research and I hope to learn the results of your study.”

“Been doing it too long to judge. Just part of life.”

“Ashtanga Yoga changed my life and my lifestyle. The reason to start yoga was not related to health problem. I was sporty in my past (jogging, bicycle, walking) but as we started living in asia it was to hot and humid to keep on doing my routine. so I found the way to yoga and slowly with more and more interest in it, it was staring to change my

life. I also became vegetarian and I am now on my way to become vegan. (not sure about my answer on my high and weight, I am 1.69 meter high and my weight is 55 kilogram)”

“I am more apt to choose positive nurturing relationships within my Sangha”

“Ashtanga vinyasa yoga has transformed my life in many ways. It helped me to understand and work through the grief I was experiencing after the death of my husband. Yoga has made me a better parent, better partner, better friend, better neighbor, better citizen of the world. Yoga helped me to wake up and it continues to keep me awake and aware of all that is going on around me without getting attached or developing further aversions. Yoga saved my life.”

“I have had Lyme disease since 2004 and it is now under control.”

“It was the best thing that could happen to me and I'm glad I found Ashtanga so early in my life. I'm happy and healthy most of the time and yoga plays a big role in this being so. Being happy and healthy is everything a person really needs.”

“It makes me turn inward and for the first time felt safe when I closed my eyes. It also taught me how to trust and listen to my conscience.”

“I feel great - I feel more connected and in tune with my environment”

“Yoga is my grounding, my spaciousness, the door to my higher self.”

“I strive more for ahimsa in my daily life and I've noticed this last year starting to see situations differently than I once did. I don't get as angry about things I can do nothing to change, such as issues in the news. I feel less effected by bad driving in traffic and don't let the stress of it get to me as much. Most importantly, when I do yoga regularly I can

walk freely and without pain or pain medication for my arthritis! I have also in the past become so obsessed with how good yoga made me feel that I did too much and minorly injured myself. Again, a lesson from yoga that everything should be done in moderation and a lesson I've learned the hard way a time or two.”

“I have been doing yoga for many years and it's benefits have been considerable in my life. Over the last few years life has been difficult and yoga and meditation have helped me through this and will continue to do so over the inevitable ageing process and adaptation of my life style as I retire. I just find if I keep my practice up you can overcome difficulties and it is better to face them. Accept change and go with the flow - you are just led to a different place with each challenge. You can't live your life without challenges in the stress- led life we lead in a western society. Just keep coming back to the breathe and the wonders of nature and this gives you the inner strength to look after yourself first and then it naturally flows to others.”

“Yoga has given me the confidence to explore other creative pursuits and interests that I probably would not have thought possible. It has also given me a greater sense of community and an outlet as a yoga teacher to support and encourage other community members in pursuing their dreams too.”

“Yoga has changed my life for the better. It is something that I have practiced off and on since I was 13. I am definitely a better person when I have a consistent practice.”

“Yoga has made me more compassionate and aware of the connection of everything.”

“I was diagnostic with diabetes in my pregnancy and yoga help me to have my sugar

levels always low my baby was born with her sugar levels normal she was 4 weeks early but she was so healthy that they let her come to the house with me, I had a daughter before this baby she was 4 weeks early too I wasn't practicing yoga with her and her sugar was high when she was born she had to spend 2 weeks at the hospital she was really weak, I had the opportunity to see the difference yoga is great”

“It's a good way to wake me up in the morning as I'm not a morning person, it makes me feel refreshed, energized and more awake. It has also helped a lot with period pain and getting my self in a routine especially a routine for exercise.”

“I find being part of the yoga community therapeutic.”

“Yoga is for me a manual for all the body s physical, mental, etc etc. I try to live to my own manual.”

“Yoga has made me a much happier person. I have had chronic pain since I was five years old. Since I have started practicing yoga I have been able to live without pain for the first time without the side effects of traditional meditation. It has also helped me overcome my social anxiety.”

“Yoga has saved my life by allowing me unity of mind/body/spirit by intertwining movement, meditation, and connectedness with higher energy.”

“I started yoga after an 80 pound weight loss that has now stalled due to menopause and some difficulty with hormones. Acceptance, relaxation and overall feeling of well being has caused me to continue doing yoga and to make it a part of my daily life. It is something I anticipate doing for a long time.”

“It has made me very conscious more able to deal with any situation that presents itself and also because of yamas and nyamas more able to connect to what really is important in life and why we are actually here..... best of luck great study”

“I sleep better after practicing yoga. It has helped me to be present and embrace life more”

“Yoga is the first exercise I have done because I "wanted" to do it and not to simply check it off my list.”

“its given me tools to cope with stress”

“When I am practicing regularly I feel better in both physical and mental health. I am inconsistent. Meditation, yoga philosophy, and other eastern philosophy has helped my mental health tremendously. I have decreased one of my medications by 94% and am almost completely weaned off.”

“Yoga, to me never really was something I'd do with the intention only doing it for health reasons. Most of the time it was because I need to still my thoughts so I can spend more time worshipping and meditating. Yoga has always been a way for me to connect with the fact I'm alive.”

“Yoga helped me to find a better relationship with my body. I learned how to better appreciate symptoms and work with them. General more confidence in my body and my body-mind set.”

“It helps me to know that I have the power to heal my body and to look within to know where I need to be more grounded in life.”

“Yoga practice taught me to stay still when I'm uncomfortable and really want to move on ...”

“Yoga has changed my life completely. My daily practice has influenced my life on every level”

“My body is very grateful the more yoga I do”

“I have lost several esteemed teachers due to relocation (India, Kuwait, retirement, studio closure) and have this year lost motivation and impetus. I seem to have hit a wall. I have not wholeheartedly established discipline of home practice for asana and meditation but I do have a meditation sangha that I can call on ...”

“I used to get anxiety attacks and since I began practicing 4 years ago I have not gotten one. I can control my breath, my heart rate and my emotions 6 now. yoga changed my life so dramatically that I quit my job teaching preschool and now teach yoga full time!”

“A subtle but still very powerful impact on my mental and physical health.”

“Yoga is such a wonderful tool that has helped me tremendously. It helps me feel great from the inside out and helps me find more patience and peacefulness in my life.”

“has changed my life...nowadays it's a way of living”

“Increased harmony and balance in general, in all aspects, relationships, physical state, dietary choices, and daily life.”

“Feel like I am more in tune with my body and can apply preventative measures if feeling run down or taking on too much. Take more rest, reflect on where I want to put my energy and how I want to feel and be, to keep health physically, emotionally, mentally

and spiritually. Improved sense of stability emotionally, and relationships around me.”

“Wonderful”

“Yoga is my life...I practice all day every day. I see no negative influence of the practice at all...only positive. This is true for myself and my clients.”

“Yoga is life”

“It has changed my outlook on life. Amazing.”

“Yoga has made an enormous positive impact on my health and lifestyle. I have practiced yoga on and off for many years, but it was not until my health was rapidly deteriorating that I decided to commit to a daily practice. This proved to be the best decision and my health has improved 100%! I became a yoga teacher to help others like me.”

“I practice yoga with my spouse. This common activity binds us together and gives us, even in our individuality, a common purpose. In addition to the shared communion with my spouse, I must note that I am blessed to have two terrific yoga instructors; without them, my practice would be much uninspired and less frequent.”

“My ability to stay focused and to not judge myself has improved. Greater awareness of my dosha has allowed me to understand my body and my actions and I have guidelines how to nurture myself. I feel more relaxed and connected to the universe and daily life. The breath is always with me and pranayama can be practiced everywhere.”

“Asana practice with pranayama and meditation help me center myself and create a foundation in the midst of an ever-changing world. I see the Divine and individuals' souls

as the only truly stable phenomena.”

“Yoga continues to help bring my body, mind and spirit in union with the Divine. I'm grateful for each group practice and I want to discipline myself to have my own daily practice. I do have a personal devotional time daily, with prayer throughout the day/night. I can really feel the positive changes of flexibility and toning - and feel less stress/pressure.”

“Yoga has allowed me to become more mellow, more in control. It, without my realizing it, changed my dietary habits. Practicing yoga is a priority for me.”

## Curriculum Vitae

Julia A. Leischner

### Objective

Obtain a position that will provide an opportunity for me to broaden my abilities, challenge me professionally, fulfill the needs of the organization, promote health of the human population, and sustainability of the environment.

### Qualifications

More than ten years collegiate level teaching experience developing and teaching traditional format and online courses. Eight years work experience in the industrial, microbiological, environmental, and holistic health fields. Nearly 20 years health, wellness, and fitness experience teaching group classes and providing private instruction and holistic health consultation. Research and development experience. Applicable degrees and certifications.

### Education

PhD Public Health Epidemiology, Walden University, Minneapolis, MN (ABD, projected completion February 2015)

Dissertation: Exploring Yoga as a Holistic Lifestyle for Sustainable Human and Environmental Health

M.A. Environmental Studies, University of Illinois at Springfield, 2001

Independent Research: Plant Growth Study: comparison of microbial biomass and plant growth in selected soils/compost

Thesis: Industrial Composting for Sustainable Waste Stream Management

B.S. Microbiology/Minor in Chemistry, Middle Tennessee State University, 1994

Undergraduate Research: *Escherichia coli* strain investigation to determine mollusccide toxicity against the zebra mussel.

### Work Experience

Assistant Professor of Biology, Benedictine University at Springfield

08/09- Present

#### Courses Taught and/or developed\*

Microbiology with Lab  
 Human Anatomy & Physiology I & II with Lab  
 Nutrition with Lab\*  
 Medical Terminology  
 Human Biology with Lab  
 Yoga Philosophy & Practice\*  
 Health & Wellness with Lab  
 Environmental Sustainability & Holistic Human Health\*  
 Ecology of a Changing Plane with Lab\*  
 Sustainability Study Away\*

#### Other Duties

Manage lab teaching assistants  
 Chair, Interdisciplinary and Diversity Task Force  
 Cadaver lab coordinator and instructor  
 Co-advisor, Green Club  
 Academic Advisor, Pre-nursing Program  
 Member, Sustainability Task Force  
 Instructor, CPR Certification Training  
 Fitness Instructor, Taught fitness classes for campus community wellness initiatives

Holistic Health Practitioner, Self-Employed

08/07-Present

Duties and Responsibilities

Provide private instruction & consultation to clients

Adjunct Faculty in Education, Illinois College

08/08-12/08

Courses Taught

Tests and Measurements in Physical Education

Other Duties

Guest lecturer for physical education courses

Adjunct Faculty in Biology, Lincoln Land Community College

08/02-08/09

Courses Taught

Human Anatomy & Physiology I & II with Lab

First Aid & CPR

Medical Terminology

Yoga

General Biology with Lab

Microbiology with Lab

Fitness Director, Instructor, Personal Trainer & Holistic Health Practitioner, YMCA

08/07-01/14

Duties and Responsibilities

Manage fitness department budget

Schedule & develop classes

Train and manage fitness instructors

Teach group classes

Provide private instruction & consultation

Owner, Instructor, Personal Trainer & Holistic Health Practitioner, Yoga Gym

08/07

03/03-

Duties and Responsibilities

Owned and operated a holistic wellness & fitness center

Offered group classes and private instruction and consultation

Studio sold organic & natural foods and products

Owner, Julia's Lotions & Potions

01/04-Present

Duties and Responsibilities

Develop product formulas

Produce and package natural products for private product line and private labels

Products: soaps, lotions, lip balms, herbal healing packs, salt scrubs, natural cleaners, reed diffusers, bath infusions, and wines

Environmental Consultant & Owner, Earth Resources Management

07/00-03/04

Duties and Responsibilities

Professional environmental services:

Consultation for air emissions, wastewater, storm water, ground water, composting, and spray irrigation

Soil & water remediation

Waste tracking and minimization  
 Waste treatment system operational troubleshooting  
 Microbiological work  
 Laboratory set-up and training  
 IEPA air, land, and water permit application & reporting: Form R,  
 SWPP, TSCA, Tier II, NPDES, title V

Environmental Systems Supervisor, Excel/Cargill 01/96-07/00

Duties and Responsibilities

Operational monitoring, analysis, implementation and troubleshooting of large scale industrial environmental management systems  
 Managed laboratory analyses and laboratory technicians  
 Tested wastewater, ground water, storm water, soil, sludge and compost  
 Responsible for permit application, reporting and compliance with IEPA air, land, and water permit requirements – form R, Tier II, TSCA, SWPP, NPDES, title V  
 Assisted with many multi-million dollar wastewater and composting construction projects and soil/water remediation efforts  
 Founder and director of health and fitness program.

Research & Development

Zebra Mussel Eradication Research – Undergraduate independent study research project that included in vitro cultivation and lyphylization of specific strains of *Escherichia coli* to determine the toxicity as a molluscicide against the invasive zebra mussel.

Corporate Wellness & Fitness Program - Developed and managed a corporate wellness and fitness for a major industry.

Industrial Composting for Sustainable Waste Stream Management– Assisted with the development, implementation, and management of a large-scale industrial composting operation and laboratory testing system to better manage organic waste streams that had previously been landfilled or land applied. This was also my Master's thesis topic.

Compost Inoculum Development – Developed a microbiological compost inoculum and aerobic brewing system. Application of this inoculum to compost rows aided in amending the microbiological populations and decreased curing time.

Plant Growth Study Research — Master's degree independent study that examined the effect on plant growth from various types of soils compared with those amended with compost. Parameters examined were soil microbial populations, soil nutrient content, and plant biomass.

Children's Gardening and Nutrition Education Intervention – Developed and implemented an organic garden program with the Jacksonville YMCA that involves children in all aspects of gardening from seed sprouting, planting, weeding, harvesting, and nutrition education. Secured a \$1,200 grant for program support and compost donation by a local industry.

Children's Wellness & Fitness Intervention -Developed a Yoga Swing studio where children can participate in yoga, pilates, strength training, cardiovascular training, relaxation and meditation in a unique manner taking a holistic approach to fitness by incorporating the whole individual - mind, body and spirit while suspended from the floor. Secured a \$9,000 grant for program development.

Organic and Sustainable Gardening Program – Developed an organic recycled bottle garden and vermi-composting system for Benedictine University at Springfield Green Club and Nutrition course students that utilizes organic and sustainable practices such as companion planting and soil amendment with vermi-compost.

Exploring Yoga as a Holistic Lifestyle for Sustainable Human and Environmental Health Research Dissertation - Cross-sectional research study that measures chronic disease indicators against yoga philosophy, lifestyle, and practice. Examined the efficacy of yoga as an alternative lifestyle that promotes environmental sustainability and human health.

### Publications

Berent, G. R., Zeck, J., Leischner, J. A., & Berent, E. A. (2015). Yoga as an alternative intervention for promoting a healthy lifestyle among college students. Accepted for publication: Journal of Addictions Nursing, Jan. 2015.

### Honors

2013-14 Benedictine University Lafata Award for Teaching Excellence Recipient

### Licenses, Training & Certifications

Animal Handler, SIU School of Medicine  
 Antiracism Training, Crossroads  
 Environmental Risk Assessment, University of Illinois at Springfield  
 Class K Wastewater Operator, Illinois Environmental Protection Agency  
 CPR Instructor, American Red Cross  
 First Aid Instructor, American Red Cross  
 Personal Fitness Trainer, International Fitness Professionals & Associates  
 Spinning Instructor, MADD Dog Athletics  
 Pilates Instructor, American Fitness Professionals & Associates  
 Yoga Instructor, American Fitness Professionals & Associates  
 Group Fitness Instructor, Aerobics & Fitness Association of America  
 Thai Yoga Massage, Soma Veda International Thai Therapists Association  
 Ayurveda, Florida Vedic College  
 Herbology, Florida Vedic College  
 Reiki Master, Florida Vedic College  
 Chakra Yoga Therapy, Florida Vedic College  
 Holistic Business, Florida Vedic College  
 Bhakti Yoga, Florida Vedic College  
 Holistic Health Practitioner, Florida Vedic College

### Professional Organizations

Sierra Club  
 American Public Health Association

### Teaching Philosophy

Drawing on professional experience in the environmental, microbiological, and holistic health fields, I bring an interdisciplinary experience to the classroom. I strive to educate students to understand how individual and societal actions and behaviors impact human health and environmental outcomes. As much as possible I use the flipped classroom model and work to engage students through a variety of group and individual assignments, classroom discussion & activities, individual research, interactive technology, and use of distance learning platforms.

### Research Interests

Global human population & environmental health sustainability  
Organic and sustainable food production  
Alternative nutrition and vegetarianism  
Chronic and infectious disease prevention and treatment  
Human health promotion  
Complementary and alternative holistic health medicine and practices  
Epigenetics

References available upon request