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# Exploring Associations Between Group Yoga Participation Over Time, Psycho-Social Variables and Exercise Adherence

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EXPLORING ASSOCIATIONS BETWEEN GROUP YOGA PARTICIPATION OVER  
TIME, PSYCHO-SOCIAL VARIABLES AND EXERCISE ADHERENCE

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## ABSTRACT

**Background** Physical inactivity is a serious issue among the American public. The impact of yoga on exercise adherence has not been investigated.

**Primary Study Objective** To assess the relationship between yoga participation over time and adherence to exercise and other health-related behaviors.

**Study Design** Exploratory design, mixed methods.

**Setting** Yoga studios and fitness facilities across central New Jersey

**Participants** 87 men and women who participate in yoga regularly defined as at least once per week on a regular basis.

**Outcome Measures** Participants self-selected to complete survey packets at their yoga establishments. The primary outcome variable measured was exercise adherence using a 7-Day Physical Activity Recall. The secondary measures included exercise self-efficacy using the Multidimensional Self-efficacy for Exercise Scale, general well-being measured with the General Well-being Schedule, Mindful Eating using the Mindful Eating Questionnaire, group cohesion using the Group Environment Questionnaire. Two open ended questions were posed to understand yoga participant's perceptions of yoga and their health-related behaviors including exercise adherence.

**Results** The analysis revealed a significant positive correlation between yoga tenure and exercise adherence,  $r = .22$ ,  $p < .02$ . In addition, participants reported a mean of 239 minutes of weekly exercise other than yoga participation. A significant difference was found in mindful eating score relative to yoga tenure,  $F = 3.633$ ,  $p < .03$  and vegetable and fruit intake relative to yoga tenure,  $F = 4.527$ ,  $p < .01$ . Mindful eating score was inversely correlated with Body Mass Index (BMI)  $r = -.185$ ,  $p < .04$ . Further analysis revealed that 72% of the yoga participants had a BMI of 24.9 or less. Qualitative data revealed that the participants felt yoga enhanced their exercise adherence and promoted the adoption of positive health habits.

**Conclusion** Yoga participation over time is associated with the adherence to exercise and the adoption and maintenance of other health-related behaviors. The findings suggest that group yoga participation may be an affective mind/body intervention in the fight against physical inactivity also impacting health behaviors.



## Chapter I

### INTRODUCTION

Inactivity has reached epidemic proportions in the United States resulting in a preponderance of chronic illnesses and lifestyle diseases. Lifestyle diseases are considered those directly linked to health behaviors and choices for example, heart disease, type II diabetes and some forms of cancer. Inadequate leisure-time physical activity is reported in 69% of adults eighteen years or older; only 31% of the adult population participates in moderate or vigorous activity to satisfy the guidelines for optimal health as cited by the Center for Disease Control (CDC) and the American College of Sports Medicine (ACSM) (CDC, 2008). Traditionally, exercise is prescribed as a method for disease prevention and fitness enhancement emphasizing the mode, intensity, and duration of an exercise session. For example, in 2007 an updated report published by ACSM and the American Heart Association (AHA) outlined the physical activity guidelines for cardio-respiratory endurance intended for health promotion and maintenance which were based upon the current evidence. The guidelines incorporate the mode of activity—aerobic activity that results in sustained elevated heart rate and respiration rate, the duration of that aerobic activity—30 minutes five days per week, and the intensity of the aerobic activity—moderate intensity which is similar to that of a brisk walk that visibly raises the heart rate (Haskell et al., 2007). Unfortunately, regardless of the appropriate exercise prescription the dropout rate associated with the onset of an exercise program is 50% within the first six months (Sallis, Havell, & Hovstetter, 1992). Consequently, exercise adherence is a key issue facing the American public (Bandura, 2005).

Epidemiological data has shown that physical inactivity increases the incidence of at least 17 chronic conditions, most of which are chronic diseases or may lead to chronic diseases (Booth, Gordon, Carlson & Hamilton, 2000). Lifestyle diseases, also known as hypokinetic diseases, may be considered those derived primarily from poor health habits, including but not limited to heart disease, hypertension, type II diabetes, hyperlipidemia, and some forms of cancer. The American public may not regard the diseases that result from inactivity as life-threatening; however, data supports that the number one cause of death in America is heart disease and the number two cause is cancer. In addition, type II diabetes is reaching epidemic proportions in adults and it is becoming more prevalent in children as well. Booth et al.(2000) explain that close to one trillion dollars in health care costs are spent on the conditions that result from inactivity, with approximately 250,000 premature deaths annually. Some experts argue that the greatest potential for health benefits can be found in having previously sedentary adults become moderately active (Pate et al., 1995).

Individuals who perform moderate levels of physical activity daily and for the long term will experience a number of health benefits. The benefits include: weight control, reduction in cardiovascular disease risk factors, reduced risk of developing type II diabetes and metabolic syndrome, reduction in the incidence of many forms of cancer, increased bone density, increased muscular strength and endurance, increased ability to perform activities of daily living, fall prevention especially in the aged population, and increased mood and mental health (CDC, 2010). The prevailing belief among healthcare professionals is that exercise adherence yields improvements in both the physiological and psychological state of being (Dishman, Ickes, & Morgan, 1980). Data supports that individuals who routinely exercise, demonstrate the mood-enhancement

benefits of exercise, improvements in physical fitness, as well as a reduction in the incidence of disease (CDC,2009). However, regardless of the many life-altering benefits of exercise, a recent survey conducted by the Centers for Disease Control found that only 11% of Americans reported involvement in health-enhancing physical activity five or more times a week on a regular basis (CDC, 2009). Clearly, the barriers to engaging in physical activity are not ameliorated by simply providing an exercise prescription or demonstrating the many benefits of exercise.

In the literature it has been noted that numerous variables promote exercise adherence such as the enjoyment and positive responses to an exercise session (Annesi, 2002; Berger & Owen, 1992; Gauvin, Rejeski, & Norris, 1996; Salmon, Owen, Crawford, Bauman, & Sallis, 2003; West, Otte, Geher, Johnson, & Mohr, 2004; Williams et al., 2008), the existence and maintenance of exercise self-efficacy (Bandura, 1977, Marcus, Eaton, Rossi & Harlow, 1994; McAuley, 1992;), the support derived from the exercise environment (Annesi, 1999; Spink & Carron, 1992; Carron & Spink, 1993;), and the physiological benefits of the activity (Cowen & Adams, 2005; Chen et al., 2008; Tran, Holly, Lashbrook, & Amsterdam, 2001) Yet, with all of the literature surrounding exercise adherence the question remains: why don't Americans exercise regularly?

Reflection upon a new theoretical model may offer a unique lens through which to view the adoption and perpetuation of health behaviors such as exercise adherence. Following the tenets of this theoretical model and applying them to an exercise program may in turn inform the processes of permanent change; see figure 1 for an illustration of the model.

Humans are complex, responsive creatures who weave together their experiences and knowledge, accented by their perceptions and feelings. Historically,

research concerning the cause and perpetuation of physical inactivity was based on theories derived from social or health psychology (Ekkekakis, et al., 2008). Some health psychologists who address a variety of health issues utilize the biopsychosocial model (Engel, 1977) as an implement for patient health management. This model promotes the idea that biological, psychological, and social processes are inextricably connected and that optimal health is a result of the interactions of all three (Suls & Rothman, 2004). Originally, George Engel created the biopsychosocial model for use by medical doctors in their patient management practices involving disease management, disability, and recovery. With the biopsychosocial model as a framework, health psychologists currently employ interventions designed to improve health; some areas of successful implementation include improvements in weight and addiction management, smoking cessation, stress reduction and mindful eating. The underlying premise supported by the biopsychosocial model is that physical health is formed through the interactions of the mind, the body, and the social environment. In fact, the National Institutes of Health (NIH) has increased funds made available for health and behavioral research recognizing the need for interdisciplinary research approaches (Suls & Rothman). The association between exercise adherence and a mode of physical activity that qualifies as a biopsychosocial intervention has yet to be investigated.

Adding to the model developed for this research, Jon Kabat-Zinn advances the concept of the indissoluble bond between the mind and the body. Kabat-Zinn, a pioneer in the mind/body health management arena and the founding director of the Stress Reduction Clinic and the Center for Mindfulness and Medicine, Health Care, and Society at the University of Massachusetts, offers a unique perspective that is based in the notion of mindfulness (Kabat-Zinn, 1982).. The mindfulness approach is derived from Buddhist teachings positing that psychological distress is rooted in judgments

made in one's mind, in essence labeling events as either favorable or unfavorable. Inevitably these judgments direct our decisions and result in suffering, dissatisfaction, and stress; mindfulness is the antithesis of the judging, biased mind. In essence, mindfulness allows an individual to respond reflectively while observing the array of feelings and sensations that may currently be evident. More specifically, mindfulness results from the regulation of focus or awareness. Self-regulation is a dynamic interactive phenomenon and mindfulness may be viewed as the self-regulation of attention (Bishop et al, 2004).

Kabat-Zinn developed the Mindfulness-based Stress Reduction Program (MBSR) incorporating hatha yoga, meditation, and body scan techniques (Schure, Christopher & Christopher, 2008). MBSR was originally developed in 1979 in a behavioral medicine environment to introduce healthy coping mechanisms to those experiencing ill health, chronic pain, and stress related disorders (Schure et al., 2008; Baer, 2003). A central teaching of MBSR is mindfulness. Mindfulness-based studies have shown improvements in quality of life (Carlson, Speca, Patel, & Goodey, 2003; Nyklicek & Kuijpers, 2008), improvements in immune function (Davidson et al., 2003), a reduction in binge eating (Kristeller & Hallet, 1999) enhanced stress management (Speca, et al.) and an enhanced positive state of mind with an increase in mindfulness self-efficacy (Chang et al., 2004). Meditation is an effective mindfulness activity defined as the self-regulation of attention from moment to moment (Kabat-Zinn, 1982). Being more self-aware and self-regulated are outcomes of meditation that may be useful when attempting to adopt or improve health behaviors; mindful approaches to exercise adherence have yet to be fully explored by the scientific community and the mechanism by which mindfulness may impact behavioral processes remains unclear.

Although the effects of mindfulness on exercise adherence have yet to be investigated, the capability of the emotional and intellectual self to direct behaviors is captured in Albert Bandura's Social Cognitive Theory (Bandura, 1986). The theory suggests that human behavior is not primarily reactionary, but rather interplay of self-understanding, self-regulating, and self-directed adaptations to and from our environment. The term cognitive or cognition implies that thoughts regulate actions with less emphasis on environmental factors and more emphasis on self-processes. Through an individual's processes of self-reflection he or she makes sense of their experiences and adjusts their behaviors in accordance with their understanding. Social Cognitive Theory posits behavioral changes are primarily self-generated stating that "what people think, believe and feel affects how they behave" (Bandura, p.25). Bandura's self-efficacy presents that an individual's belief in their capability to perform an action will directly impact their ability to carry out said action. Strong exercise self-efficacy is associated with well-developed self-regulation skills and the capability to overcome barriers that may interfere with regular exercise. High levels of exercise self-efficacy support the maintenance of activity over time; more specifically, exercise self-efficacy refers to an individual's belief in their ability to engage in exercise as a regular course of action (Bandura, 2005). Research is necessary to identify a mode(s) of exercise that promotes exercise self-efficacy while also facilitating exercise adherence via the mind-body connection (Ekkekakis, Hall, & Petruzzello, 2008).

Yoga fits these criteria as it is a popular mind/body form of exercise. Yoga literally means "union," referring to the mind, body, and spirit. In the original Sanskrit language yoga is translated as "he yokes," or "yoking" (Diab, 2001). Hatha yoga is considered the generic form of yoga and incorporates mind-body activities associated

with the physical aspects of fitness and psychological well-being. The health-related aspects of fitness through yoga include improved muscular strength, flexibility, balance, and coordination; psychologically there is a strong link to improved mental development and self-efficacy (Forge, 1997). The integration of the mind and the body differentiates yoga from most other forms of exercise. The yoga positions, postures or poses—all interchangeable terms—number in the hundreds. Kinesiologically, the postures employ gravity, bodyweight, positioning, and duration of hold to stimulate the muscular skeletal system. In addition, yoga training may incorporate all or some of the following: breathing awareness, meditation and relaxation techniques, soothing music, and serene atmosphere.

The rise in yoga participation in the U.S. has stimulated an increase in research investigating the physiological and psychological effects. Qualitative data suggests that yoga produces physical confidence, improvements in self-care, and increased energy (Schure et al., 2008). Additional research has found that individuals reporting involvement in a regular yoga practice over a period of at least four years had attenuated weight gain and more energy output through physical activity than those who did not do yoga (Kristal, Littmam, Benitez, & White, 2005). Although this research did not investigate a yoga-exercise adherence relationship specifically, an association was found between regular yoga practice and increased energy output through other forms of physical activity. Further research is warranted investigating the potential yoga-exercise adherence relationship.

Yoga is at its core a mind-body activity, placing awareness of self at the center. The Schure et al. (2008) qualitative research study previously mentioned employed MBSR program as the intervention for graduate students in psychological counseling.

Data were collected over the span of 4 years and involved 33 students. The program itself incorporated Hatha yoga, meditation, and Qigong. Qigong is a Chinese meditative practice involving slow bodily movements and breathing techniques. The course met for 15 weeks, twice a week for 75 minutes and included readings, journal writings, and the active mind-body exercises included in yoga. As a final assignment the students were asked to answer four open-ended questions pertaining to their perceptions regarding what they experienced with this program. The students reported improvements in physical balance, flexibility, and strength along with increased body awareness and sensitivity. In regard to the effects of self-awareness on confidence and decision-making, it was reported that students had an increased confidence and trust in themselves (Schure et al., 2008). The students presented that they felt connected inwardly, trusting their own perceptions more. Adding that they felt more connected to their body and how to engage it, with the new realization that they were physically capable with less variation in their capability. Also noteworthy were the student reports that performing the yoga poses provided a sense of accomplishment and increased enjoyment in challenging the body physically. The qualitative data collected from this small sample of convenience in this investigation may not be generalizable to other populations of yoga participants. The participants were students in graduate psychology which may impact their self-perception capabilities. Finally, a pilot study conducted by Bryan, Parasher, Cahill and Pinto-Zipp (accepted 2011) found an increased adherence to exercise in a group of previously sedentary adults after 10 weeks of twice-weekly yoga classes in comparison to a control group. The limitations in the available research necessitate further scientific investigation into the mind/body effects of yoga in order to determine its usefulness as an exercise intervention that may lead to long-term improvements in exercise adherence and other health behaviors.



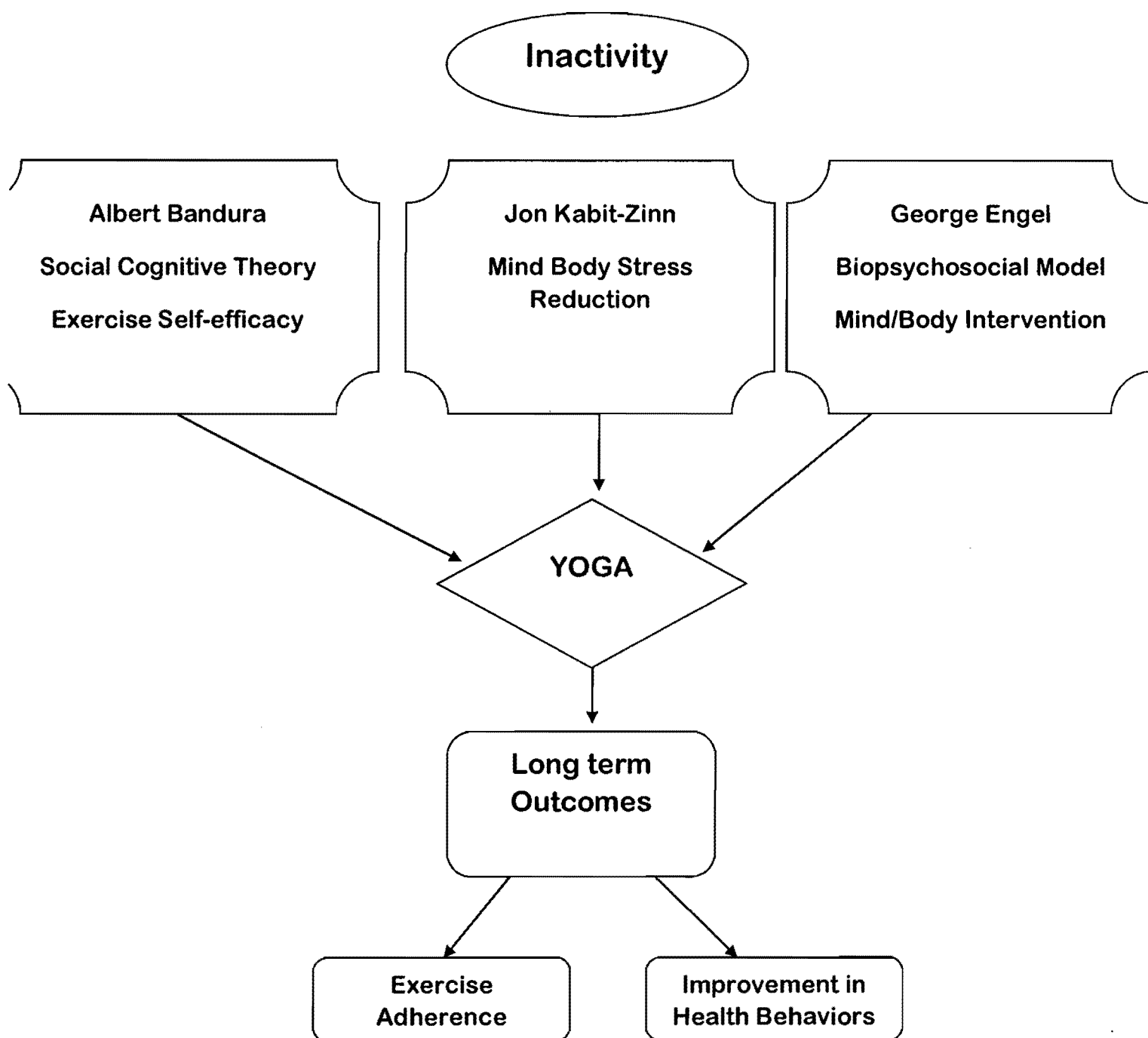


Figure 1. Theoretical model supporting yoga as an exercise intervention for exercise adherence and other health behaviors

## **Statement of the Problem**

The majority of Americans are not physically active enough to enhance health and prevent lifestyle diseases (CDC,2008). Fitness specialists provide exercise prescriptions for inactive individuals focusing on the mode, intensity, and duration of an activity; however, 50% of Americans who begin an exercise program drop-out within the first year (Sallis et al., 1992). The consequences of inactivity are astronomical healthcare costs and approximately 250,000 premature deaths annually (Booth et al., 2000). Copious amounts of research demonstrate the physiological, emotional, and psychological benefits of regular exercise; nonetheless, the majority of Americans don't adhere to exercise. So the question of what factor or combination of psycho-social factors may be associated with exercise adherence is a paramount one to address.

## **Purpose of the Study**

The purpose of this study was to investigate whether a relationship exists between participation in a group yoga program over time and exercise adherence. Additional variables of interest and their relationship to yoga participation include: general well-being, exercise self-efficacy, group environment cohesion, and mindful eating.

## **Research Questions**

1. Is there a relationship between the amount of time in months/ years that an individual participates in yoga classes and adherence to physical activities?
2. Is there a relationship between the amount of time in months/ years that an individual participates in yoga classes and exercise self-efficacy?

3. Is there a relationship between the amount of time in months/ years that an individual participates in yoga classes and general well-being?
4. What is a yoga participant's perception of group cohesion?
5. Is there a relationship between exercise self-efficacy and exercise adherence among yoga class participants?
6. Is there a relationship between exercise adherence and general well-being among yoga class participants?
7. Is there a relationship between exercise self-efficacy and general well-being among yoga class participants?
8. Is there a relationship between the amount of time an individual has performed yoga classes and mindful eating practices?
9. What are the yoga participant's self-perceptions of the impact yoga has had on their health behaviors and exercise adherence?

## Chapter II

### REVIEW OF LITERATURE

There is substantial evidence demonstrating the physiological and psychological benefits of physical exercise; however, population trends indicate that the majority of Americans do not exercise at all or on a consistent basis to enjoy the many benefits of regular physical exercise (Morgan & Dishman, 2001). Physical inactivity results in an estimated global expenditure of 1.9 million human lives annually (World Health Organization, 2003). Identifying the mechanisms associated with exercise adherence is a primary goal of exercise and health scientists. There may be a combination of variables, both physiological and psychological, that contribute to the adoption of the desired health behaviors associated with exercise adherence. Therefore, it is necessary to uncover a combination of salient variables and in turn use that exercise adherence evidence-based knowledge to develop productive programming. Currently, in the literature an association has been noted between exercise adherence and each of the following: positive affect, exercise self-efficacy, and social support. An exercise intervention that encompasses these areas may positively impact exercise adherence.

#### **Enjoyment, Positive Affect and Mood Enhancement**

Based on the current available evidence, the Department of Health and Human Services (2000) suggested that an emphasis should be placed on an activity being enjoyable that begins at an intensity that is moderate to promote exercise adherence among inactive individuals. Salmon, et al. (2003) investigated the relationship between sedentary behavior and enjoyment, preferences, and perceived barriers of physical activity. They enlisted 1,332 adult respondents surveyed from the Australian Electoral Commission Roll. The barriers identified by survey participants included environmental

items such as weather, cost of programming or safety and personal barriers, as well as participants' age, family commitments and lack of time. Enjoyment of physical activity was rated on a Likert scale ranging from no enjoyment (1) to a lot of enjoyment (5). The preference of activity was identified by the respondents' choice of the activity that they "would most prefer to do". The results showed that respondents who reported high enjoyment in physical activity were also most likely to report high levels of physical activity; this finding supports the enjoyment/exercise adherence connection.

Some variables which reportedly affect enjoyment during a bout of exercise are social interactions and support, the intensity of the activity, the current fitness level of the participant, and present mood state (Gauvin et al., 1996). The acute emotional responses to exercise have been interpreted as either supporting or interfering with the maintenance of exercise (Godin, 1994). Researchers have begun to study the transient psychological states that occur after a bout of exercise. The exercise-induced changes in psychological state may include, but are not limited to improved feelings of energy, increased calm, increased tranquility and a reduction in anxiety and depression (Gauvin & Spence, 1998). Gauvin and Spence report that exercise-induced changes in psychological states may be considered a central outcome variable for exercise adherence and health psychology. Gauvin & Rejeski (1993) developed the Exercise Induced Feeling Inventory to further study exercise-related affects and feeling states resulting from acute bouts of activity. This inventory is a 12-item feeling scale comprised of the following subcategories: positive engagement, revitalization, physical exhaustion, tranquility, positive affect, and negative affect.

Further research on feeling states was conducted by Williams et al. (2008). The researchers proposed that hedonic responses, for example pleasant versus unpleasant,

influence whether or not to repeat or persist in an activity. Williams et al. examined the relationship between affective responses to moderate-intensity cardio-respiratory activity and the likelihood of performing future physical activity among previously sedentary individuals. Thirty seven healthy adult participants were asked to perform 30 minutes of cardio-respiratory activity on most days of the week. The affect response was measured by the Exercise Induced Feeling Inventory and the amount of participation in physical activity was recorded using the Physical Activity Recall (Blair et al, 1985). The researchers found that acute affective responses to moderate-intensity physical activity were associated with self-reported exercise participation 6 and 12 months later. Thus, if a bout of activity was enjoyable and perceived as acutely pleasant, it may have promoted the perpetuation of that activity. To further expand the discussion of acute responses to exercise, Gauvin, Rejeski & Norris (1996) investigated the relationship between feeling states and affect in women performing bouts of exercise in a variety of moderate level cardiovascular fitness classes at a YMCA. The respondents completed the Exercise Induced Feeling Inventory; on average they reported significant improvements in affect and feeling states after exercise when compared to their pre-activity scores. However, the researchers did not investigate the relationship between the feeling states and exercise adherence.

Annesi (2002) conducted one of the first studies analyzing the association between changes in acute exercise-induced feeling states and adherence to exercise, using moderate cardiovascular training as the exercise intervention. The participants were 75 new members to a YMCA fitness center between the ages of 21 and 60 who had not participated in regular physical activity for the previous 2 years. The researchers categorized the participants into groups with low, medium or high self-

motivation. The combination of the feeling state subscale scores and self-motivation scores optimized the prediction of exercise attendance compared with each variable separately. The researchers suggested the degree of self-motivation may moderately effect the feeling state on exercise adherence given that individuals with low self-motivation were most responsive to positive feelings resulting from a bout of exercise and their exercise attendance was positively impacted by these feelings. Thus inferring that a new exerciser, especially one with low self-motivation, is at risk for exercise drop-out and may be well-served by a positive exercise-induced feeling state.

In the literature a variety of exercise interventions have purported to have favorable effects on psychological state; these include walking, stretching and toning (McAuley et al., 2003), cardiovascular exercise (Annesi, 2002), swimming and yoga (Berger & Owen, 1992), and African dance and yoga (West et al., 2004). In addition, regular physical activity is negatively correlated with non-clinical depression and anxiety (Mutrie & Hannah, 2007) and is associated with positive effect and mood (Biddle, 2000). Thus based upon this data, mood enhancement is a potential outcome variable of physical activity. If a bout of exercise is of a type and intensity that is manageable for a participant, it is more likely to result in overall mood enhancement. It is critical to recognize the important link between the perception of a positive, mastery experience and the appropriate intensity of an exercise session. A mastery experience may be considered one that is achievable and results in a sense of accomplishment. Conversely, an inappropriate intensity level may affect motivational properties and diminish the sense of mastery, resulting in a diminished propensity for exercise adherence. Inappropriate exercise intensity, or the degree of difficulty, is suspected as a contributor to physical inactivity (Ekkekakis, et al. 2008). To explore the intensity-affect-

adherence causal chain, Ekkekakis et al. measured affective responses using the ventilatory threshold as a gauge of intensity. The ventilator threshold is the point at which ventilation increases disproportionately to oxygen uptake (Neiman, 2007). Thirty young physically active, adult, volunteer college students participated in 15 minute treadmill tests below, at, and above the ventilatory threshold. The researchers used an 11-point Feeling Scale that ranges from “very bad” to “very good” and a Rating of Perceived Exertion scale (RPE) which is a 15-point scale ranging from 6 to 20. The results showed that intensity that exceeded the ventilatory threshold decreased the amount of pleasure; the researchers posit that this reduction in pleasure can negatively affect exercise adherence. The literature demonstrates that how a person feels during and immediately after a bout of exercise impacts their exercise adherence. To compound that, an individual's belief surrounding the performance of an activity, or their exercise self-efficacy, is positively correlated with the performance of that activity.

### **Exercise Self-Efficacy**

Albert Bandura's (1977) self-efficacy theory suggests that confidence in the ability to perform a behavior is positively correlated with the actual performance of that behavior. To increase the probability of establishing an affinity for physical exercise the experience should be pleasant, achievable and self-efficacy building. Strong exercise self-efficacy is associated with the capability to overcome barriers that may interfere with regular exercise; high levels of exercise self-efficacy support the maintenance of activity over time. More specifically, exercise self-efficacy refers to an individual's belief in their ability to engage in exercise as a regular course of action (Bandura, 2005). Exercise self-efficacy scales include probable barriers that an individual may face that could potentially avert them from their attempt to exercise regularly. Marcus, et al.



(1994) found that exercise self-efficacy may have the strongest relationship to habitual physical activity. They investigated the stages of readiness to exercise using the Transtheoretical model; this model has been used extensively in the study of behavior change research in areas such as smoking cessation and weight-loss. The participants in the study were drawn from four Rhode Island worksites, including 698 male and female adults. The participants were surveyed pertaining to their exercise stage of change behavior, their exercise self-efficacy, and a decisional balance measure survey that presents questions involving the perceived pros and the cons associated with exercise. The three constructs --pros, cons, and exercise self-efficacy-- were examined a second time six months after the first analysis to determine each construct's independent ability to predict physical activity participation. The data revealed that exercise self-efficacy is a strong predictor of the performance of physical activity within a six month period. The relationship between exercise self-efficacy and exercise adherence is critically linked to the fight against physical inactivity.

Continuing the research on the role of self-efficacy in exercise adherence McAuley (1992) utilized a population of previously sedentary middle-aged adults in a group exercise environment. There were 103 sedentary middle-aged subjects between the ages of 45-64 years. Four exercise classes were offered per week, with the expectation that the participants would attend at least three times a week. The classes incorporated cardiovascular activity in incrementally longer durations up to a total of 40 minutes by the 10<sup>th</sup> week. Exercise self-efficacy was assessed at week 12 and week 20, attendance was also taken throughout the study. McAuley (1992) found that perceptions of exercise self-efficacy predicted the number of exercise sessions and the intensity of these sessions. In McAuley's exercise adherence research he emphasizes the need to

study the process of exercise adherence throughout the adoption and continuation stages of exercise compliance. In a follow-up study McAuley (1993) investigated the relationship between exercise participation and exercise self-efficacy in the older adults four months after the termination of the original study. McAuley found exercise self-efficacy was the single significant predictor for the continuation of exercise post-study, demonstrating once again the link between exercise self-efficacy and exercise adherence.

Individuals with a history of sedentary behavior may have a number of real and perceived barriers preventing them from beginning an exercise program. Exercise self-efficacy which includes an individual's belief system surrounding successfully engaging in physical activity, has been shown to affect the intensity, duration, and consistency with which an individual engages in exercise (Marcus, et al, 1994). Improvement in psychological well-being including exercise self-efficacy, should be considered a desirable outcome variable for improvement in exercise adherence. Exercise self-efficacy is associated with a sense of mastery surrounding the exercise experience, consequently exercise self-efficacy may be the most salient variable supporting well-being in an exercise experience (Netz et al., 2005).

Further research examined mechanisms underlying the link between exercise and psychological well-being looking at the perceived psychological benefits of resistance training in older adults (Dionigi, 2007). This qualitative study included in-depth interviews with the older adult exercise participants before, during, and after the 12-week resistance training program. Three main themes surfaced from the data collected; physical changes, "good feeling", and "the social side". The physical changes were improvements in strength, endurance, balance and coordination. The "good

feeling” was described as a sense of well-being and an increased knowledge and efficacy in utilizing fitness equipment. It is important to note that Individuals who score higher in a general well-being inventory are more likely to adhere to exercise (Stephens, 1988). The sense of mastery reported in the Dionigi study was expressed as “I know how to do it” articulating a sense of accomplishment. In addition, a critical factor associated with a sense of well-being was social support. The positive social interactions were both reported by the participants and observed by the researcher. It was explained by the participants as a sense of camaraderie and support towards their goals, expressing that the environment was comfortable and positive and thus enhanced their sense of well-being. Overall, Dionigi reported that self-efficacy and social interaction were the most prominent link between exercise and psychological well-being.

### **Group Exercise Environment**

The social interaction provided in a group exercise environment may result in feelings of social support along with the cohesion effects of a communal setting. An abundance of exercise adherence literature concentrates on the psychology of the individual, focusing on personal attributes and tendencies that support or diminish involvement in regular exercise. The social psychology of a group exercise environment presents another underlying mechanism for the promotion of exercise adherence. Early research demonstrates that adults predominantly prefer to exercise in a group setting (Heinzelmann & Bagley, 1970; Stephens & Craig, 1990). Heinzelmann and Bagley reported that 90% of the adults in their study preferred to exercise in a group exercise program. Carron, Widmeyer & Brawley( 1988) investigated the relationship between group cohesion and exercise adherence across organized sport programs, physical

recreation programs, and physical exercise programs. The researchers utilized the Group Environment Questionnaire, which measures cohesion on four different scales supporting the multidimensionality of the group interactions construct. Carron et al. found an increased likelihood of exercise adherence with increased perceptions of group cohesiveness. Their conclusion was supported across varied group exercise experiences including fitness classes, recreational sports, and elite team sports.

To further the discussion on group cohesiveness Annesi (1999) explored the impact of social or group cohesion on exercise adherence in a controlled quasi-experimental study. The participants in the intervention group and the control group were sedentary for at least six months and new to the gym facility. All of the participants were given an exercise program to follow for a period of 15 weeks. The intervention group was exposed to fitness-specialist-conducted warm-ups and cool-downs in a separate group exercise room for 5 to 7 minutes before and after their work-out. The control group had no scheduled group interactions. It is interesting to note that the group interaction time for the intervention group was relatively short, simply requiring the participants to move from a crowded gym floor to a more intimate room for a brief period of ten minutes. Regardless, significant differences were found in exercise adherence, with 71% of the intervention group maintaining their exercise program throughout the 15 weeks versus only 50% in the control group. The length of time before dropping out was also longer for the intervention group than the control group. In addition, the intervention group spent more time talking to one another throughout their time at the gym, enjoying enhanced social interactions. To promote exercise adherence the researchers suggest participant grouping, or gathering exercisers together in a group amidst a busy fitness facility, is a reasonable, productive program. A non-

competitive group exercise session, however brief, presents a unique opportunity to derive social support, camaraderie, and leadership in an exercise environment.

Group aerobic exercise classes offer the many benefits of cardiovascular activity for example: a reduced incidence of heart disease, increase caloric expenditure, mood enhancement, stress reduction, and decreased incidence of type II diabetes (Franklin, 2000). Aware of these physiological and psychological benefits Spink and Carron, (1992) sought to explore the relationship between the social support and group cohesiveness in an aerobics class environment along with the potential impact on exercise adherence. The participants were 171 women attending aerobic exercise classes for 14 weeks, three times a week. The researchers chose to compare the participants' absenteeism and lateness with their scores on a modified version of the previously mentioned Group Environment Questionnaire (Carron et al., 1988) designed to assess cohesiveness. The measurement tool is comprised of 18 questions divided into four subscales. The subscales are: (1) individual attractions to the group-social, (2) individual attractions to the group-task, (3) group interaction- task, (4) group integration-social. The results showed that individuals who were absent from the classes the least, reported being engaged with the group task and the group socially. As for the lateness component, those who were late the least scored the highest on the measures of cohesion. The effects of exercising in a group should not be underestimated when addressing the many barriers that prevent individuals from adhering to exercise for the long-term. The combination of achievable and enjoyable exercises with social and emotional support may be critical to the adoption and perpetuation of physical activity (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003).

### **Exercise Adherence: A New Mind/Body Theoretical Perspective**

While examining the exercise adherence literature it becomes evident that simply providing an exercise prescription with attention to mode, intensity and duration does not attend to the multidimensionality of human behavior. Three distinct theoretical perspectives when considered together may result in improved development and identification of productive exercise adherence programming. The first arm of this triangulated perspective is derived from George Engel's biopsychosocial model (Engel, 1977). Dr. Engel developed this model to attend to ailing patients promoting a biological, psychological and social approach to disease and symptom management (Suls & Rothman, 2004). The model is predicated on the interactivity of the biological, psychological, and social processes, integral to the achievement of optimal health and disease management. The biopsychosocial model also provides a conceptual base for health psychologists, emphasizing a multisystem approach to human functioning. A new branch of medicine referred to as behavioral medicine posits, "That mental and emotional factors, the ways in which we think and behave, can have a significant effect, for better or worse, on our physical health and on our capacity to recover from illness and injury" (Kabat-Zinn, 1990, p.1). Exercise adherence methodology should take in to consideration that biological enhancement is not accomplished alone but in accordance with other main processes of humanity. Cindi Lee, one of America's leading yoga teachers and founder of OM yoga center in New York City explains, "The most important part of any body discipline, is noticing how our mind and our body affect each other" (Lee, 2011, p. 28). In fact, the emotional and the social motivations for an individual can prove more effective at compelling the adoption of healthy behaviors. Levels of stress, social support and emotional state of being play an important role in immune function, cardiac disease management and cancer recovery (Davidson et al., 2003; Anderson, 2002; Smith & Ruiz, 2002).

The integrative approach to medicine is similar in theory to the biopsychosocial model. According to the Consortium on Academic Health Centers for Integrative Medicine, the term Integrative Medicine refers to medicine that considers the whole person in achieving optimal health, not simply just the physical state. Integrative medicine embraces therapies that support healing from within as well as outside medical science, by recognizing that an individual has resources in their social network, religious life, emotional state, and in their search for meaning that can optimize their well-being (McGonigal, 2011).

The Mind Body Stress Reduction programming developed by Jon Kabat-Zinn is the second prong of a three-prong theoretical perspective. Kabat-Zinn, as previously mentioned, is the founding director of the Stress Reduction Clinic and the Center for Mindfulness and Medicine, Health Care and Society at the University of Massachusetts. The Mind Body Stress Reduction Programming (MBSR) developed by Kabat-Zinn uses a combination of hatha yoga, body scan, and meditation (Schure, et al., 2008). A key tenet in MBSR is mindfulness. Again, mindfulness denotes awareness in the present state of being; the absences of projection, judgment, or assessment; just existing in the present moment fully. Davidson et al. (2003) conducted research on the changes in mental and physical health as a result of an eight-week mindfulness meditation program. The researchers assessed brain electrical activity in 25 participants performing mindful-meditation using repeated measures and contrasting their brain activity with that of a 16-member control group. Measurements were taken before the program began, immediately afterward, and four months post-intervention. Alterations were found in the left-sided anterior activation center of the brain in the intervention group; this area of the brain is associated with positive affect. The researchers explain that the increases seen in the meditation group's left-side activation center can occur as

evidence of a faster recovery to positive or negative events; evidence of emotional regulation. The country's leading researchers in mindfulness explain that mindfulness promotes healing and has a place in America's health care system (Boyce, 2011).

A mind/body intervention is a unique approach to garner improvements in self-regulation for the enhancement of health and well-being. Sara Lazar Harvard neuroscientist and researcher in the psychiatry department of Massachusetts General Hospital was the first to report structural changes in some regions of the brain as a result of meditation practices. Through MRI the Lazar found that some cortical areas of the brain were thicker in meditators versus non-meditators. The pre-frontal cortex was affected; this area of the brain is responsible for executive functions such as planning, decisions making, and judgment. The insula portion of the brain also demonstrated an enhanced thickness. The insula is responsible for self-awareness with the integration of social and emotional processing. Both areas of the brain are thought to participate in the ability to self-regulate (Lazar, Wasserman, Gray, Greve, Treadway, et al.2005). Susan Bauer-Wu, an associate professor of Nursing and Georgia Cancer Coalition Distinguished Scholar at Emory University, focuses her research on the clinical applications of mindfulness-meditation and the effects on quality of life and health in those suffering from serious illness. Bauer-Wu suggests that there are three main benefits from mindfulness-associated disease prevention and health enhancement; these are stress reduction, early diagnosis, and making healthy lifestyle choices (Boyce). Ultimately, the ability to choose healthy behaviors and optimize emotional regulation may promote adherence to exercise.

The final component of the mind/body exercise adherence theoretical model incorporates a component of Albert Bandura's Social Cognitive theory, specifically exercise self-efficacy. As previously mentioned, Albert Bandura's (1977)



self-efficacy theory suggests that confidence in the ability to perform a behavior is positively correlated with the actual performance of that behavior. There are considerable self-regulation benefits from the development and maintenance of a strong exercise self-efficacy. It is an individual's beliefs that will drive their choices and will help them to persist in what they believe is attainable, ultimately overcoming barriers. A mode of exercise that enhances exercise self-efficacy may be more salient than one that enhances every aspect of health-related fitness. Improvements in fitness will come with regular exercise (Centers for Disease Control and Prevention, 2010); in fact, an initial enjoyable, self-efficacy building activity may lead to improved confidence to participate in additional modes of activity (Kristal, Littman, Benitez, & White, (2005). Figure 2 provides a visual depiction of this three-pronged theoretical model developed to encompass the complexity of human behavior regulation. It is necessary to research exercise programming that encompass the tenets of this model in pursuit of the enhancement of adherence to exercise, while at the same time maintaining the decisive absence of a standard exercise prescription.

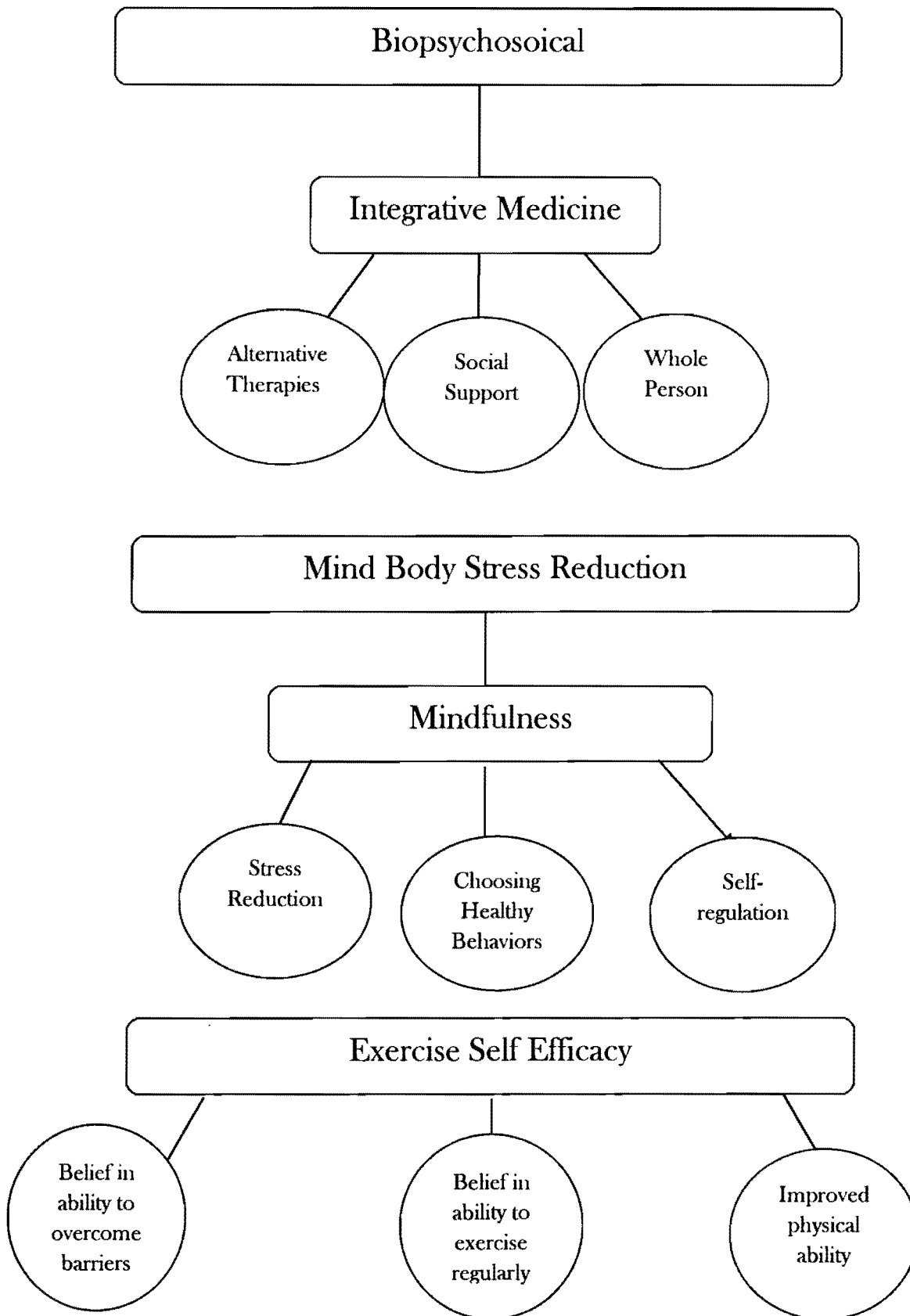


Figure 2. Exercise Adherence: A New Mind/Body Theoretical Perspective

## **Yoga: A Mind/Body Approach to Exercise Adherence**

Historically researchers have suggested that it may be productive to view exercise adoption and adherence as an interactive process rather than a single phenomenon (McAuley, 1992). Exercise scientists are beginning to realize that a synthesis of factors involving the mind and the body have a significant effect on exercise adherence (Schure, et al., 2008); yoga is productive movement form that engages a combination of mind/body activities such as meditation, relaxation, breath awareness, and mindfulness. Again, yoga literally means “union,” referring to the mind, body, and spirit. The popular western concept of yoga focuses primarily on the mind and the body with less emphasis on the spiritual. There are at least eight common forms of yoga employed in the United States (Stemmans, 2003): Hatha yoga, as previously mentioned, Iyengar yoga, Ashtanga yoga, Bikram yoga, Sivananda yoga, Kundalini yoga, Kripalu yoga, and Viniyoga. These forms of yoga are differentiated by the postures they include, the temperature of the room, the types of breathing exercises, the sequencing, the degree of difficulty, and the philosophy attached to the type or style of yoga. The founder of a school of yoga has a primary influence on the teachings that comprise that discipline of yoga; however, yoga is universally comprised of postures, mindfulness meditation, relaxation, and attention to breath.

Yoga is at its core a mind-body activity, placing awareness of self at the center. As mentioned in the introduction, a qualitative research study was conducted using a mindfulness-based stress reduction course as the intervention for graduate students in psychological counseling (Schure et al., 2008). The students reported improvements in physical balance, flexibility, and strength along with increased body awareness and sensitivity. In regard to the effects of self-awareness on confidence and decision-making, it was reported that students had an increased confidence and trust in

themselves (Schure et al., 2008). Schure et al. suggested that following the yoga intervention participants were more physically capable than previously thought and that this capability was unwavering. Bandura's (1977) self-efficacy theory suggests that confidence in the ability to perform a behavior is positively correlated with the actual performance of that behavior. If yoga has a positive effect on exercise self-efficacy as described in the Schure et al. qualitative study, the result may be an improvement in exercise adherence. Strong exercise self-efficacy is associated with the capability to overcome barriers that may interfere with regular exercise; high levels of exercise self-efficacy support the maintenance of activity over time. Improvements in exercise self-efficacy may result from a specific exercise intervention, in turn leading to increased exercise adherence (Marcus et al., 1994). Yoga as an intervention may be perceived as acutely pleasant, given that it is taught at an intensity that is agreeable to the participant and performed within a nonthreatening environment. The benefits from participating in a yoga intervention may include an improvement in exercise self-efficacy increasing confidence in ability (Schure et al.) and positively impact exercise adherence.

A host of variables may contribute to the perpetuation of exercise including the acute response to exercise; this refers to how a person feels immediately following a bout of exercise. Subjective states occurring during and immediately following an exercise intervention may be seen as predictors of future exercise participation. Annesi (2002) reports that the acute response to exercise has been strongly associated with exercise adherence. Yoga is a non-competitive, moderate intensity physical activity that incorporates attentiveness to the physical state of being; yoga classes are conducted cultivating an awareness of current feeling states, otherwise known as mindfulness.

Mood alteration or a change in feeling state is a psychological construct. Berger & Owen (1992) examined feeling state changes in individuals participating in yoga and swimming. Previously, Berger & Owen (1988) found a reduction in stress during Hatha yoga participation similar to that found when jogging or swimming. Currently, the researchers were interested in whether or not yoga and or swimming produce positive psychological changes. They hypothesized that a positive mood state would be a result of these activities and that these modes of exercise might also be useful for individuals who find more intense forms of exercise unpleasant or physically difficult. There were 101 college student participants, 22 for yoga, 37 for swimming, and 36 for a lecture group serving as the control. The exercise groups met for approximately 80 minutes per week for a period of 14 weeks. The Profile of Mood States was completed by all participants before and after class on three separate occasions throughout the semester. To measure mood, the researchers used the 65-item Profile of Mood States which contains a 5-point scale to assess adjectives related to mood states. To investigate the relationship between mood change and exercise adherence, the researchers used the State-Trait Anxiety Inventory. This tool provided an assessment of how the participants generally felt, expressed in a 4-point scale. Based upon the results of the Profile of Mood States questionnaire there were consistent mood benefits of yoga. Both swimmers and yoga participants experienced decreases in their scores measuring anger, confusion, tension, and depression when compared to the control group (Berger & Owen, 1992). The researchers also found that those who reported the greatest mood changes attended classes more consistently than those who demonstrated less psychological benefit. Identifying a psychologically favorable exercise intervention, such as swimming and yoga in this case, may lead to the recognition of a movement form that promotes exercise adherence.

Adding to the yoga-mood enhancement literature, Streeter et al (2009) and his colleagues sought to investigate changes in brain  $\gamma$ -aminobutyric (GABA) levels following a session of yoga and compared that to the brain GABA levels generated after a session of reading quietly. The researchers explained that GABA dysfunction is associated with mood disorders and that pharmacological treatment aims to increase GABA levels in this population. The researchers note that yoga has shown some usefulness as an adjunctive therapy in epileptic patients keeping in mind that the effects of many anti-seizure medications used for epilepsy are mediated through the GABA system. In addition, randomized controlled trials using yoga to combat depression were cited in this study, reporting significant reductions in symptoms. The researchers stipulate that yoga may decrease the symptoms of individuals who suffer from depression, anxiety disorders, or epilepsy by increasing the brain GABA levels. The GABA study included 8 experienced yoga practitioners and 11 subjects assigned to the reading group. The subjects were recruited through advertisement and were 18–45 year old men and women with no known history of psychiatric illness or substance abuse. The experienced yoga practitioners had participated in yoga for at least four months and the control reading group had no previous experience with yoga; there were no significant differences between the two groups in age, gender, education, ethnicity, marital status or body mass index. The yoga practitioners conducted their own 60-minute yoga sessions with at least 55 of the minutes spent doing yoga postures and breathing exercises. Anatomical magnetic resonance imaging scans (MRSI) were performed on all participants before and after their intervention—again the reading group was considered the control group.

The results revealed a 27% increase in GABA levels in the yoga group with no corresponding increase in the reading group. The researchers report that “The acute elevation of brain GABA levels following the practice of yoga asanas in experienced practitioners suggests that yoga asanas may be an efficacious treatment for low GABA levels.” (Streeter et al., 2009, p.423) This study suggests increased GABA levels as one possible explanation for the improved mood effects of yoga that is reported across the literature.

Yoga is considered physical activity and may be associated with improvements in health-related behaviors over time as demonstrated in the research conducted by Kristal et al. (2005). The data set for this research were collected from the Vitamins and Lifestyle study (VITAL)(White, et al. 2004) derived from the 77, 738 questionnaires completed by men and women between the ages of 50 and 76 who resided in Washington State; the current study was further delimited using only subjects from VITAL between the ages of 53 and 57 years of age. That sample included 15,550 adults who were reported in good health and had completed self-reported data on height and weight. The researchers investigated weight change retrospectively, comparing weight at the age of recruitment in the study with weight at age 45. In addition, they used the data on recreational physical activity reported retrospectively for the previous ten years. This data included physical activities that were performed regularly, defined as participation in the activity at least once a week for at least one year of the past ten. Three specific activities were included in the questionnaire, these were: walking, lifting weights, and practicing yoga. The researchers also used a food frequency questionnaire to assess the intake of fruits and vegetables.

Linear regression was used to statistically analyze the relationship between yoga and weight change, yoga and the intake of fruits and vegetables, and the amount of energy expended through physical activity other than yoga. Among those individuals who were involved in a regular yoga practice for four or more years there was an attenuation of weight gain. They found a 3.1 lb. lower gain in weight among those at a normal body weight and an 18.5 lb lower weight gain among those who were categorized as overweight. The participants in the study who reported doing yoga for four or more years reported expending twice-as-much metabolic energy through exercise, excluding yoga, than those who were not involved in a regular yoga practice. This measurement was calculated by assigning an intensity code to each activity and then establishing mathematically the caloric expenditure by determining the number of minutes per session, the number of sessions per week and the number of years of performance of each activity. In addition, the four-or-more year yoga group consumed 45% more fruits and vegetables and their fat intake was 11% lower than the non-yoga population. Although the caloric expenditure from a regular yoga practice may be moderate, the mind-body effects may support long-term, positive health-related behaviors; further investigation is warranted. The researchers inferred that yoga places an emphasis on body awareness and may aid in the adoption of healthy dietary habits, promote improved exercise habits, and enhance the self-control needed for the maintenance of these behaviors. One limitation in this work is the lack of causal relationship; for example, are the individuals who eat more fruits and vegetables and expend much energy through physical activity more likely to choose yoga as an activity, or does the practice of yoga result in or support an increased intake of fruits and vegetables and an increased caloric expenditure through physical activity? A random controlled trial incorporating yoga as the exercise intervention with previously sedentary



participants in a between and within repeated measures design will extend the yoga/exercise adherence, healthy-behaviors body of knowledge.

A positive impact on exercise adherence will likely result in health-related improvements including those associated with health-related fitness. An increase in the volume of physical activity is correlated with a decrease in diseases associated with a sedentary lifestyle and an improvement in the ability to carry out activities of daily living (CDC,2010). Regular physical activity is critical in the fight against lifestyle diseases and premature death. The benefits of regular physical activity are a reduced risk in developing one or more of the following maladies: hypertension, hyperlipidemia, obesity, overweight, cardiovascular disease, various forms of cancer, stroke, and type II diabetes (CDC, 2010). The American College of Sports Medicine recommends the daily incorporation of a variety of health-related activities to enhance health-related fitness; these are, muscular strength, muscular endurance, balance, flexibility, and cardiorespiratory endurance (Franklin, 2000). To investigate yoga's effects on the health-related aspects of physical fitness, a quasi-experimental pilot study with pre-post test design was conducted by Tran, et al. (2000); 10 adults between the ages of 18 and 27 years with one male and 9 female participated. These individuals were sedentary adults, who were physically inactive for the previous six months. The participants were asked to attend at least half of the 32 Hatha yoga classes offered on campus over an 8 week period and to refrain from all other modes of exercise. Testing was divided into two sessions allowing for a rest day in-between to promote physical recovery. On the first day maximal strength and VO2 Max were evaluated and muscular endurance, flexibility, body composition, and pulmonary function were measured on the second test day (Tran et al.). The post-test results revealed a significant increase in flexibility,

muscular endurance, muscular strength, and cardiorespiratory endurance. As noted by the researchers, these physiological measurements were chosen because they are indicators of health-related fitness. This was a pilot study with a small sample and no control group; while the preliminary results were positive this research needs to be replicated using an experimental model and larger sample for validation.

Chen et al. (2008) added to the literature investigating the effects of yoga on physical fitness in senior citizens; this was a quasi-experimental pre and post-test design with the yoga classes meeting three times per week for 24 weeks. The participants were recruited from eight different senior citizen centers with 176 completing the study. The results showed significant improvement in the measures of physical fitness in the post testing, which included flexibility, cardiorespiratory endurance, body composition, and functional ability (Chen et al.). Yoga offers significant improvements in the parameters of physical fitness; this is vital to enhancements in health status.

Bryan et al. (accepted 2011) found in pilot work that previously inactive adults improved their adherence to exercise following a ten-week, twice weekly yoga program. In addition, the yoga class participants reported experiencing positive acute feelings following the yoga classes and improvements in general well-being, while the control group had a decrease in general well-being over the same time frame. Qualitative data collection revealed improvements in self-awareness, increased awareness of eating behaviors, and improvements in stress management behaviors. Based upon these findings, further investigation of yoga as a productive intervention in the fight against physical inactivity and poor health behaviors is warranted.

Adhering to a well-rounded exercise program is associated with improvements in the health-related components of fitness including cardiovascular ability, muscular strength and endurance, balance, and flexibility (CDC,2010). In addition, the health-related effects of exercise adherence include decreases in morbidity and increases in longevity; quality of life is said to improve with increased optimism and a decreased incidence of depression. Engel's biopsychosocial model (1977) postulates that recovery from illness as well as the adoption of healthy behaviors require attention to an integration of factors as a consequence of the complexity of the biological, psychological, and social aspects of life. Mindfulness creates a connection between the mind and the body resulting in an increased understanding of self and an enhanced ability to self-regulate.

The body of research suggests that the psychological effects of an exercise intervention are as important to consider as the improvements in physical fitness that may result. The functional decline resulting from inactivity has similar characteristics to biological aging. The reversal of functional decline and the attenuation of biological aging are made possible through adherence to a well-developed exercise program. Overcoming the perceived barriers, whether psychological or physiological, to physical activity is the key to exercise adherence. Bandura's self-efficacy theory suggests that the perceived barriers to physical activity may involve cognitive, situational, or structural barriers (1997). It is important to remember that barriers, whether real or perceived, impede the progress of an individual to accomplish change. For example, an individual experiencing fatigue and nausea as a result of cancer treatment may perceive their poor health as too potent a barrier to overcome and as a result, not employ moderate exercise as a health-improvement strategy. Likewise, a cloudy day may represent a formidable barrier to the maintenance of a daily walking program in an individual who is

susceptible to this type of impediment; in actuality, both examples illustrate barriers that interfere with desired behaviors. Bandura suggests that increased exercise self-efficacy can enable an individual to overcome obstacles that interfere with the development and maintenance of desirable health behaviors such as regular physical activity.

Exercise self-efficacy is regarded as a critical outcome variable; improvements in exercise self-efficacy may be derived from an exercise intervention that is perceived as agreeable, achievable, and mood enhancing. Research has shown that yoga results in enhanced mood benefits (Berger & Owen, 1992), reductions in perceived stress (Cowen & Adams, 2005), increased mental clarity (Schure et al, 2008), diminution in symptoms associated with depression and anxiety (Streeter et al., 2007), and an increased perception of physical capability (Schure et al., 2008). Significant improvements in the health-related aspects of physical fitness have resulted from yoga interventions (Tran et al,2001 ;Cowen & Troy, 2005;Chen et al., 2008).

Currently, there are overwhelming statistics surrounding inactivity and the lack of exercise adherence in America. The lifestyle diseases and healthcare costs associated with these difficulties suggest that exercise scientists and health professionals must develop more comprehensive strategies to address the many facets of the problem. As we recognize the complexity that surrounds the adoption of positive behaviors for improved well-being, it is useful to investigate the impact of yoga on health-related behaviors, especially exercise adherence. Yoga is a distinct exercise intervention that offers an integration of stimulus addressing the mind and the body. A consistent component of yoga classes is mindfulness meditation with the goal of connecting participants inwardly to enhance self-awareness. Yoga can be performed in a group atmosphere allowing for the social and cohesion benefits of an exercise community. As a movement form, yoga is a non-competitive, easily modifiable activity that is easily

adjusted to a type and intensity that is agreeable to the participant. As national efforts continue in the fight against inactivity, it is vital to investigate the association between yoga participation and adherence to exercise.

## Chapter III

### METHODS

#### Participants

Apparently healthy males and females 18 years or older who participate in yoga classes at least once a week were recruited to participate in the study. Participants were drawn from areas throughout New Jersey.

#### Inclusion and Exclusion Criteria

The inclusion criteria for the subject selection:

- 1) Adult yoga participants over the age of 18
- 2) Participating in yoga class at least one class per week consistently; defined as one or more classes per week on a weekly basis
- 3) Participating in yoga classes in a commercial or recreation facility

The exclusion criteria for subject selection:

- 1) Pregnancy
- 2) Only participating in private yoga sessions
- 3) Attending yoga classes on an inconsistent basis; defined as less than one class per week on a weekly basis

#### Design and Variables

This study is an exploratory design utilizing a mixed method of data collection

#### Variables

The variables include general well-being as measured by the General Well-Being Schedule (Appendix F ), exercise self-efficacy as measured by the Multidimensional Self-efficacy for Exercise Scale (Appendix G ), group cohesion as measured by the Group Environment Questionnaire (Appendix H ), the amount of physical activity participation as measured by 7-Day Physical Activity Recall (Appendix I ) Mindful eating as measured by the Mindful Eating Questionnaire and two open-ended questions pertaining to the yoga experience (Appendix E ). Yoga tenure is the final variable, defined as at least one yoga class per week on a weekly basis.

### **Measurements**

The personal data was with participants completing a self-report survey which was developed for the purpose of gathering personal data for this study. General well-being scores, exercise self-efficacy scores, group cohesion scores, mindful eating scores, and the amount of physical activity performed in a seven-day period will all be measured using standardized valid and reliable tools established in the literature. Two open-ended questions were developed by the author to further explore the effects of yoga through self-reflection; the two questions posed will then be coded for emergent themes across all participants.

### **Personal Data**

The demographic and personal data gathered includes: age, gender, height, weight, ethnicity, level of education, types of yoga performed, length of participation in yoga classes expressed in months and years, number of yoga classes currently taking per week, approximate number of yoga teachers attended throughout yoga experience, servings of fruits and vegetables eaten per day, other forms of exercise performed

regularly, amount of time spent during yoga class on meditation/relaxation, and the amount of time spent during yoga class performing postures.

### **General Well-being Schedule.**

The General Well-Being Schedule (GWBS) was designed by the National Center for Health statistics. There are six subscales including the constructs of energy level, satisfaction, freedom from worry, and self-control. The survey consists of 18 items. A high score on the General Well-Schedule indicates an absence of bad feelings and the existence of positive feelings. National surveys have revealed that higher scores on the GWBS are associated with increased engagement in physical activity for both men and women across age groups. Fazio (1977) conducted a concurrent validation study for the General Well-Being Schedule and found the test re-test correlation was .851 for the entire scale; internal consistency was .912 for men and .945 for woman. The National Center for Health Statistics used a sample of 6,931 for the GWBS survey and have established meaningful norms. The time required to complete this survey is approximately 5-7 minutes.

### **Multidimensional Self-efficacy for Exercise Scale.**

The Multidimensional Self-Efficacy for Exercise Scale is an instrument designed to measure three sub-domains of exercise self-efficacy; these are task self-efficacy, scheduling self-efficacy, and coping self-efficacy (Rodgers, Wilson, Hall, Fraser, and Murray, 2008). Exploratory factor analysis followed by confirmatory factor analysis demonstrated the expected factor structure. Subsequently the generalizability of the factor structure was confirmed with a random sample of 470 adults, and discriminate validity was demonstrated in this sample population through the instrument's ability to



distinguish between exercisers and non-exercisers. Finally, the self-efficacy scale was responsive to changes in exercise experiences. The time required to complete this survey is approximately 3 minutes.

### **Group Environment Questionnaire.**

The Group Environment Questionnaire (GEQ)(Carron, Brawley, & Widmeyer, 2002) (see Appendix H) is comprised of 18-items that are divided into four subscales which assess perceived group cohesiveness, they are: Individual Attraction to Group-task (ATG-T), Individual Attraction to Group-social (ATG-S), Group Integration-task (GI-T), Group Integration-social (GI-S). The reliability coefficients as measured by Chronbach's Alpha are: ATG-T .75, ATG-S .64, GI-T .70, GI-S .76. The GEQ is reliable and has good internal consistency. "To date, there is evidence that the GEQ is a valid instrument for the assessment of perceived cohesion. There have been judgments of the GEQ's content validity as well as demonstrations of its criterion-related validity (concurrent and predictive) and its construct validity" (Widmeyer, Brawley, & Carron, 1985, p.50).

Modifications were made to the GEQ to accommodate its use with a group exercise class rather than a sports team, as it was originally designed. The wording changes to accommodate this fitness sample have been used elsewhere (Carron, Widmeyer, & Brawley, 1988; Carron & Spink, 1993; Spink & Carron, 1992); further, Carron & Spink (1992) investigated the internal consistency of the modified group environment questionnaire for use in fitness classes and found internal consistency values highly similar to those found with the extensively validated original version of GEQ. The Chronbach's alpha values of the four subscales for the modified version are .77, .61, .71, .77. Researchers have used GEQ to investigate group cohesion and

exercise endurance (Annesi, 1999). The time required to complete this survey is approximately 5-7 minutes.

### **Mindful Eating Questionnaire**

The mindful eating questionnaire (MEQ) is a 28 item questionnaire that assesses an individual's awareness of sensations, emotions, motivations, and responses to eating; also referred to as feeding. There are four domains represented with the questionnaire, disinhibition, awareness, external cues, emotional responses, and distraction (Framson, et al., 2009). Responses are gathered in a four point scale ranging from never/rarely to usually/always. It has a good internal consistency reliability with a Chronbach's alpha at .64 and MEQ score is inversely related to body mass index.

### **Procedures**

The principal investigator (PI) contacted commercial and recreation exercise sites that offer yoga classes via phone, email and/or in person. The PI communicated with the decision maker of the establishment requesting the opportunity to solicit their yoga participants for possible involvement in the study. The PI explained that recruitment will begin with flyers of solicitation posted in their waiting room directing potential participants to the coded survey packets placed in a common area held in a receptacle, accompanied by a return receptacle. A full explanation of the project was offered to the decision maker and all questions answered. The decision maker offered the option to preview the recruitment flyer, solicitation letter, dependent variable surveys and open-ended questions. When consent is granted (Appendix K), the PI arranged to deliver all materials to the establishment and committed to retrieving the completed surveys once a week for a period of six weeks.

The outside of the survey packet was affixed with the solicitation letter (Appendix C). The order of surveys in the packet was personal data (Appendix D), 7-day physical activity recall (Appendix I), two open-ended questions (Appendix E), general well-being schedule (Appendix F), exercise self-efficacy survey (Appendix G), and group environment questionnaire (Appendix H) ,and Mindful Eating Questionnaire (Appendix J). The time to complete the packet was approximately 25-30 minutes.

## Chapter IV

### RESULTS

#### Demographic Profile

Data was collected from a combination of seven fitness centers and yoga studios through-out New Jersey. Three hundred surveys were dispensed to the collection sites, with 87 completed surveys returned. The collected survey retrieval counts are as follows: 13,19,13,10,12,10,10. The collected sample included 71 women (81.6%) and 16 men (18.4%) with a mean age of 47. Additionally, there were 66 (75%) white, 11 Asian (12.6%), 3 Native Hawaiian, 3 Indian, 1 African American, 1 Hispanic/Latino and 2 no answer. The majority of participants (94%) had at least a two-year college education. The personal data collected revealed that 72 % of the sample had a BMI of 24.9 or less, with a mean of 23.18. The participants reported regular participation in yoga classes spanning from 1 month to 540 months; the mean participation was 65.43 months. The number of yoga classes attended per week ranged from 1-7 with a mean of 2.67. The range of yoga teachers experienced was 2-60 with an average of 12. The minutes in class spent meditating and doing physical postures were a mean of 10 and 52.8 respectively. Participants reported engaging in average of 239.70 minutes of exercise per week, aside from their yoga participation. Finally, when asked for the number of ½ cup servings of fruits and vegetables ingested per day, participants reported a range from 1-12, with a mean of 5. A summary of demographic and personal data may be found in table 1.

Table 1.

*Demographic and Personal Data*

Variable	N	%	Range	Mean
Age	18-78			47
Gender				
Female	71	81.6		
Male	16	18.4		
Ethnicity				
White	66	75		
Asian	11	12.6		
Indian	3	.03		
Native				
Hawaiian/ Pacific Islander	3	.03		
African				
American	1	.01		
Hispanic	1	.01		
No answer	2	.02		
Education				
High School	7	8		
Two-year				
College	6	6		
Four-year				
College	33	37		
Master's				
Degree	32	36		
Doctorate	9	10		
BMI			17.2-40.2	23.18
Months Yoga			1-540	65.43
# Teachers			2-60	12.24
Classes Per. Wk.			1-7	2.67
Meditation Minutes			2-60	10

Table 1. (continued)

*Demographic and Personal Data*

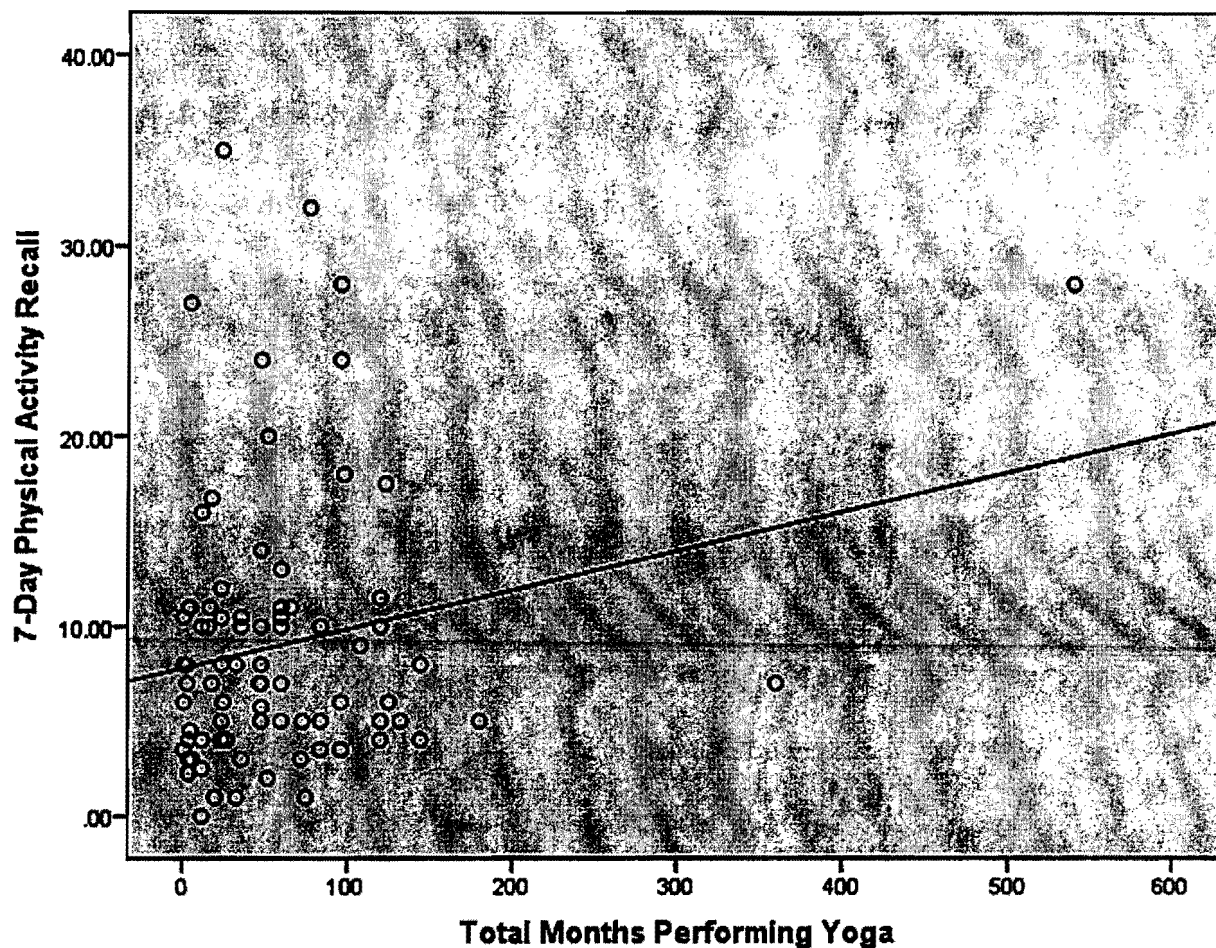
Variable	N	%	Range	Mean
Posture Minutes			15-90	52.08
Exercise Minutes			0-585	239.70
Servings of fruits and Vegetables			1-12	5.06

## Quantitative Data Analysis

### Yoga tenure and exercise adherence

The relationship between yoga tenure or, the amount of time in months a participant performed yoga, and exercise adherence was measured using the Physical Activity 7-day Recall (Appendix H). An analysis using Pearson's correlation coefficient indicated that there is a significant linear relationship  $r=.22$ ,  $p< .02$ . For these data, the mean (SD) for yoga tenure was 65.43 (77.23) and physical activity recall was 9.08 (7.07). These results are graphically depicted in figure 3.

**Figure 3. 7-Day Physical Activity Recall and Total Months Performing Yoga**

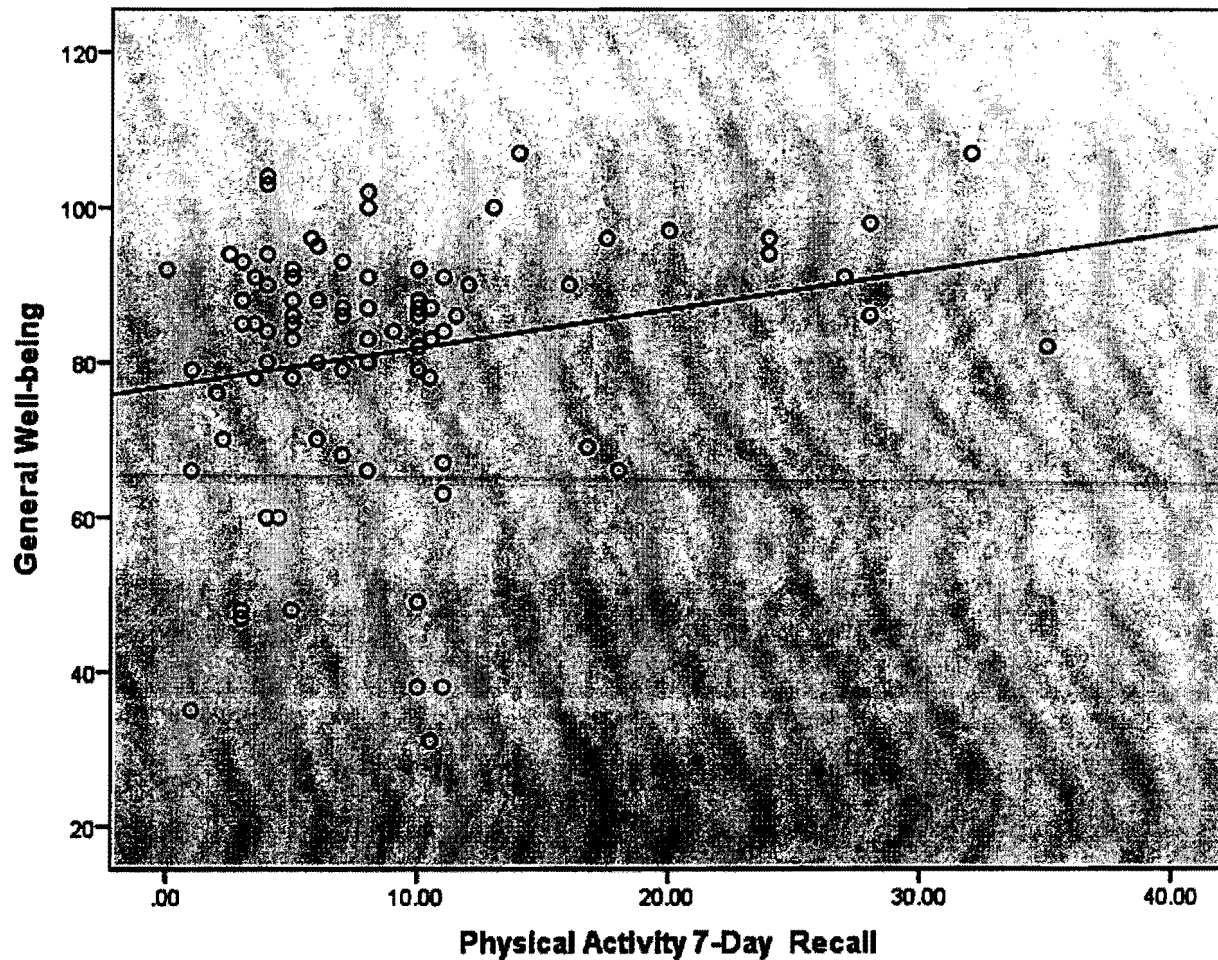


### **General well-being and exercise adherence**

The relationship between general well-being (Questionnaire in appendix E) and exercise adherence was measured, again using the 7-day physical activity recall survey. An analysis using Pearson's correlation indicated that there is a significant linear relationship between exercise adherence and general well-being  $r = .214$ ,  $p < .025$ . For these data, the mean (SD) for exercise adherence was 9.08 (7.17) and for general well-being was 81.62 (16.64). The graphic representation of these results

follows in figure 4. The findings demonstrate a positive relationship between participating in yoga regularly and the amount of physical activity performed.

**Figure 4. General Well-being and Exercise Adherence**



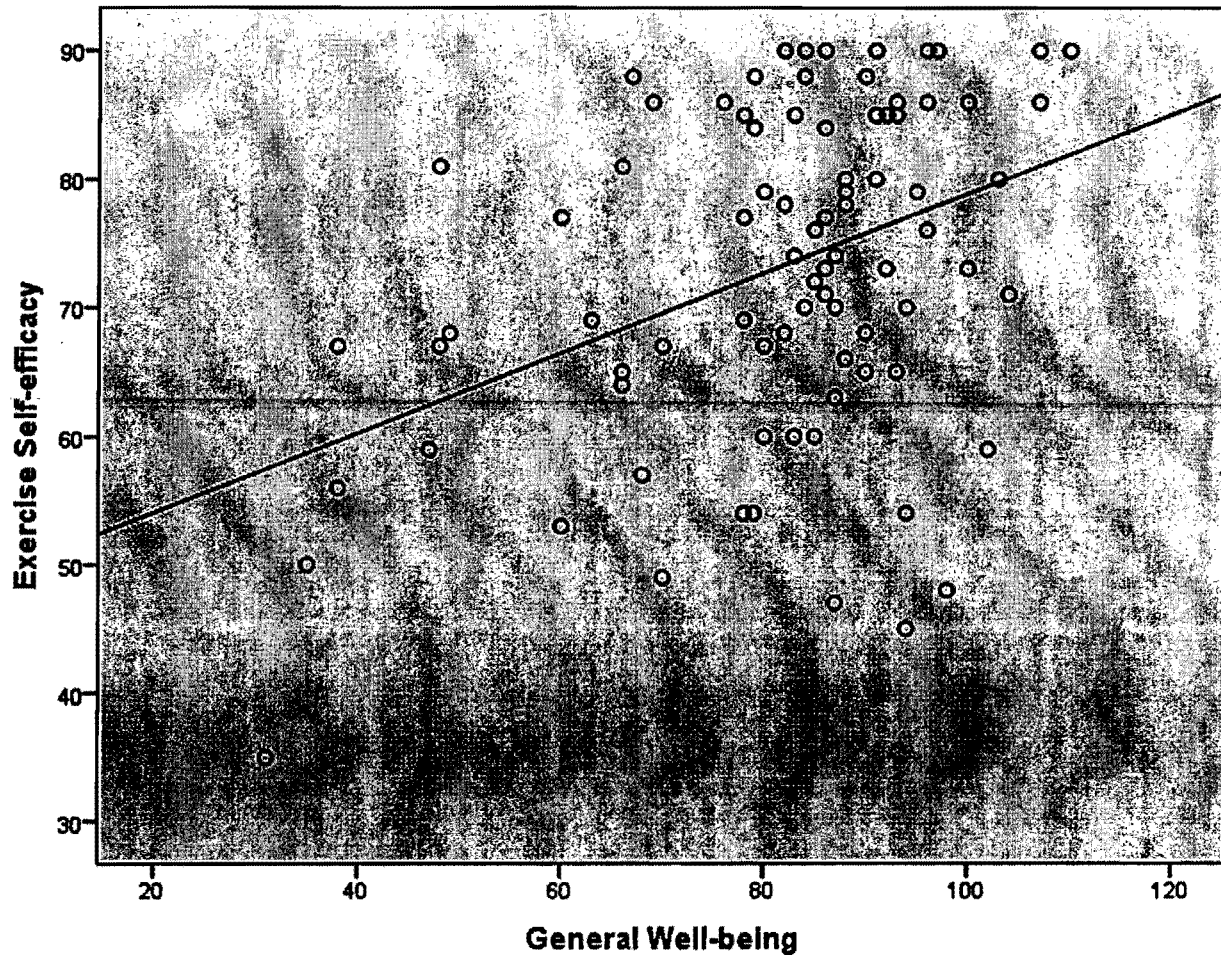
#### **Exercise self-efficacy and general well-being**

The relationship between exercise self-efficacy (Survey in appendix F) and general well-being was investigated. An analysis using Pearson's correlation coefficient indicated a significant linear relationship between exercise self-efficacy and general well-being,  $r=.398$ ,  $p < .000$ . For these data, the mean (SD) for exercise self-efficacy was 73.21 (13.01) and for general well-being was 81.62 (16.64); this is shown in figure



5. The results suggest a positive relationship between an individual's state of well-being and the amount of exercise they perform.

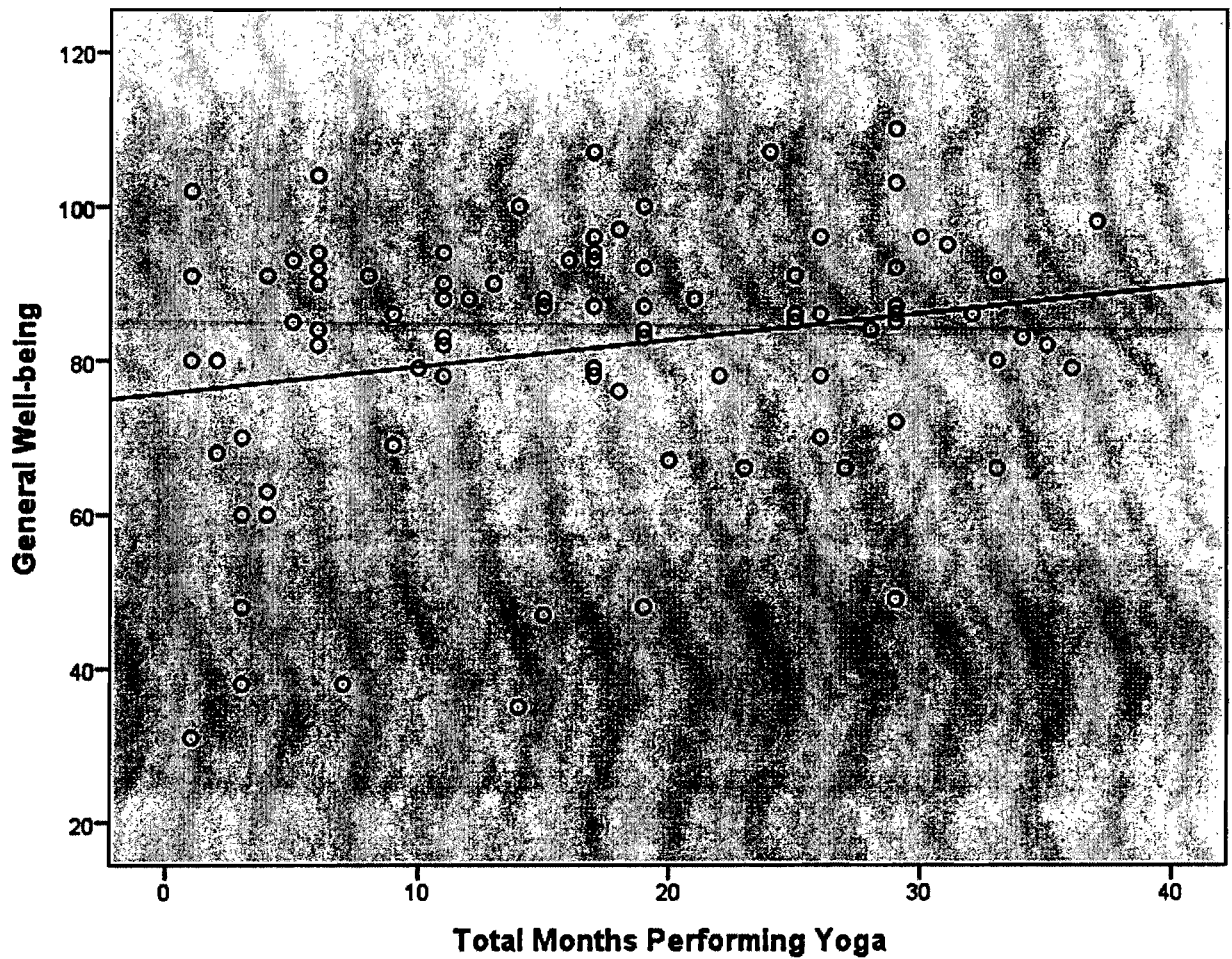
**Figure 5. Exercise Self-efficacy and General Well-being**



The relationship between general well-being (Survey in appendix F) and yoga tenure was investigated. An analysis using Pearson's correlation coefficient indicated a significant linear relationship between general well-being and yoga tenure  $r=.215$ ,  $p < .023$ . For these data, the mean (SD) for general well-being was 81.62 (16.64); and for

yoga tenure was 17.01 (10.34). The results suggest a positive relationship between an individual's state of well-being and the amount of yoga they have performed in months/years. This relationship is depicted in figure 6.

**Figure 6. General Well-being and Total Months Performing Yoga**



### **Group cohesion perceptions**

The Group Environment Questionnaire (Appendix G) consists of four separate constructs; they are Individual Attraction to Group Social (ATG-S), Attraction to Group Task (ATG-T), Group Integration Social (GI-S), and Group Integration Task (GI-T). The Attraction to Group Task score was slightly above the norm for this research. Found in Table 2. Are the scores along with the results of the pilot study for purposes of comparison.

Table 2.

#### ***Group Cohesion Survey Norms and Results***

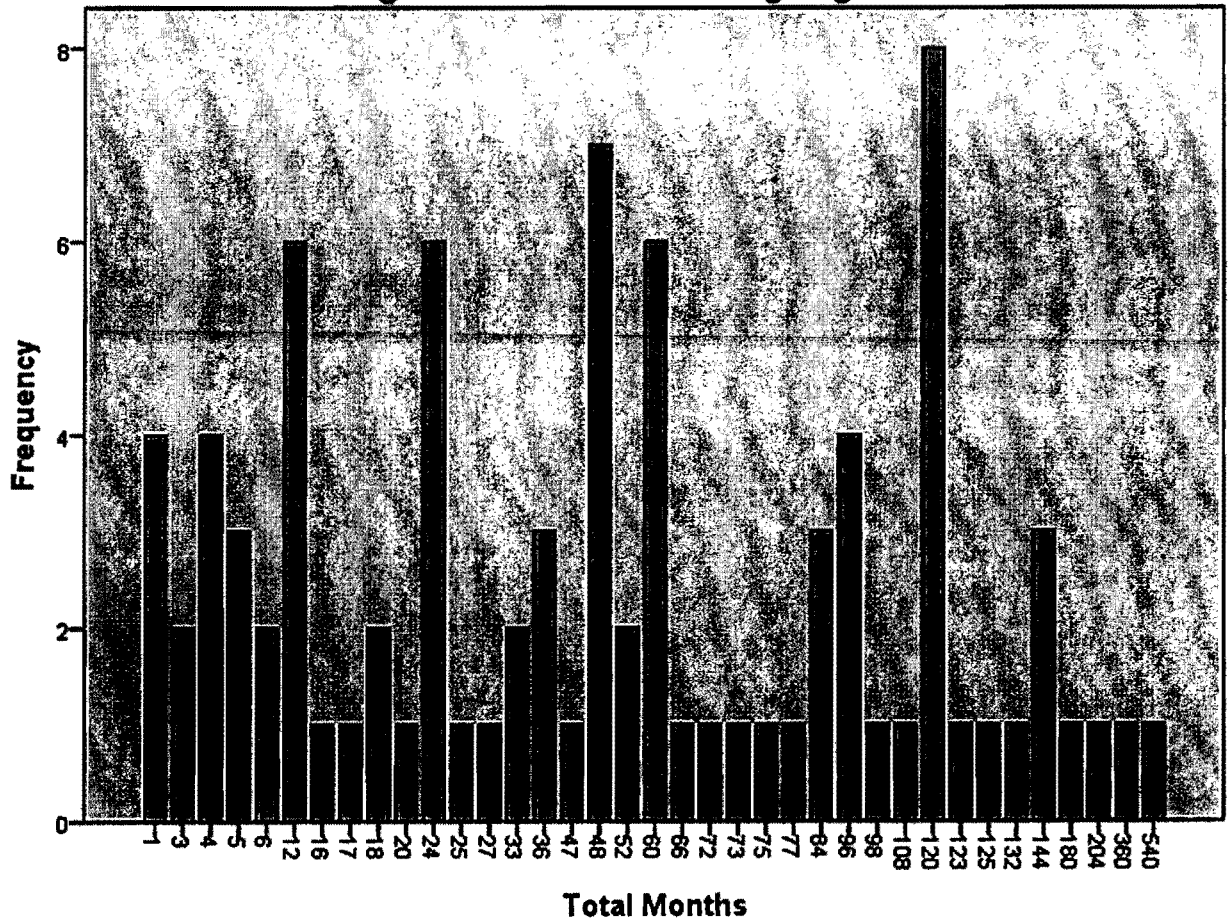
<b>Construct</b>	<b>Normative Values</b>	<b>Pilot Study</b>	<b>Study Result</b>
<b>ATG-S</b>	<b>31.97</b>	<b>28</b>	<b>30.59</b>
<b>ATG-T</b>	<b>30.87</b>	<b>34</b>	<b>31.84</b>
<b>GI-S</b>	<b>24.22</b>	<b>14.33</b>	<b>20.18</b>
<b>GI-T</b>	<b>29.47</b>	<b>30.70</b>	<b>27.62</b>

### **Transforming Data**

Given skewedness of yoga tenure data (3.475 positively skewed or skewed to the right) the data in to groups which is standard practice for skewed data. The authors propose that the skewedness is not a reflection of data gathering practices but rather reflective of the fact that the current population is not likely to have participated in 45 years of yoga. The bulk of the participants engaged in yoga for less than 6 years (72 months) with the entire population ranging from 0-45 years of yoga participation. Groups

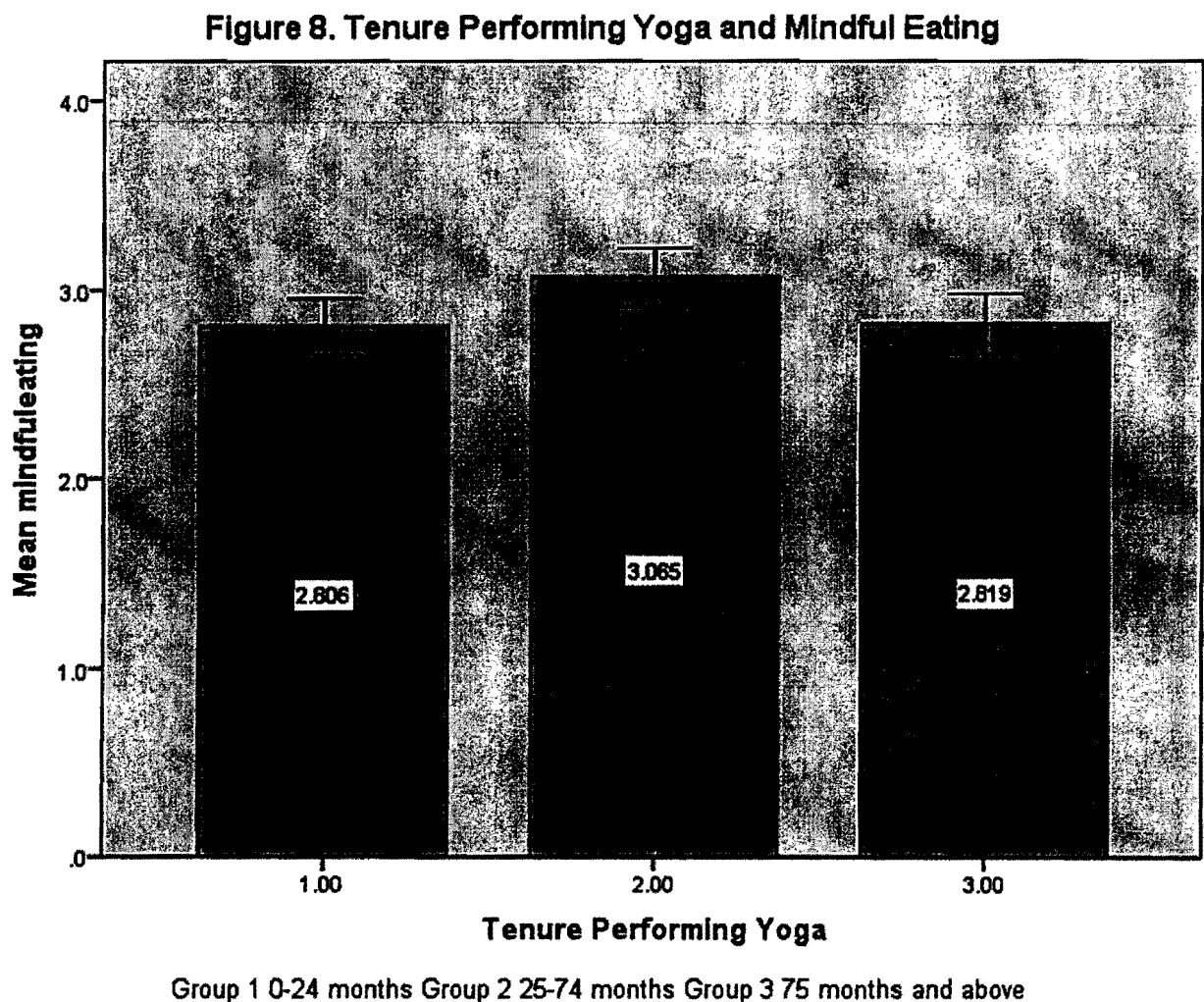
roughly equal samples. The transformed data has a normal skewness of .66. The data distribution before transformation is displayed in figure 7. The data after transformation consist of three groups; the first group includes participants who have taken yoga for 1-24 months. The second group consists of participants from 25-74 months, with the final group 75 months and beyond. The sample size for each group is 32, 26, 28 respectively.

**Figure 7. Months Performing Yoga**

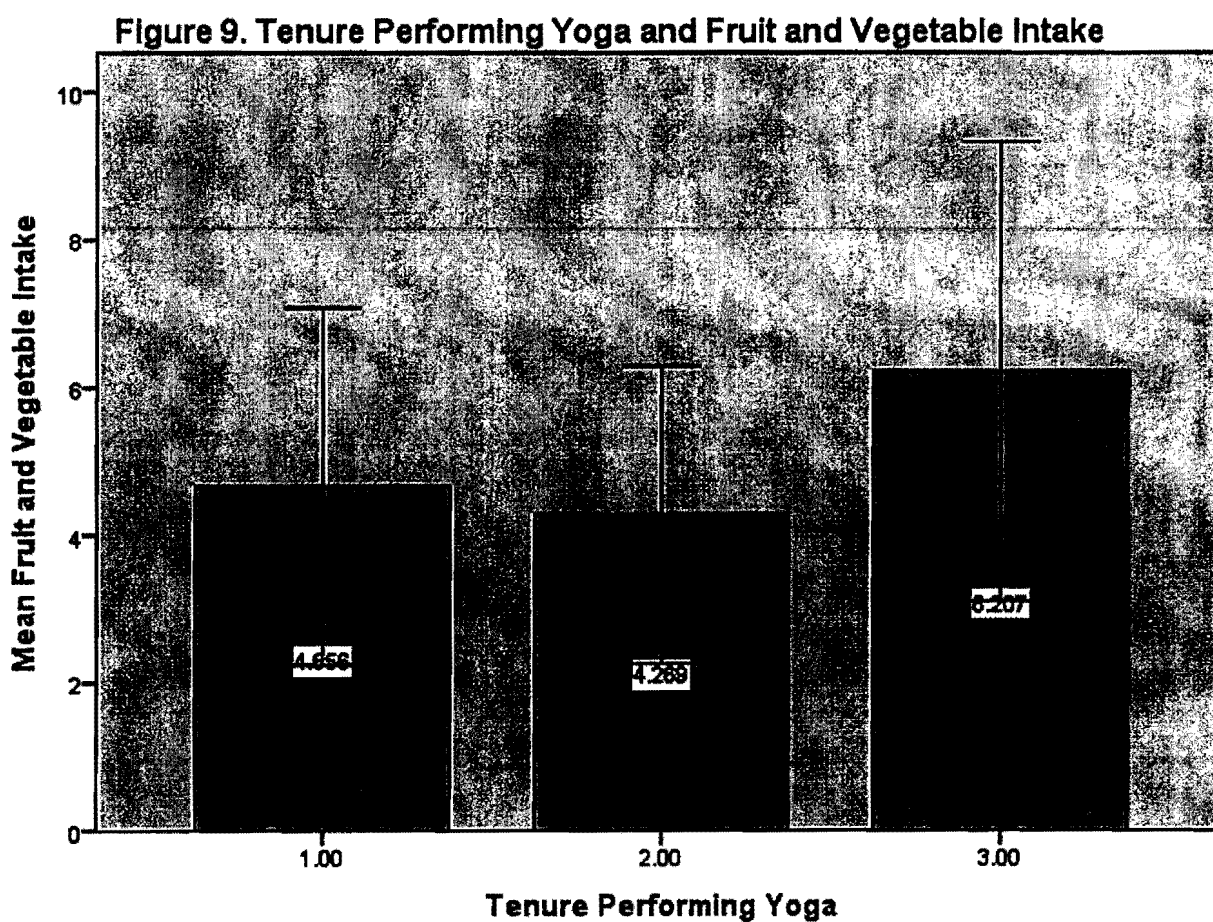


were developed using equal percentile splits, 33%, and 66% respectively, to create

The relationship between the yoga tenure and mindful eating practices was investigated using the mindful eating questionnaire (appendix I) and the transformed data in groups. The overall test of the means in One-way ANOVA was significant  $F(2,80) = 3.633$   $p < .03$ . The Bonferroni method was used to perform pairwise comparisons indicating at the overall 0.05 level that the first grouping is significantly different from the second grouping ( $M = 2.59$ ,  $SD = .1056$ ). The findings suggest a difference in mindful eating practices relative to the amount of time an individual has performed yoga; figure 8 illustrates these results.



The relationship between yoga tenure in groups and the amount of fruits and vegetables consumed on a regular basis was investigated. The overall test of the means in One-way ANOVA was significant  $F(2,84) = 4.527$   $p < .014$ . The Bonferroni method was used to perform pairwise comparisons indicating at the overall 0.05 level that the second grouping is significantly different from the third grouping ( $M = -1.938$ ,  $SD = .693$ ). The findings suggest a positive relationship between the amount of time in months that a person performs yoga and their fruit and vegetable intake.



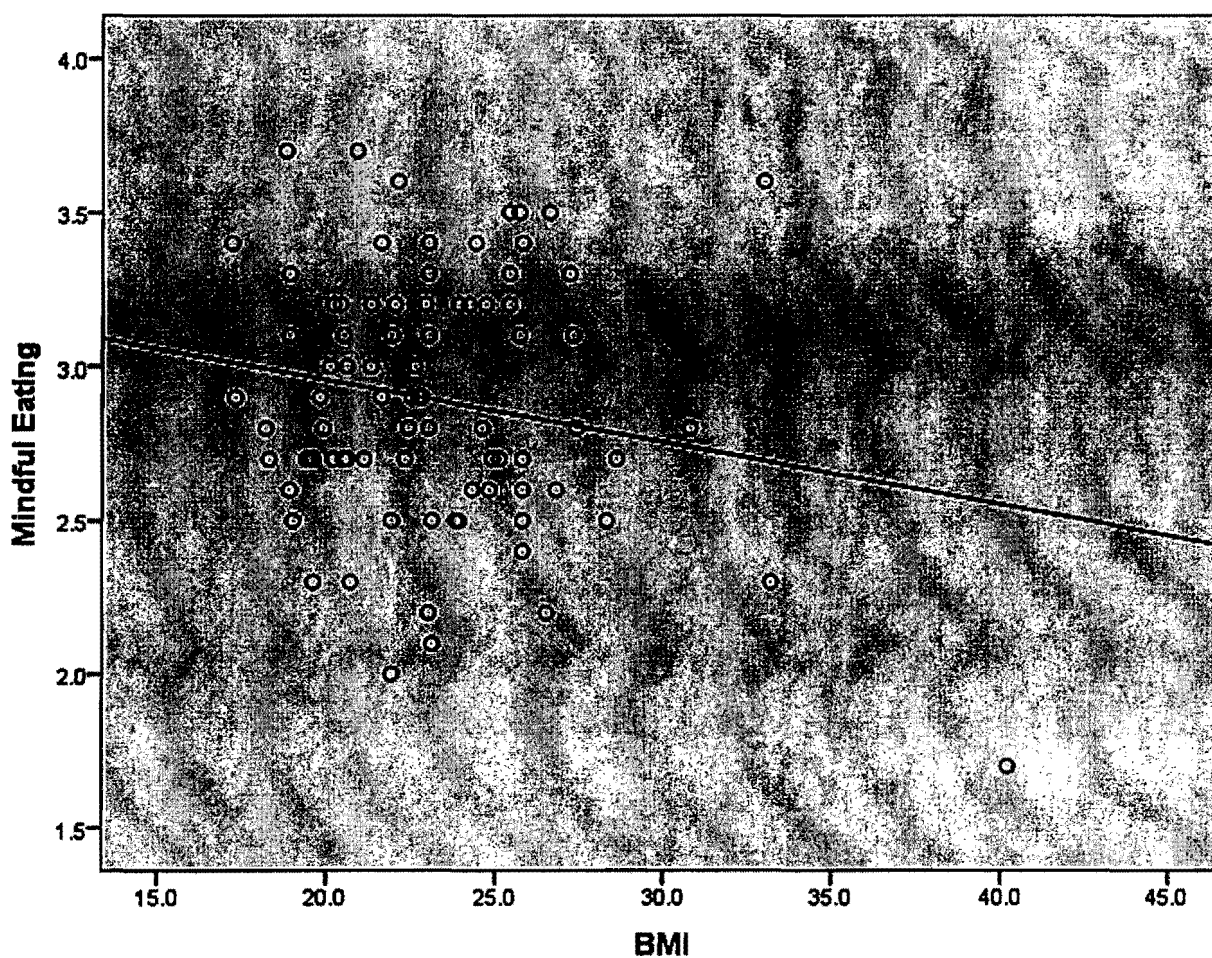
\* Group 1: 0-24 months Group 2: 25-74 months Group 3: 75 months and above

Descriptive analysis was conducted to determine the body mass index (BMI) of the yoga participants in the study. The analysis revealed that 72% of the yoga



participants had a BMI of 24.9 or less which is the healthy category. The mean for the entire sample was 23.18, with 22% falling in the overweight category; only 3% of the sample had a BMI of greater than 30 indicating obesity. Further analysis was then conducted to determine what if any relationship existed between BMI and mindful eating. An analysis using Pearson's correlation coefficient indicated a significant inverse relationship between mindful eating and BMI  $r = -.185$   $p < .047$ . The mean (SD) for mindful eating was 2.89 (.409) and for BMI was 23.18 (3.72). The inverse relationship between BMI and mindful eating is illustrated in figure 8.

**Figure 10. Mindful Eating and Body Mass Index**





Further correlational statistical analysis was conducted on the following research questions resulting in no significant correlation between variables:

1. Is there a relationship between the amount of time (in months and/or years) that an individual participates in yoga classes and exercise self-efficacy?

**Findings:** Pearson's correlation coefficient of  $r = .025$ ,  $p < .41$

2. Is there a relationship between exercise adherence and exercise self-efficacy among yoga class participants?

**Findings:** Pearson's correlation coefficient of  $r = .145$ ,  $p < .09$

### **Qualitative Data Collected**

The yoga participants were asked two open-ended questions (Appendix C) included in each research packet. The data were analyzed for emerging themes and coded. Question one was: Have any of your health behaviors changed over the course of your yoga experience in ways that may be related to your participation in yoga? In response to question one, 91% of the participants reported that yoga had impacted their health behaviors, with 39% stating that yoga had an impact on their eating behaviors and 41% reporting changes in emotion-related behaviors. The emerging themes for question one were eating behaviors, physical behaviors, emotional/psychological, and physical changes.

Question two was: Based upon your participation in yoga classes, do you believe yoga has had an impact on your ability to adhere to an exercise program? Overall, 87% of the respondents reported that yoga impacted their ability to adhere to exercise with 21% of sample communicating that they had an increased desire to adhere to exercise. In addition, 31% of sample reported emotions impacting adherence. The emerging themes for question two were desire to keep exercising, physical ability, increased self-awareness impacting choices, perceptions and emotions, and improve/prevent

symptoms. Tables three through six correspond to open ended question one, while tables seven through eleven correspond to question two.

Table 3.

*Emerging Themes One: Question One*

Theme: Eating behaviors	Code	Respondent Sample
	Choosing Healthier Foods	I feel like my food choices are better, don't put bad food into a healthy body
	Better Hydration	I am more aware of staying hydrated
	Eating Slowly	I eat more slowly
	More Mindful	I am more conscious, disciplined, and mindful with nutrition
	Portion Control	My eating habits have changed I pay attention to the portion of food

Table 4.

*Emerging Theme Two: Question One*

Theme: Physical Behaviors	Code	Respondent Sample
	Posture	The postures in yoga remind me to walk and sit more erect
	Sleep	I now sleep better and longer at night with regular practice

Table 5.

*Emerging Theme Three: Question One*

Theme: Emotional/Psychological	Code	Respondent Sample
	Mindfulness	Yoga has opened me up to myself
	Meditation	I started meditating daily
	Stress Management	I have a better overall sense of well-being and better ability to handle stress
	Health Focused	I have more focused on overall health
	Mental/Emotional Health	I am more conscious, disciplined, and mindful of my emotions

Table 6.

*Emerging Theme Four: Question One*

Theme: Physical Changes	Code	Respondent Sample
	Back Pain	Participation in yoga has eliminated lower back pain caused by a herniated disc
	Arthritis/Joint Pain	If I miss the pain in my knees returns and I get very stiff and uncomfortable
	Health/Fitness	Have gained flexibility and strength

Table 7.

*Emerging Theme One: Question Two*

Theme: Desire to Keep Exercising	Code	Respondent Sample
	Exercise Frequency	Yoga has and does help me to get to the gym more frequently and keep up my walking each day
	Class Structure	Since participating in yoga classes, it has become easier to adhere to a program versus attempting to exercise on my own
	Adherence	I started getting back in to shape by taking yoga. I've since joined a gym and have made regular exercise a part of my life

Table 8.

*Emerging Theme Two: Question Two*

Theme: Emotional/Psychological	Code	Respondent Sample
	Injury Prevention	Yes, it kept me from injuring myself. I have back problems
	Improved Fitness	More fit because of yoga
	Physique	Seeing a change in my physical appearance has kept me on an exercise program

Table 9.

*Emerging Theme Three: Question Two*

Theme: Emotional/Psychological	Code	Respondent Sample
	Aware of Self	Yes it helps me focus more internally, keeping me more motivated and focused on myself and my health
	Connection with Self/Body	Yoga has given me the ability and awareness to really connect with my body not just exercise...it has enhanced my relationship with myself

Table 10.

*Emerging Themes Four: Question Two*

Theme: Perceptions and Emotions	Code	Respondent Sample
	Enhanced Feelings	Enhances how I feel, impacting what I do
	Enjoy Community/Group	I look forward to seeing the same people and teachers
	Improved Self	I find myself seeking out yoga classes when I feel as if my health habits/behaviors or overall physical/ mental wellness are compromised
	Mind-Body	Yoga is the only exercise I've done that engages the mind as much as the body

Table 11.

*Emerging Themes Five: Question Two*

Theme: Improve/Prevent Symptoms	Code	Respondent Sample
	Arthritis	Yoga has made me more flexible and dramatically improved my range of motion and stiffness from degenerative type spinal/pelvic arthritis
	Aging	Until I began yoga classes the effects of aging-stiffness, balance issues, made it difficult for me to do any exercise
	Disease/Pain	I have several incurable degenerative diseases-chronic discomfort, low energy, low stamina, and prescription meds including steroids. Yoga helps me greatly under current conditions
	Weight Management	I have lost 50lbs since I began yoga classes

## Chapter V

### DISCUSSION

In the United States, 68% of the adult population does not engage in physical activity to the extent necessary for impacting health and preventing disease (CDC,2008). The resulting lifestyle diseases and chronic conditions account for 75% of health care costs nationally (CDC). The average annual direct medical costs increase by \$330 for each individual reporting physical inactivity (Pratt, 2000); overweight increases yearly per person health care costs by \$125; and obesity requires an additional \$395.60 (US Department of Health and Human Services, 2001). The poor health and exercise habits of average Americans are of grave concern and result in approximately 250,000 premature deaths annually (Booth, et al., 2000).

Not only are adults in record-breaking poor health, this may be the first generation of off-spring who will not have the life-expectancy of their parents. As such, it is critical to implement programming that will promote physical activity as a lifestyle. The current study sought to investigate the relationship between regular yoga participation, health behaviors, and exercise adherence from a unique mind/body theoretical perspective (See Figure 2.). The theoretical model suggests that there is an intricate connection between the mind and the body, postulating that a combination of factors must be addressed in order to adopt permanent health behaviors. In essence, it may be a combination of effects or collection of experiences that leads to the adoption of health-enhancing behaviors. For this study, data were collected to understand the factors associated with regular yoga participation including the physiological, psychological, and social perspectives of



regular yoga participants. Generally, the quantitative findings provide some evidence in support of the proposal that the amount of time in months spent participating in yoga was significantly related to exercise adherence. The qualitative data lent additional support to these findings. Some of the statements expressed by the participants were, "When I improve in yoga class, then I also stay consistent with strength training and cardio classes" and "Yoga has and does help me to get to the gym more frequently and keep up my walking each day-probably attributable to this euphoric feeling after class."

The responses of the yoga participants tell a story of self-awareness and self-care ascribed to their yoga tenure. They credit a belief in their ability to exercise regularly, an increased sense of well-being, improvement in mood, and a reduction in stress to their yoga participation. In addition, it appears that how they feel impacts their behaviors. For example: "I am able to manage my stress and anxiety better and have a different perspective in dealing with things" and "I get a feeling of well-being after a yoga class—my outlook on life improves." This feelings-adherence relationship is well-supported in the literature (McAuley, et al.,2003; Williams, et al.,2006)

References to emotional regulation and improvement were prevalent in response to both open-ended questions and supported by the quantitative data analyses. Stress management was often cited as an outcome of yoga participation; for example: "The more able I am to practice yoga, meditation and breathing the more calm I am and less stressed." The quantitative analyses revealed a significant relationship between general well-being and exercise adherence as well as general well-being and exercise self-efficacy.

Exercise self-efficacy, or the belief that one can carry out exercise as a matter of course, is often cited in the literature as the most salient variable associated with the adherence to physical activity (Marcus & Eaton, 1994; McAuley, et al., 2003). Although exercise self-efficacy and the exercise adherence measurements were not correlated in the quantitative analysis of this study, the qualitative data suggests a relationship: "I started getting back in to shape by taking yoga. I've since joined a gym and have made regular exercise a part of my life." Also, (in response to question) "Yes, absolutely it helps me do other exercise more confidently." Similarly, only one of the group cohesion constructs was measured at or slightly above the norm; however, the qualitative data was replete with examples of this relationship. For example, one participant stated, "Since participating in yoga classes, it has become easier to adhere to a program versus attempting to exercise on my own" and another added, "I enjoy the group dynamics and routine that come with taking a weekly class." The qualitative data supports the literature depicting a positive association between group exercise and exercise adherence.

Yoga participation was also significantly correlated with both fruit and vegetable intake and mindful eating practices. In this instance, the open ended questions revealed an abundance of data purporting the synergy between yoga and improved eating habits and yoga and an increased desire to improve nutrient intake. Statements to this end include, "I have become more mindful of what I'm eating" and "I am more conscious, disciplined, and mindful with nutrition." One might infer that the participant's BMI reflected the participant's adherence to exercise and proper nutrition. The majority of yoga participants in the study were a healthy weight (72%) and only 3% fell in to the obese category (national average is 33.8%) the remainder of the yoga participants, 25%, fell in to the overweight category (national

average 34%). For this study 25% of the yoga participants fell in to the overweight/obese categories while currently the national average is 68% of adults overweight and obese (Flegal, Carroll, Ogden, Curtin, 2010). The findings of an inverse relationship between BMI and mindful eating among the participants in this study substantiate the relationship between yoga and mindful eating.

## Chapter VI

### SUMMARY AND CONCLUSIONS

Yoga classes are organized around physical movement; however, the physical movement may be simply a vehicle for self-awareness that results in the strengthening of the whole. As one participant stated, “Yoga has impacted my ability to adhere to my exercise routine because of its positive mental and physical effects. Yoga has given me an overall sense of well-being and confidence” and “Yoga is the only exercise I’ve done that engages the mind as much as the body.” This combination of effects may have a greater impact on self-direction or self-regulation than previously understood. Jon Kabat-Zinn, the seminal researcher on mindfulness suggests, “Mindfulness is basically just a particular way of paying attention. It is a way of looking deeply into oneself in the spirit of self-inquiry and self-understanding.” Further, he adds, “It is in the focusing of the mind that we find a coherent source of energy for living, for problem solving, and for healing” (Jon Kabat-Zinn, 2009, p. 11). Yoga is a unique movement form that incorporates mindfulness and meditation, unifying the mind and body. It may be in this connectedness that self-regulation is improved—further research is necessary.

The current research presents several limitations; primarily, the participants were predominately white, highly educated women. Interestingly, this is not merely a result of exercise venue as several of the sites included in the research were in diverse socio-economic communities. One hypothesis may be that yoga has not become a mainstream activity and may be riddled with misperceptions pertaining to the benefits

of this mind/body activity. Regardless, the sample restricts the generalizability of the current research findings. Future research is necessary to assess yoga in a variety of populations and age-groups among a larger population. Research is needed among youth, possibly in an academic environment, to measure the impact of yoga on the development of self-awareness, health behaviors, and exercise participation. Another limitation pertains to the lack of a causal link among the variables. By design, this exploratory research does not allow for proclamations of cause and effect relationships. What can be stated is that the factors studied exist in accordance with one another and that human behavior is a complex phenomenon often requiring a mixed-methods form of inquiry for data collection and comprehension. Additional limitations include the self-selection of participants and the self-report nature of the data collection; both of these characteristics restrict the findings.

Finally, the tenets of the theoretical model developed for this research should be applied to alternative movement forms to ascertain the efficacy of the model and to further inform the development of productive programming. It is imperative to develop strategies and interventions that take in to consideration the whole person while combating physical inactivity and poor health behaviors. The health of future generations depends on our ability to integrate new evidence-based approaches when combating persistent poor health behaviors.

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## Appendix A

### Definitions

Hatha Yoga- a generic form of yoga that incorporates postures and breathing.

Exercise- physical movement that increases the rate of energy use of the body

Mindfulness-state of awareness from moment to moment

Exercise Self-Efficacy-belief in the ability to carry out exercise regularly

Appendix B

Solicitation Flier

# Yoga Participant Volunteers Needed!!

SUBJECTS ARE NEEDED TO COMPLETE RESEARCH

QUESTIONS ON THE EFFECTS OF YOGA

If you are between the ages of 18 and 70 and perform yoga at least one day per week, we need your help!

Survey packets are available in your facility, please ask an administrator for their location.

**All information will be kept confidential and destroyed after data extraction.**

## Appendix C

### Solicitation Letter

Hi my name is Stephanie Bryan Tormey; I am a PhD candidate in the Department of Health Sciences at Seton Hall University. I am currently conducting a research study analyzing the relationship between yoga, health behaviors, and exercise adherence. I would like to inquire whether you might be interested in completing surveys investigating this relationship.

To be included in this study you need to currently attend yoga classes on average at least once a week and be between the ages of 18 and 70. If you don't attend at least one yoga class per week or you are pregnant you will not be able to participate in this research.

Participation in this study is voluntary, by completing these surveys you are giving your consent to participate. There is no compensation for participation in the study. All data is completely confidential, will be stored in a locked file cabinet, will be reported in aggregate form with no identities required, and destroyed in less than three years after completion. Upon completion of these surveys, please return the surveys to the envelope and drop this package in the return receptacle. The surveys include a demographic survey, 7-day physical activity recall, two open-ended questions, general well-being schedule, exercise self-efficacy survey, and group environment questionnaire. The time to complete the packet is approximately 20-25 minutes.

The study is completely voluntary and can be discontinued at any point.

Thank you for participation in this study.

If more information is needed, please contact me:

Stephanie Tormey

Tormeyst@shu.edu

908-391-1238

## Appendix D

## Demographic Survey

The following is a demographic survey. It will be used to gather general information about you which may or may not influence the results of the study.

**Directions: Please answer the following questions.**

1. How old are you? \_\_\_\_\_
2. What is your gender? (F) (M) circle one
3. What is your ethnicity? (check the appropriate box)  
Do you consider yourself to be-  
Hispanic/Latino ( ) Black or African American ( )  
Native Hawaiian or Pacific Islander ( ) White ( )  
American Indian or Alaskan Native ( )
4. What is your weight in pounds? \_\_\_\_\_
5. What is your height in feet and inches? \_\_\_\_\_
6. What is your completed level of education? Check all of the appropriate boxes.
  - a. Graduated from high school ( )
  - b. Graduated from two-year college ( )
  - c. Graduated from four-year college ( )
  - d. Graduated with master's degree ( )
  - e. Graduated with doctoral degree ( )
  - f. Other, please specify \_\_\_\_\_
7. What types of yoga have you participated in throughout your yoga experience, please check as many as may apply.

- a. Iyengar ( )
- b. Bikram ( )
- c. Kripalu ( )
- d. Kundalini ( )
- e. Ashtanga ( )
- f. Viniyoga ( )
- g. Sivananda ( )
- h. Hatha ( )
- i. Other, please specify \_\_\_\_\_

8. Approximately how many different yoga teachers have you taken classes with throughout your yoga experience? \_\_\_\_\_
9. How long in months and years have you participated in yoga classes at least once per week? \_\_\_\_\_
10. How many yoga classes on average do you participate in per week? \_\_\_\_\_
11. How much time on average in minutes is dedicated to meditative practices and/or relaxation during your yoga classes? \_\_\_\_\_
12. What other types of exercise do you perform at least once per week—please list them all and the amount of time in minutes and days per week the exercise is performed? \_\_\_\_\_  
\_\_\_\_\_



## Appendix E

### Two Open-Ended Questions

1. Have any of your health behaviors changed over the course of your yoga experience in ways that may be related to your participation in yoga? If yes, please describe which behaviors you believe have changed and how.
2. Based upon your participation in yoga classes, do you believe yoga has had an impact on your ability to adhere to an exercise program? If so, please note why.

## Appendix F

### General Well-Being Schedule

#### The General Well-Being Schedule

Instructions: The following questions ask how you feel and how things have been going for you during the past month. For each question, mark an "x" for the answer that most nearly applies to you. Since there are no right or wrong answers it's best to answer each question quickly without pausing too long on any one of them.

1. How have you been feeling in general?

- 5  In excellent spirits
- 4  In very good spirit's
- 3  In good spirits mostly
- 2  I've been up and down in spirits
- 1  In low spirits mostly
- 0  In very low spirits

2. Have you been bothered by nervousness or your "nerves"

- 0  Extremely so, to the point where I could not work or take care of things
- 1  Very much so
- 2  Quite a bit
- 3  Some—enough to bother me
- 4  A little

5  Not at all

3. Have you been in firm control of your behavior, thoughts, emotions or feelings?

5  Yes, definitely so

4  Yes, for the most part

3  Generally so

2  Not too well

1  No, and I am somewhat disturbed

4. Have you felt so sad, discouraged, hopeless, or had so many problems that you wondered if anything was worthwhile?

0  Extremely so—to the point I have just about given up

1  Very much so

2  Quite a bit

3  Some—enough to bother me

4  A little bit

5  Not at all

5 Have you been under or felt you were under any strain, stress, or pressure?

0  Yes—almost more than I could bear

1  Yes—quite a bit of pressure

2  Yes—some, more than usual

3  Yes—some, but about usual

4  Yes—a little

5  Not at all

6. How happy, satisfied, or pleased have you been with your personal life?

5  Extremely happy—couldn't have been more satisfied or pleased

4  Very happy

3  Fairly happy

2  Satisfied—pleased

1  Somewhat dissatisfied

0  Very dissatisfied

7. Have you had reason to wonder if you were losing your mind, or losing control over the way you act, talk, think, feel, or of your memory?

5  Not at all

4  Only a little

3  Some, but not enough to be concerned

2  Some, and I've been a little concerned

1  Some, and I am quite concerned

0  Much, and I'm very concerned

8. Have you been anxious, worried, or upset?

0  Extremely so—to the point of being sick, or almost sick

1  Very much so

2  Quite a bit

3  Some—enough to bother me

4  A little bit

5  Not at all

9. Have you been waking up fresh and rested?

5  Every day

4  Most every day

3  Fairly often

2  Less than half the time

1  Rarely

0  None of the time

10. Have you been bothered by any illness, bodily disorder, pain, or fears about your health?

0  All the time

1  Most of the time

2  A good bit of the time

3  Some of the time

4  A little of the time

5  None of the time

11. Has your daily life been full of things that are interesting to you?

5  All the time

4  Most of the time

3  A good bit of the time

2  Some of the time

1  A little of the time

0  None of the time

12. Have you felt downhearted and blue?

0  All of the time

1  Most of the time

2  A good bit of the time

3  Some of the time

4  A little of the time

5  None of the time

13. Have you been feeling emotionally stable and sure of yourself?

5  All of the time

4  Most of the time

3  A good bit of the time

2  Some of the time

1  A little of the time

0  None of the time

14. Have you felt tired, worn out, used-up, or exhausted?

0  All of the time

1  Most of the time

2  A good bit of the time

3  Some of the time

4  A little of the time

5  None of the time

Note: For each of the following four scales, the words at each end describe opposite feelings. Circle any number along the bar that seems closest to how you have felt generally *during the past month*.

1. How concerned or worried about your health have you been?

**Not** 10 8 6 4 2 0 **Very concerned**  
**concerned**  
**at all**

16. How relaxed or tense have you been?

**Very** 10 8 6 4 2 0 **Very tense**  
**Relaxed**

17. How much energy, pep, and vitality have you felt?

**No energy** 0 2 4 6 8 10 **Very energetic,**  
**at all, listless** **dynamic**

18. How depressed or cheerful have you been?

**Very** 0 2 4 6 8 10 **Very cheerful**  
**depressed**

## Appendix G

## Multidimensional Self-Efficacy for Exercise Scale

**Please answer the following questions.**

1. How confident are you that you can complete your exercise using proper technique?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
2. How confident are you that you can include exercise in your daily routine?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
3. How confident are you that you can exercise when you feel discomfort?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
4. How confident are you that you can follow directions to complete exercise?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
5. How confident are you that you can exercise when you lack energy?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
6. How confident are you that you can consistently exercise three times per week?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**
7. How confident are you that you can perform all the required movements?  
**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**



8. How confident are you that you can arrange your schedule to include regular exercise?

**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**

9. How confident are you that you can exercise when you don't feel well?

**0= not at all confident    1 2 3 4 5 6 7 8 9    10=completely confident**

## Appendix H

## Group Environment Questionnaire

**Now a few questions about your exercise class experience. Please respond by checking a numerical response for each question.**

1. I do not enjoy being a part of the social interactions in this exercise class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

2. I am not happy with the amount of exercise I get in this exercise class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

3. I am not going to miss the members of this class when the class ends.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

4. I am unhappy with my exercise class member's desire to become more fit.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

5. Some of my best friends are in this exercise class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

6. This exercise class does not give me enough opportunities to improve my personal fitness.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

7. I enjoy other exercise activities more than this exercise class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

8. I do not like the style of exercise in this exercise class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

9. For me, this exercise class is one of the most important social groups to which I belong.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

10. My fellow exercisers and I are united in trying to reach our fitness goals.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

11. Members of this exercise class would rather exercise on their own rather than gather together as a group.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

12. We all take responsibility for any poor performance in our fitness class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

13. My fellow exercisers and I rarely socialize together.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

14. My fellow exercisers and I do not have similar aspirations for fitness

improvements.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

15. My fellow exercisers and I would like to spend time together outside of class.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

16. If members of our exercise class have problems during class, everyone wants to encourage them.

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

17. Members of our exercise class do not associate outside of our exercise class

Strongly Disagree

Strongly Agree

1      2      3      4      5      6      7      8      9

18. My fellow exercisers and I do not communicate freely about each person's responsibility to become more fit.

Strongly Disagree

Strongly Agree

1 2 3 4 5 6 7 8 9

60

The relationship between the yoga tenure and mindful eating practices was investigated using the mindful eating questionnaire (appendix I) and the transformed data in groups. The overall test of the means in One-way ANOVA was significant  $F(2,80) = 3.633$   $p < .03$ . The Bonferroni method was used to perform pairwise comparisons indicating at the overall 0.05 level that the first grouping is significantly different from the second grouping ( $M = 2.59$ ,  $SD = .1056$ ). The findings suggest a difference in mindful eating practices relative to the amount of time an individual has performed yoga; figure 8 illustrates these results.

**Figure 8. Tenure Performing Yoga and Mindful Eating**



## Appendix I

### 7-Day Physical Activity Recall Questionnaire

During the last seven days, how much total time did you spend doing VIGOROUS physical activity and MODERATE physical activity? Record only time actually engaged in the activity (ignore breaks, rest periods, etc.) Please do not record any light physical (office work, light house work, very light sports such as bowling, or any activities sitting).

VIGOROUS ACTIVITY (jogging or running, swimming, strenuous sports such as singles tennis or racquetball, digging in the garden, chopping wood, brisk walking etc.)

Total hours for last seven days:

---

MODERATE ACTIVITY (sports such as golf or doubles tennis, yard work, heavy housecleaning, bicycling on level ground, brisk walking, etc.)

Total hours for last seven days:

---

## Appendix J

**Mindful Eating Questionnaire**

Please check the box that best applies to you.

1= Never/rarely  
 2= Sometimes  
 3= Often  
 4= Usually/always

Question		1	2	3	4
1. I eat so quickly that I don't taste what I am eating.					
2. When I eat at "all you can eat buffets, I tend to overeat.	I don't eat at buffets. <input type="checkbox"/>				
3. At a party where there is a lot of good food. I notice when it makes me want to eat more food than I should.					
4. I recognize when food advertisements make me want to eat.	Food ads never make me want to eat. <input type="checkbox"/>				
5. When a restaurant portion is too large, I stop eating when I'm full.					
6. My thoughts tend to wonder while I am eating.					
7. When I am eating one of my favorite foods, I don't recognize when I've had enough.					
8. I notice when just going into a movie theater makes me want to eat candy or popcorn.	I never eat candy or popcorn. <input type="checkbox"/>				
9. If it doesn't cost much more, I get the larger size food or drink regardless of how hungry I feel.					
10. I notice when there are subtle flavors in the foods I eat.					
11. If there are leftovers that I like, I take a second helping even though I'm full.					
12. When eating a pleasant meal, I notice if it makes me feel relaxed.					
13. I snack without noticing that I am eating					

14. When I eat a big meal, I notice if it makes me feel heavy or sluggish.					
15. I stop eating when I'm full even when eating something I love.					
16. I appreciate the way my food looks on my plate.					
17. When I'm feeling stressed at work, I'll go find something to eat.	I don't work <input type="checkbox"/>				
18. If there's good food at a party, I continue eating even after I'm full.					
19. When I'm sad, I eat to feel better.					
20. I notice when foods and drinks are too sweet.					
21. Before I eat I take a moment to appreciate the colors and smells of my food.					
22. I taste every bite of food that I eat.					
23. I recognize when I'm eating and not hungry.	I never eat when I'm not hungry <input type="checkbox"/>				
24. I notice when I'm eating from a dish of candy just because it's there.					
25. When I'm at a restaurant, I can tell when the portion I've been served is too large for me.					
26. I notice when the food I eat affects my emotional state.					
27. I have trouble eating ice cream, cookies, or chips if they're around the house.					
28. I think of things I need to do while I am eating.					



## Appendix K

### Decision Maker's Approval Communication Via Email

Dear Stephanie and to whom it may concern,

We are happy to participate in your study. I give you permission to leave your surveys at my studio, and we will do our best to support the gathering of information presuming our clients are not unduly pursued or bothered. Feel free to drop off your materials.

Warmest regards,

Julia Kadarusman, Owner/Operator  
Onyx Mind Body  
908-834-8064  
[www.onyxmindbody.com](http://www.onyxmindbody.com)

Julia@onyxmindbody.com

To Whom It May Concern,

I give my permission for Stephanie Tormey to conduct a yoga survey at The Club at Ricochet as part of her doctoral thesis. I understand that the survey will not be disruptive to classes & that the surveys will be filled out on a volunteer basis by participants and picked up by Stephanie.

Kathi Gladis  
Group Exercise Director  
The Club at Ricochet  
South Plainfield, NJ

To Whom It May Concern,

Stephanie Tormey has my permission to leave yoga surveys being used for her dissertation research at our yoga studio, Powerflow in Chatham New Jersey. I realize that participation in the research is completely voluntary and my clients are under no pressure to participate.

Best,

Jerry LePore  
Owner  
Powerflow Yoga

To Whom It May Concern:

On behalf of the Edison Branch YMCA, I give my permission for Stephanie Tormey to survey our yoga participants at the Edison Branch YMCA, I realize that participation is completely voluntary.

Lexy Anderson  
Associate Executive Director  
Edison Branch Y  
1775 Oak Tree Road  
Edison, NJ 08820  
lexy.anderson@ymcaofmewsa.org  
732-494-3232 ext 505

To Whom it may concern:

Stephanie Bryan Tormey has my permission to provide research survey packets to the members of my yoga studio for her dissertation work. I realize that participation is completely voluntary and that Stephanie will drop off and pick up the survey packets from my studio.

Thank you,

Claire Diab

**Claire Diab**  
The American Yoga Academy  
located at The Wilshire Grand Hotel  
350 Pleasant Valley Way  
West Orange, NJ 07052  
(973) 731-9960  
Mobile: 732-991-6839  
[ClaireDiab@AmericanYogaAcademy.com](mailto:ClaireDiab@AmericanYogaAcademy.com)  
[www.AmericanYogaAcademy.com](http://www.AmericanYogaAcademy.com)

[Facebook](#)

[Twitter](#)

Dear Stephanie,

The Somerset Hills YMCA is eager to assist you with the Yoga surveys. Please feel free to drop them at the Riverwalk welcome center to my attention and we will distribute as per your intention.

Please let me know the date they are needed back.

Thank you so very much.

Kate Russo | Director of Riverwalk Operations  
Somerset Hills YMCA | 665 Martinsville Road, Basking Ridge, NJ 07920  
TEL: 908.766.7898 x402 | EMAIL: [krusso@somersethillsymca.org](mailto:krusso@somersethillsymca.org)  
WEB: <http://www.somersethillsymca.org>

Hello Stephanie,

This is to confirm that you will be leaving yoga surveys at the Chatham Club at 484 Southern Blvd, Chatham NJ. These surveys will be given to the yoga instructors at the Chatham Club to be distributed to the members, filled out & then returned to you. If you have any questions you may email me at the above address.

Best regards, Jennifer O'Connor, Program Director, The Chatham Club

[jrscoconnor@gmail.com](mailto:jrscoconnor@gmail.com)

## Appendix L

## Qualitative Data: Emerging Themes and Coded

**Question One:** Have any of your health behaviors changed over the course of your yoga experience in way that may be related to your participation in yoga? If yes, please describe which behaviors you believe have changed and how.

Emerging theme: Eating Behaviors

Coded in Sub-categories A.choosing healthier foods, B. better hydration, C. eating more slowly D. more mindful of eating E. improved eating F. portion control

1. When I began actively and regularly participating in yoga I also began eating more cleanly, less processed food-A
2. Whenever yoga and healthy eating aren't practiced regularly, one lags-A
3. Eat healthier-A
4. Became a vegetarian-A
5. Eating behaviors, choosing more healthy choices-A,E
6. A lot more conscious of what I eat (i.e. meat v. veggies and organic v. non-organic)A
7. Eating better and more moderately A,F
8. I have become more mindful of what I'm eating: how my food is processed and have moved to a plant based diet—have eliminated dairy and wheat and sugar from my diet. D,A,
9. I eat healthier and I am more conscious of what I am fueling my body with. A,E
10. I am eating better E
11. Most notably my eating habits are getting better E
12. I am more aware of staying hydrated B
13. I feel like my food choices are better, don't put bad food into a healthy body A
14. I eat better E
15. I eat more mindfully—more veggies and fruits A,D
16. This makes me want to eat healthy E
17. I have increased preferences for healthy foods A
18. My asana practices have regulated my eating habits E
19. Now I eat mindfully now D
20. I am more conscious, disciplined, and mindful with nutrition D
21. I eat slower and drink more water B,C
22. I am eating better E
23. My eating habits have changed I pay attention to the portion of food—what to eat, and eat slowly A,C,F
24. I have improved eating habits E
25. Yes, I have better eating habits E
26. Eating smaller portions, healthier E
27. I have also been eating healthier foods I believe because yoga has helped me develop a new respect for my body D
28. I drink more water and eat healthier. A,B
29. I am motivated to eat healthier A
30. Better nutrition A
31. It has encouraged us to eat more fresh and local foods. A
32. I eat healthier when I do yoga, because I tend to do yoga at night and don't want to eat heavy a meal either at

## Emerging theme: Physical Behaviors

Coded in sub-categories: A. posture B. sleep C. other

1. More mindful of posture A
2. Posture sitting properly A
3. More conscious of posture, supporting low back and spine alignment in all activities-driving posture improved, standing posture improved, more aware of shoulder alignment A
4. I now sleep better and longer at night with regular practice B
5. I breath deeper making me more relaxed C
6. The postures in yoga remind me to walk and sit more erect A
7. I am flossing my teeth more C
8. I am conscious of my posture A
9. I am aware of my posture A
10. I do more stretching and core C
11. I'm more conscious of my posture, and stretching on days I don't do yoga because I know how great it feels to be relaxed, stretched out and tension free. A
12. It makes me sit and stand more correctly and makes me more aware of when I am not in alignment or when certain areas of my body are tense. A
13. Breathing more fully. C

Emerging Theme: Emotional/Psychological Behaviors:

Sub-categories: A. mindfulness, B. meditation, C. stress management/anxiety, D. health focus/habits, E. spiritual F. mental/emotional health G. relaxation

1. More focus on overall health D
2. Adopted healthier lifestyle, more aware of bad habits D
3. Become more health conscious D
4. Deepened my meditation practice B
5. Have become a much healthier person mentally since I began a dedicated yoga practice F
6. I know now to relax/meditate/practice yoga when I find myself on the brink of stressing out B, C,G
7. I am growing spiritually E
8. I am able to manage my stress and anxiety better and have a different perspective in dealing with things C,F
9. I am able to handle stress more effectively, I have increased energy and clearer mind C,F
10. I have learned to relax and relieve stress C
11. I have begun setting time aside for meditation on a daily basis B
12. I am more flexible F
13. I am more aware of what my body is capable A
14. As I push myself in yoga , I feel the decision is a more holistic one and not endorphin or adrenalin fueled decision A
15. I find myself seeking out yoga classes when I feel as if my health habits/behaviors are or overall physical/ mental wellness are compromised D,F
16. Yoga has opened me up to myself A
17. I enjoy the spiritual part of yoga E
18. I have a better overall sense of well-being and better ability to handle stress C,F
19. I have a better ability to sense changes in my body A
20. I have better body awareness and better ability to cope with injury/identify injury A
21. I have a better body image F
22. I started meditating daily B
23. The more able I am to practice yoga, meditation and breathing the more calm I am and less stressed B,C
24. I relax more often G
25. I get a feeling of well-being after a yoga class—my outlook on life improves F
26. Yoga makes me want to take care of myself A
27. Yoga has changed the way I approach life F
28. I am more conscious, disciplined, and mindful with self –care A,D
29. I am more conscious, disciplined, and mindful of my emotions F
30. I meditate now for stress B,C
31. I am more health conscious D
32. I take better care of my body D
33. Yes, yoga has been a great stress reliever for me. I feel more capable of managing stress levels and feel more relaxed on a day-to-day basis. Yoga has also helped my energy level C
34. My health behaviors have definitely changed due to my yoga experience. I have developed the ability to control anxiety due to my yoga practice. C
35. Yoga is just one component of our lives that has changed to paying more attention to our overall health as we age. D
36. Yes, more patient and focused on exercising and learning new routines. D

Physical Changes: A. back pain, B. arthritis, C. weight management, D. Soreness, pain, E Health and fitness,

1. Less injuries, reduced soreness after exercising. D
2. Lost weight C
3. Health improved E
4. Flexibility improved E
5. Decrease blood pressure E
6. Help joint problems go away B,D
7. Upper back pain went away with regular yoga A
8. I am 78 yrs. Old and don't need prescriptions and I am still working E
9. Had back pain, it stopped A
10. Small muscles in feet do not hurt anymore D
11. I lost 20 lbs C
12. Pain in my knees has diminished- I can now walk and enjoy moving better—had arthritis, in knees prior to now-if I miss the pain in my knees returns and I get very stiff and uncomfortable. D,B
13. Have gained flexibility and strength E
14. My immune system has improved and less I have less frequent migraines/ headaches E
15. Yes, my right knee is now getting better D
16. My body is more flexible—yoga helps with stiffness E
17. Improved mobility with less pain in joints. B,D
18. Participation in yoga has eliminated lower back pain caused by a herniated disc. A
19. My digestion and elimination have improved E
20. I have better balance E
21. I am stronger and more flexible E

**Emotional Changes: A. Stress, B. Improved emotional state C. Self-aware**

1. I practice many yoga positions daily and seem a bit less anxious B
2. Calmer B
3. Calm mind B
4. Stress reduction A
5. Less easily stressed A
6. Feel relief and relaxed, cool calm and happier B
7. Have gained a sense of well-being B
8. My mind is clearer B
9. I am more confident B
10. As a result of my yoga practice I have become more aware of my physical condition C

**No Answer:**

I,I,I,I,I,I,I,I,I,I

**No:**

I,I,I,I

**Medicine/ Treatment: General**

1. Now use nontraditional medical providers i.e ayurevda doctor and acupuncture
2. I participated in a detox
3. I have a more holistic approach to healing and medicine
4. I use natural remedies for minor health issues.



**Question 2: Based upon your participation in yoga classes, do you believe yoga has had an impact on your ability to adhere to an exercise program? If so, please note why.**

Desire to keep exercising: A. exercise frequency B. class structure. C. adherence

1. This routine exercise works for me C
2. Yes, when I improve in yoga class than I also stay consistent with strength training and cardio classes C
3. Yoga is a way to continue exercising as an adult and has improved my way of living as well C
4. Having a scheduled (and paid for) yoga class holds me accountable so I cannot skip or not show up simply because I don't want to or don't feel like going today B
5. Having kept up yoga for ten years now, it's easily the longest single exercise type that I have managed during my life. So there must be something to it. As I said it works for me and my body C
6. Yes, when I become more involved in yoga (i.e. take more classes) I am more motivated B
7. Yoga has and does help me to get to the gym more frequently and keep up my walking each day-probably attributable to this euphoric feeling after class A
8. Yes, it has definitely made me adhere to a stricter exercise program B
9. Yes, because I feel better physically so I can exercise more C
10. I have started stretching at home to keep limber C
11. Yes, by having to go to the class I have specified time and am more disciplined in my exercising B
12. Yes, it keeps me regimented and more focused B
13. Yes, and I have always been an avid exerciser. However, since participating in yoga classes, it has become easier to adhere to a program versus attempting to exercise on my own. ( I exercise more regularly now)A,B
14. I enjoy the classes so I go every chance I get. B
15. Most of my previous exercise in the last 3 years had been solitary (running) so it is nice to engage in group exercise. I have always adhered to an exercise regimen, but I enjoy the group dynamics and routine that come with taking a weekly class.
16. Yes, it makes me feel healthy and flexible which motivates me to keep doing it as well as other exercise classes and cardio exercising to supplement my exercise schedule. A, C
17. I enjoy exercising more and look forward to going to class, I can often tell when I haven't been to class in a while based on how my body feels and it pushes me to go. A,C
18. I started getting back in to shape by taking yoga. I've since joined a gym and have made regular exercise a part of my life. A,C
19. I enjoy yoga. I see the physical benefits and it's not too strenuous- I rarely feel "too tired" for yoga-once at the gym for voga I often continue exercising.C

Physical Ability : A. injury prevention, B. improves components of fitness, C. Physique D. enables other types of exercise

1. Yes, yoga assists in preventing risks of injury due to high impact aerobics A
2. Helped after other strenuous classes (such as pump). Helped improve balance and posture in all classes B
3. This allows me to continue with other types of exercise D
4. Yes, absolutely because I am more agile B
5. Yes, because I am more flexible B
6. My stamina has improved, I feel like my muscles get toned well with yoga than other kinds of exercise B
7. More fit because of yoga B
8. Yes, my commitment and ability are now consistent B
9. It has improved my flexibility B
10. Seeing a change in my physical appearance has kept me on an exercise program C
11. I began to improve my back and neck mobility and found much more A
12. Yoga has helped increase my muscle tone and core strength without adding weight lifting bulk. This has noticeably helped increase my running (very core based) stamina A,D
13. Yes, because of the results, more relaxed, better balance, looser muscles B
14. Yes, it kept me from injuring myself. I have back problems A
15. Yes, it makes me feel healthy and flexible which motivates me to keep doing it as well as other exercise classes and cardio exercising to supplement my exercise schedule. B
16. . I feel that my exercising has increased my balance, posture and muscle strength has improved. B

Perceptions and emotions: A. enhanced feelings, B. enjoy environment/community/group, C. Improved self D. engaging/mind-body

1. Enhances how I feel, impacting what I do A
2. I practice yoga and exercise regularly because I feel better when I do A
3. I find myself seeking out yoga classes when I feel as if my health habits/behaviors are or overall physical/mental wellness are compromised A,C
4. Yoga does help me adhere to regular exercise because even when I don't want to exercise I can always practice yoga and feel better A
5. Yes, absolutely it helps me do other exercise more confidently; I am less worried about injuring myself A,C
6. Yes, concentration C
7. Yes, the more I do, the more I want to do A
8. Yes, because of the balance and clarity that it creates for my entire day and work schedule C
9. Better person because of yoga C
10. Yes, my commitment and ability are now consistent C
11. I look forward to seeing the same people and teachers B
12. Yes, the positive feelings yoga induces are reinforcing. You feel so great afterwards you are encouraged to practice as frequently as possible A
13. Because I enjoy yoga and the benefits it definitely motivates me to keep going and maintain the exercise program I've set for myself A
14. Can relax better C
15. I am more likely to attend a yoga class than a spin class if I'm tired or sick A
16. Yes, because I enjoy both the physical and mental aspect D
17. Well, I can adhere to an exercise program if it's not just exercise-which I see as drudgery-I need some other interest and yoga has that for me, so I can adhere to it D
18. Yoga is the only exercise I've done that engages the mind as much as the body D
19. Yoga provides a quiet space for me to recharge and refocus A,D
20. Yoga is part of a community. If we are there regularly, we all benefit. B
21. I seem to do better with someone pushing me and I like the meditative flow of doing vinyasas over and over again to the sound of my own breathing B
22. Absolutely, just because I love yoga. Yoga has taken me from a physical journey to a spiritual one. A,D
23. Yes, because if I am tired and sluggish I know after a yoga class I will feel relaxed and energized A
24. Yes, trains your mind and body to feel good every day doing poses and stretching D
25. Yes, because yoga feels good so it's not dreadful....it's pleasant A
26. Yoga has most definitely impacted my ability to adhere to an exercise program. Enjoying the overall well-being I feel after participating in a yoga class I am always motivated to attend. A
17. Yoga has impacted my ability to adhere to my exercise routine because of its positive mental and physical effects. Yoga has given me an overall sense of well-being and confidence. A,C,D
27. Concentration and commitment A

**Increases self-awareness impacting choices: A. aware of health, B. connection with self/body**

1. Yes, because it brings awareness of the health of your body A
2. Yes it helps me focus more internally, keeping me more motivated and focused on myself and my health A,B
3. Yes, I enjoy it and when I miss class I am very aware of my body, it feels stiffer and weaker; therefore, I always make an effort to get to class no less than 2 times per week B
4. Yoga makes me aware of where my body needs work in terms of strength. After yoga classes I found that I need to work on my shoulders and upper body strength. My decision to include weight training in my exercise regime was based on this feedback B
5. After being diagnosed with breast cancer, I started restorative yoga classes which helped me relax and focus on myself B
6. Yoga has given me much better awareness of my body and how to preserve it B
7. Yoga has given me the ability and awareness to really connect with my body not just exercise...it has enhanced my relationship with myself B
8. Yoga becomes a part of your daily life and makes you want to focus on your body more B
9. Seeing the changes in myself and receiving the benefits of yoga, I believe I am going to continue to practice yoga in my life and share the yoga with people around me B
10. I think more about meditation and relaxation and I believe I give myself permission to act upon it and or slow down with age B



## Appendix M

The Effects of Yoga on Psychosocial Variables and Exercise Adherence: A  
Randomized Controlled Pilot Study

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## **Abstract**

**Background** Physical inactivity is a serious issue among the American public. The impact of yoga on exercise adherence has not been investigated.

**Primary Study Objective** To assess the effects of ten-weeks of yoga classes held twice a week on exercise adherence in previously sedentary adults.

**Study Design** Pilot randomized controlled trial.

**Setting** A yoga studio in central New Jersey.

**Participants** Twenty-seven adults (mean age 51) who were physically inactive for a period of at least six months.

**Interventions** Hour-long Hatha yoga classes meeting twice a week for ten weeks compared to an untreated control group.

**Outcome Measures** Data were collected from both groups at baseline, mid-point, and post-test I, along with a five-week post-test II data collection for the intervention group pertaining to exercise adherence. The study's primary outcome measure was exercise adherence measured by 7-day Physical Activity Recall. The secondary measures included exercise self-efficacy measured by Multidimensional Self-Efficacy for Exercise Scale, general well-being measured by the General Well-Being Schedule, exercise group cohesion measured by the Group Environment Questionnaire, acute feeling response measured by the Exercise Feeling Inventory, and two open-ended questions coded for emerging themes and subcategorized.

**Results** The analysis revealed that the yoga group's mean hours of physical activity at ten weeks reflected a significant increase in exercise adherence from baseline ( $P < 0.012$ ) and a significant difference from the control group ( $P < 0.004$ ). At five-week post intervention there was no significant change in the yoga participant's exercise adherence,  $P = .906$ . Exercise self-efficacy changed significantly from base line to 5 weeks ( $P < .029$ ) and changed significantly in comparison to the control group ( $P < .010$ ). In addition, the yoga participant's group cohesion score was consistent with the norms on two constructs of the Group Environment Questionnaire, Attraction to Group Task and Group Integration Task. The exercise induced feeling inventory revealed that the yoga participants "felt strongly" that their experiences in yoga were peaceful, happy, up-beat, enthusiastic and they felt revived following the yoga classes. Qualitative analysis of data revealed self-reported improvements in exercise behaviors, stress management, and eating habits.

**Conclusions** Ten-weeks of yoga classes twice a week significantly increased a previously inactive participant's adherence to physical activity. Additionally, the findings suggest that a mind/body exercise program may be an effective intervention in the fight against physical inactivity.



Physical inactivity is one of the most pressing American public health concerns of the 21<sup>st</sup> century. Inadequate leisure-time physical activity is reported in 69% of adults eighteen years or older; only 31% of this adult population participates in moderate or vigorous activity to satisfy the guidelines for optimal health as cited by the Centers for Disease Control and Prevention and the American College of Sports Medicine.<sup>1</sup> Epidemiological data have shown that physical inactivity increases the incidence of at least 17 chronic conditions, most of which are chronic diseases or may lead to chronic diseases.<sup>2</sup> Lifestyle diseases may be considered those derived primarily from poor health habits; close to one trillion dollars in health care costs are spent on the conditions that result from inactivity along with approximately 250,000 premature deaths.<sup>2</sup> The most prevalent lifestyle diseases include heart disease, hypertension, type II diabetes, hyperlipidemia, and some forms of cancer. Some experts argue that the greatest potential for health benefits can be found in having previously sedentary adults become moderately active.<sup>3</sup> Unfortunately, when adults begin an exercise program, the corresponding drop-out rate is approximately 50% in the first six months of activity<sup>4</sup>; consequently exercise adherence is key issue facing the American public.<sup>5</sup>

Historically, research concerning the cause and perpetuation of physical inactivity has been based on theories derived from social or health psychology.<sup>6</sup> Various health psychologists who address a multiplicity of health issues utilize the biopsychosocial model<sup>7</sup> as an approach to patient health management. This model promotes the idea that biological, psychological, and social processes are inextricably connected and that optimal health is a result of the interactions of all three.<sup>8</sup> Originally, the biopsychosocial model<sup>8</sup> was created for use by medical doctors in their patient management practices involving disease symptoms, disease-management, and recovery. Although the biopsychosocial model has yet to be employed as the foundation for

improvements in exercise adherence; it is possible that exercise adherence may improve while using an exercise intervention that is focused on the interactions of the mind, the body, and the social environment.

Yoga is an age-old practice and literally means “union,” referring to the mind, body, and spirit. In the original Sanskrit language yoga is translated as “he yokes,” or “yoking”<sup>9</sup>. Since yoga has been associated with physical and mental well-being, this controlled pilot study was structured to determine the effects of group yoga classes on exercise adherence in previously sedentary adults. Engaging in yoga has been linked to the physical aspects of improved overall fitness which may include improved muscular strength, muscular endurance, flexibility, and balance.<sup>10, 11, 12</sup> Additionally, participation in yoga has been associated with mood enhancement<sup>13</sup> and stress reduction.<sup>14</sup>

Hatha yoga is considered the generic form of yoga; however, there are at least eight common forms of yoga employed in the United States.<sup>15</sup> The forms of yoga are differentiated by many characteristics such as the postures they include, the temperature of the room, the types of breathing exercises, the sequencing of postures, the degree of difficulty, and the philosophy attached to the type or style of yoga. Yoga positions, postures or poses number in the hundreds. Kinesiologically, the postures employ gravity, bodyweight, positioning, and duration of hold to stimulate the body. In addition, yoga may incorporate all or some of the following: breath awareness, relaxation techniques, meditation and visualization, soothing music, serene atmosphere, and dim lighting.

Group Hatha yoga classes which are prominent in the western world, satisfy the tenets of the biopsychosocial model including a special emphasis on mindfulness. Mindfulness is considered the ability to attend to thoughts and emotions as they arise thereby promoting awareness in the present state.<sup>16</sup> Jon Kabat-Zinn focuses on mindfulness in the mind body stress

reduction programming that he originally developed to help ill patients with pain and symptom management.<sup>17</sup> Based upon these notions, mindfulness may be a critical component of health behavior management. Traditional exercise protocols are prescribed to combat inactivity with attention to mode, intensity and duration; yoga provides a unique mind/body approach towards the improvement of health-related behaviors such as inactivity. Currently, there is little or no evidence that yoga, which is a multidimensional mind/body activity, positively affects exercise adherence.

With the rise in yoga participation in the U.S., qualitative data suggests that yoga produces physical confidence, improvements in self-care, and increased energy.<sup>18</sup> Additional research has also found that individuals reporting involvement in a regular yoga practice over a period of at least four years had attenuated weight gain and more energy output through physical activity in activities other than yoga, when compared with individuals who performed no yoga.<sup>19</sup>

The emerging body of research suggests that the psychological effects of an exercise intervention are as important to consider as the improvements in physical fitness. However, overcoming the perceived barriers to physical activity, whether psychological or physiological, is the key to exercise adherence. Bandura's social cognitive theory suggests that the perceived barriers to physical activity may involve cognitive, situational, or structural barriers<sup>20</sup>. It is important to remember that barriers, whether real or perceived, impede an individual's ability to accomplish change. An exercise intervention that includes inwardly focused meditative practices promotes self-awareness and may result in self-generated improvements in health behaviors such as exercise adherence. The functional decline that results from inactivity has similar characteristics to those experienced through biological aging. The reversal of functional decline and the attenuation of biological aging are made possible through adherence to regular exercise.

The primary purpose of this study was to assess the effects of group-conducted Hatha yoga on exercise adherence in previously inactive individuals. In addition, the perceptual benefits of yoga were assessed. Perceptual outcomes included assessments of general well-being, acute feeling response to exercise, group environment responses, and exercise self-efficacy along with two open ended questions to allow for personal narrative.

## **METHODS**

### **Study Design and Setting**

This pilot study was a randomized controlled trial involving previously inactive adults drawn from the community in central New Jersey. Participants were randomly assigned on a first come basis to either ten-weeks of Hatha yoga classes or a control group; participant recruitment ended when 31 participants were collected, 15 for the control group and 16 for the intervention group.

### **Study Participants**

The study participants responded to fliers placed in the vicinity of the yoga studio. The fliers solicited physically inactive adult men and woman between the ages of 18-65 who were healthy but categorized themselves as being physically inactive for a period of six months prior to participation in this study. Physical inactivity was defined as exercising less than twice weekly for a period of less than a half an hour. The exclusion criteria for the participants included answering yes to any of the questions on the Physical Activity Readiness Questionnaire (PAR-Q), pregnancy, or a reported muscular-skeletal condition substantially limiting mobility; for example, limiting the ability to rise from a sitting position to a standing position.

Interested potential subjects contacted the primary investigator via phone. Subjects were screened by phone using a recruitment script; if the potential participant expressed an interest in

the study then the inclusion and exclusion criteria were discussed as well as an oral presentation of the PAR-Q form. If all of the PAR-Q questions were negative then an appointment was scheduled. At the scheduled meeting a written consent form, PAR-Q form, exclusion and inclusion criteria form, and pre-assessment measures were obtained. To maintain confidentiality, all questionnaires and release forms were marked with the subject's unique confidential numerical code. The control did not participate in any form of exercise and were informed they would receive ten weeks of yoga classes at the end of the study period.

### **Yoga Intervention**

The yoga classes were 60 minutes in length meeting twice a week for 10 weeks. The classes were taught by a certified yoga teacher who was the primary investigator, with over ten years of experience teaching yoga. The classes followed a standard reproducible progression, with five minutes of breath awareness and meditative awareness, followed by 45 minutes of yoga postures and ten minutes of breath awareness and relaxation. The participants began in a seated position on a yoga mat and then moved to lying down positions, to kneeling positions, to standing positions, to lying down positions again and finally to a seated position. Modifications for postures were provided when requested, with the emphasis on yoga as a non-competitive, individualized activity performed according to each participant's level of physical comfort. The class format remained the same and included a combination of postures derived from the master list of 59 postures utilized for this research. Universally, yoga is comprised of well over 1,000 postures; in Table 1 we find what may be considered essential yoga poses.<sup>21</sup>

### **Data Collection**

Both groups were involved in pre-testing, mid-point testing, and post-testing. The pre-testing was conducted at the yoga studio for all participants; the mid-point testing and post-

testing were conducted by mail for the control group using self-addressed stamped envelopes for ease of return and in person for the yoga intervention group with the use of coded questionnaires and easy-access receptacles. In addition, the yoga intervention group retrieved a coded Exercise Induced Feeling Inventory from a receptacle located at a back table in the yoga studio at the conclusion of each yoga class to assess their post-yoga feeling state. At the post-test, two open ended questions were added to the yoga intervention group survey packet, creating an opportunity for a personal narrative and reflection. The group environment questionnaire (GEQ) was provided only to the intervention group as the control group did not meet collectively during the intervention stage. The GEQ was distributed at mid-point and end-point in order to assess the effects of group cohesion. Finally, at five weeks post intervention, the exercise adherence survey was mailed to the intervention group with a self-addressed stamped envelope for easy return.

## **Measures**

### *Demographics*

At pre-testing a baseline demographic survey was filled out by all participants. The survey included: age, marital status, gender, children living in the household, work status, and exercise history; this information is found in Table 2.

### *Attendance*

Attendance was recorded with the participants simply checking a sheet at the end of each class meeting. Records were kept for any class cancellations due to hazardous driving conditions throughout the winter season.

## **Data Analysis**

### *General Well-Being Schedule*

The General Well-Being Schedule (GWBS) was designed by the National Center for Health statistics. There are six subscales including the constructs of energy level, satisfaction, freedom from worry, and self-control. The survey consists of 18 items. A high score on the GWBS indicates an absence of bad feelings and the existence of positive feelings. National surveys have revealed that higher scores on the GWBS are associated with increased engagement in physical activity for both men and women across age groups. Fazio<sup>22</sup> conducted a concurrent validation study for the GWBS and found the test re-test correlation was .851 for the entire scale; internal consistency was .912 for men and .945 for woman. The National Center for Health Statistics used a sample of 6,931 for the GWBS survey and have established meaningful norms.

### ***Multidimensional Self-Efficacy for Exercise Scale***

The Multidimensional Self-Efficacy for Exercise Scale is a nine-item instrument designed to measure three sub-domains of exercise self-efficacy; these are task self-efficacy, scheduling self-efficacy, and coping self-efficacy.<sup>23</sup> Exploratory factor analysis followed by confirmatory factor analysis demonstrated the expected factor structure. Subsequently, the generalizability of the factor structure was confirmed with a random sample of 470 adults. Finally, the self-efficacy scale was responsive to changes in exercise experiences.

### ***Group Environment Questionnaire***

The Group Environment Questionnaire (GEQ)<sup>24</sup> is comprised of 18-items that are divided into four subscales which assess perceived group cohesiveness, they are: Individual Attraction to Group-task, Individual Attraction to Group-social, Group Integration-task, Group Integration-social. The reliability coefficients as measured by Chronbach's Alpha are: Individual Attraction to Group-task .75, Individual Attraction to Group-social .64, Group Integration-task .70, Group Integration-social .76. The GEQ is reliable and has good internal consistency.

Modifications were made to the GEQ to accommodate its use with a group exercise class rather than a sports team, for which it was originally designed. The wording changes to accommodate this fitness sample have been used elsewhere.<sup>25, 26</sup> Carron & Spink<sup>27</sup> investigated the internal consistency of the modified group environment questionnaire for use in fitness classes and found internal consistency values highly similar to those found with the extensively validated original version of GEQ. The cronbach's alpha values of the four subscales for the modified version are .77, .61, .71, and .77.

### ***Exercise Induced Feeling Inventory***

Acute response to exercise was measured by the Exercise Induced Feeling Inventory (EFI).<sup>28</sup> This is a 12-item scale designed to assess the response to an activity immediately following the activity. A five-item Likert scale with 0=Do Not Feel (DNF), 1= Feel Slightly, 2=Feel Moderately, 3=Feel Strongly,4= Feel Very Strongly. The EFI is a four-factor model consisting of 1-revitalization, 2-positive engagement, 3-tranquility, and 4-physical exhaustion. This measure was designed to focus on states directly tied to physical activity. Psychometric studies indicate that EFI has high internal consistency, factorial validity, and concurrent validity and that it is sensitive to exercise manipulations.<sup>29</sup>

### ***7-Day Physical Activity Recall***

Exercise adherence was measured by the 7-Day Physical Activity Recall<sup>30</sup>; it is a two question survey requesting the amount of time spent engaged in moderate activity and the amount of time engaged in vigorous activity in the previous week, with examples of each category to inform the participant. Vigorous movement included activities such as swimming and running and moderate activities were considered movements such as heavy house cleaning or slow walking. Dishman and Steinhardt found that 7-Day Recall of Physical Activity has high



correlations with a concurrent 7-day diary of physical activity. “Intra-class reliability for repeated assessments of total (.89) and vigorous (.90) recall was high across seven weeks”<sup>31</sup>. Significant correlations have also been reported when Taylor, et al.<sup>32</sup> compared direct measurement of physical activity through the electric monitoring of heart rate and 7-Day Recall of Physical Activity.

### ***Open Ended Questions***

Two open-ended questions were also administered inquiring about changes in health behaviors as a result of participating in consistent yoga classes, along with views on the yoga experience as it relates to the ability to adhere to exercise.

### **Data Analysis**

All data were analyzed using SPSS (Versions 16 and 18). Baseline demographics were analyzed using independent *t-tests*. For the variables of general well-being, exercise self-efficacy and exercise adherence a repeated-measure analysis of variance with one between factor was performed to compare data collected on three separate occasions: pre-test, mid-point test and post-test I. The assumption of sphericity was checked using Mauchley’s test and the Bonferroni method was used to perform pairwise comparisons following a significant test result. The post-test II data were analyzed with a paired *t-test*. The acute feeling Lickert-scale response to exercise was analyzed for mean frequency across ten yoga classes. The group cohesion assessment was assessed based on norm referenced scores. Finally, the answers to the open ended questions were coded for emerging themes and subcategorized.

### **Results**

#### ***Sample***

There were 45 inquiries received throughout the process of reaching the desired sample-size of 31. Of the 45 potential participants, 37 were assessed for potential eligibility, with 4 not meeting the inclusion criteria and 2 others not attending the initial screening meeting. The mean age for the study participants was 50 for the intervention group and 52 for the control group; the participants ranged in age from 34-65. During the study one participant dropped out of the intervention group and four participants in the control group ceased to provide data; demographics are presented in Table 2. Some of the demographic information collected pertains to perceived barriers for exercise adherence such as childcare and employment status.

### ***Treatment Adherence***

There were 20 yoga classes scheduled to meet twice a week for a period of ten weeks. Due to hazardous weather conditions, four classes were canceled. On average yoga participants attended a mean of 12 classes.

### ***Primary Outcome***

For the exercise adherence analysis Mauchley's test for sphericity was plausible ( $p=0.71$ ). The overall test of the means in repeated measures ANOVA was significant for a main effect of time  $F(2,50)= 5.383, p< 0.012$  and group main effect  $F(1,25)= 10.152 p< 0.004$ . The Bonferroni method was used to perform pairwise comparisons indicating at the overall 0.05 level that pre-test is significantly different from mid-point ( $M = -1.896, SD= .698$ ) and from pre-test to post-test I ( $M = -2.817, SD=.854$ ). Figure 1. presents the illustration of these findings.

The intervention group completed a post II exercise adherence survey at five-week post yoga intervention to determine if they were able to maintain their physical activity level. A paired-samples t-test was performed to ascertain whether there was any significant change in their physical activity. There was no significant difference in the post-test I to post-test II exercise adherence data ( $M = -.25000$ ,  $SD = 7.20000$ ,  $N=12$ )  $t = (11) -.120$ ,  $p = .906$ .

### ***Secondary Outcomes***

For the exercise self-efficacy analysis Mauchley's test for sphericity was plausible ( $p=0.289$ ). The overall test of the means in repeated measures ANOVA was significant for a main effect of time  $F(2,50) = 3.817$ ,  $p < .029$  and group main effect  $F(1,25) = 7.854$ ,  $p < .010$ . The Bonferroni method was used to perform pairwise comparisons indicating that at the overall 0.05 level exercise self-efficacy changed from pre-test to mid-point ( $M = 6.042$ ,  $SD 2.292$ ). Figure 2 displays these findings.

For the general well-being analysis Mauchley's test for sphericity was plausible ( $p=0.77$ ). The overall test of the means in repeated measures ANOVA was not significant as hypothesized. However, an unexpected finding of significant interaction effect was found,  $F(2,50) = 8.489$ ,  $p < 0.001$ , resulting from an increase in general well-being in the intervention group and a decrease in general well-being in the control group.

The mean acute feeling response to the ten yoga classes is illustrated in Figure 3. The yoga participants reported feeling strongly that their experiences in yoga were peaceful, happy, up-beat, enthusiastic and they felt revived following the yoga classes. They also felt moderately refreshed and only slightly tired, fatigued, or worn out.

An evaluation of the linear relationships between variables was measured using Pearson's correlation coefficient. The analysis revealed that exercise adherence and exercise self-efficacy

show a positive significant linear relationship  $r = 0.409$  and  $p < 0.01$ . In addition, general well-being and exercise adherence show a positive significant linear relationship  $r = 0.612$  and  $p < 0.000$ . Finally, general well-being and exercise self-efficacy show a positive significant linear relationship  $r = 0.589$  and  $p < 0.001$ .

The group cohesion data collected was analyzed using the calculation procedures developed by the authors of the survey (Carron, Brawley, & Widmeyer, 2002)<sup>24</sup> and then assessed against the norms that have been established for the survey; the results can be found in Table 3. The yoga participant's score was consistent with the norms on two constructs of the group cohesion measurement, Attraction to Group Task and Group Integration Task.

Additionally, the yoga participants responded to two open-ended questions regarding the effects of the yoga classes on their health behaviors and their adherence to exercise. Responses were coded for emerging themes and organized into sub-categories under each theme. The emerging themes were physical effects, emotional effects, exercise habits and feelings, and health behaviors; see Table 4 for further illustration.

## **Discussion**

This pilot study investigated the effects of ten-weeks of twice-weekly yoga classes in previously inactive adults; its findings have both practical and theoretical applications. In practical terms, the yoga intervention produced significant improvements in exercise adherence. Essentially, these individuals progressed from not performing exercise on a regular basis to consistent yoga class participation as well as supplementary physical activity. This is a key finding as the literature suggests that the maintenance of regular exercise provides a critical link to health improvement and disease prevention. Additionally, as the literature suggests, it is vital to adhere to exercise over the longer-term. Participants in this study did demonstrate adherence

as they maintained their physical activity for five weeks beyond the yoga intervention. The participants' responses to the open-ended questions further support these findings, for example: "I have also added two miles of walking three or four times per week" and "I will make sure to exercise 2-3 times a week."

The remaining variables in the study contribute to the theoretical discussion, and fortify the practical implications. Exercise self-efficacy, general well-being, and exercise adherence were all found to be positively correlated in this study. Exercise self-efficacy is regarded as an individual's belief in their ability to carry out exercise as a matter of course—serving as the psychological arm of the biopsychosocial model. How a person feels in general and in relation to their exercise capabilities in particular, may be critically associated with adherence to exercise. A participant claimed, "Yoga makes me feel better and so therefore I want more of it." Another respondent stated, "I feel much stronger and better about the way I look. I have more energy and look forward to this class every week."

The acute feeling response to the yoga classes was favorable and may have been a key contributor to participant's improved perceptions of ability, which may have further fostered adherence. Interestingly, yoga participants reported, "I have definitely reaped benefits emotionally and physically. When stressed I try to concentrate on my breathing and my focus has improved as well" and "I make sure to make more time for myself every day." It is possible that Jon Kabat-Zinn's focus on increased mindfulness with an ill or suffering population may influence health-behavior management in an apparently healthy population (Kabat-Zinn, 1982)<sup>17</sup>. Participants also self-reported an increased awareness of their eating habits as they became more conscious of their physical and emotional selves, indicating that this may be an important subject for investigation in future mind/body research.

The biopsychosocial model asserts that there is a social complexity to health behavior. The group cohesion data represent the participants' perceptions of the impact of exercising in a group. Two of the constructs corresponded with the norm, despite the fact that the yoga group had a minimum of interaction-time together. At the very least, these findings suggest that the impact of social support on exercise adherence requires continued investigation.

This pilot study provides dual implications: first, that yoga has a positive impact on exercise adherence in a previously inactive population and second, that a model predicated upon the complexity of human behavior management may be useful when attempting to establish permanent change in health behaviors. Future research should strive to address a variety of strategic imperatives, including: a larger sample of yoga participants, a longer period of time in which to measure the exercise adherence behaviors, additional exercise interventions that meet the tenets of the biopsychosocial model, and finally, the inclusion of a broader range of health behaviors such as eating and sleeping habits.

## Tables and Figures

**TABLE 1.** Postures

<b>Posture/Position</b>	<b>Description</b>
Knee down twist	lying supine, one leg straight other leg bent and moved across body, bent knee towards floor
Downward dog	hands and feet on floor straight arms and legs, body in inverted V.
Upward dog	lying prone legs straight and off of floor, hands on floor arms straight, lifting chest and abdomen off of floor.
Cobra	similar to upward dog with legs on the ground
Chair	standing knees are bent less than parallel to the floor, feet flat on floor, arms overhead
Plank	prone position, arms straight, hands on floor, toes and forefoot supporting lower body, body suspended off the floor
Side plank	same as plank but one arm holds body sideways to floor, other arm extended into the air.
Table	prone position on hands and knees, shoulder and hip distance apart.
Reverse table	supine position, on hands and feet with knees bent into the air, abdomen parallel to the floor.
Cat-in table position	arch back, rounding, abdomen pulling in.
Dog-in table position	sway back, dropping abdomen towards the floor.
Tree-balance posture	standing on one leg, other foot placed on standing leg, above or below the knee, arms in various positions
Eagle-balance posture	standing on one leg, wrap other leg around standing leg, wrap arms in opposite rotation around one another.
Cobbler's pose	seated, bottoms of feet together, various movements done in this position, forward flexion, rocking side to side, feet extended away from hips.

Child's pose	prone position, knees bent upper body and hips sitting back on lower legs and feet, forehead resting on floor, arms extend at shoulders.
Bridge-supine position	feet on floor knees bent, lift hips and abdomen off of floor, back of shoulders down on floor.
Warrior postures	standing one foot on horizontal line, other foot perpendicular to it, legs wider than shoulder distance apart, variations: facing horizontal foot-knee bent to almost 90degrees, arms extended over head from shoulder, facing perpendicular foot arms extended laterally from shoulder, facing horizontal foot back leg off of ground parallel to floor, arms extended over head.
Seated spinal twist	one leg straight other leg bent and foot placed over straight leg, same side arm as straight leg wraps around bent knee upper body rotates around away from straight leg.
Lying down hip rocks	lying supine, feet on floor, knees bent, movement from hips allowing knees to drop from side to side.
One legged locust	same position as above, lift one leg and one arm(opposing).
Pigeon	prone position, one leg on floor, other leg bent at knee with gluteul region touching floor, drop upper body down to floor, arms extended at shoulder overhead.
Reclining hand to big toe	twist-lying supine, one leg straight other leg straight out to side, toe or foot held with corresponding hand out to the same side of the body.
Revolving knee to head-	sitting one leg extend straight out to side, other knee bent into pelvis, upper body bends sideways one arm along leg, other arm overhead.
Sideways seated angle	seated legs extended out one to each corresponding side, turn trunk towards one leg fold upper body over towards outstretched leg.
Seated forward bend	legs extended out in front from the hip, folding upper body forward onto legs.
Boat	lying prone lift arms overhead off of floor and legs together off of floor, weight principally on abdomen/pelvis region



Boat	supine position, legs extended straight out at hips and in V position, arms straight out from shoulders parallel to the floor.
Seated stick	seated, leg extended straight from hips, palms pressed into floor at either side of hip, emphasis on posture.
Standing stick	balancing on one leg, other knee is bent into chest, arms wrapped around bent leg.
Gate crossbar	on knees, body extended straight/upright, arms extended over head, bend upper body to each side, extend one leg out to side, straight, other knee is down on floor, arms overhead, bending to the side with upper body.
Mountain pose	standing straight on feet.
Crossbar	gate position, standing forward bend- bend upper body at hips down towards legs, arms reaching toward floor.
Sun salutations	starting in standing position(mountain pose), forward bend, one leg lunge, plank, yoga push up(four limb stick), cobra, downward dog, lunge, forward bend, back to standing(mountain pose).
Wide legged forward bend	standing with legs wide apart, bend forward with hands reaching towards floor
Side angle pose	standing legs wide apart, one knee bent towards 90 degrees, lean upper body towards bent leg, lay forearm on bent leg, rotate head to look towards ceiling.
Extended side angle pose	same as above with arm extended over head by ear
Sideways extended pose	legs much wider than hip distance apart, feet pointing in the same direction, hands in prayer position behind back, fold upper body forward over legs.
Half moon	legs wider than hip distance apart, one foot pointing horizontally, upper body bent forward at hip over foot, back leg lifts up straight, arms extend
Extended triangle	standing with feet wide apart, one foot on horizontal line the other perpendicular to it, with legs straight fold upper body sideways, arms extended straight out at shoulder height,

	moving hand towards the floor.
Five pointed star	standing with legs wider than hip distance apart, arms extended at shoulder height straight out
Yoga push up-(four limb stick)	in push up position, ball of feet on ground, hands at sides of body, elbows pointing back towards feet, dropping body to ground without touching abdomen or knees.
Revolved lateral angle	one leg lunges forward, other leg stays straight and back, take elbow of arm opposite forward leg and place it outside of the bent knee, rotate body towards bent knee and beyond.
Camel	kneeling on knees, lowering body backwards towards feet, arms drop to ankles behind, abdomen sways in an extreme arch.
Standing bow	standing on one leg, other leg extends back from hip, hold ankle of leg in air with corresponding arm, allow body to move forward at the hip towards forward standing leg, torso eventually parallel with the ground, other arm extended over head also parallel with ground
Thread the needle	in table position, take one arm and thread it through table, dropping posterior shoulder onto the floor, turning upper body at waist in the direction of threaded arm.
Rising sun	standing, hands clasped behind back, lift hands with straight arms out away from body, lift chin, opening chest and shoulders
Setting sun	standing, same position as above, but fold forward at hip towards legs, lifting arms behind you and away from body
Spread out foot leg	standing with wide spread legs, fold body forward, while hands on ankles, lift upper body up, looking out with lifted head and shoulders as well.
Seated angle	seated with legs completely straddled, hands outstretched to ankles or feet, drop upper body from waist between legs towards floor
Sideways seated angle	same position as above, turn upper body towards one leg, fold body over leg, placing hands on opposite sides of ankle.
Tortoise-seated	feet on floor, knees towards ceiling, fold through legs with upper body, lace arms under knees.
Bow pose	lying prone, bend knees and hold ankles with hands, lift upper body and thighs off of floor.

One legged bridge pose	bridge position, lifting one leg to the ceiling, holding body with other leg on floor.
Legs up the wall pose	lying on ground with gluteals pressed into the wall, and legs straight up the wall towards the ceiling
Stomach abdomen turning round	lying supine, arms out in a T, legs straight bottoms of feet towards ceiling, drop legs together to one side, allow legs to hover over the ground.
Upward spread out foot	lying supine arms over head or under posterior hip region, legs straight to ceiling, lower legs down together in increments
The eternal one	lying on side bottom leg straight, lift top leg in line with body with a straight leg to the ceiling, hold toe with hand.
Locust	lying prone lift legs straight off of ground, arms are by the sides of the body palms up on hands, lift arms parallel with torso, lift head.

**TABLE. 2** Demographic Data

Characteristic	Total (n)	Percentage	Intervention (n)	Control (n)
Married	15	59.3%	11	5
Single	12	40.7%	4	7
Gender	Female- 22 Male- 5	81.5% 18.5%	13 2	9 3
Never exercised for 6 months straight	10	37%	5	5
Have exercised for six months straight	17	63%	10	7
Children living at home	12	44.4%	8	4
No children living at home	15	55.6%	7	8
Employed	24	85.2%	14	10
Unemployed	3	14.8%	1	2

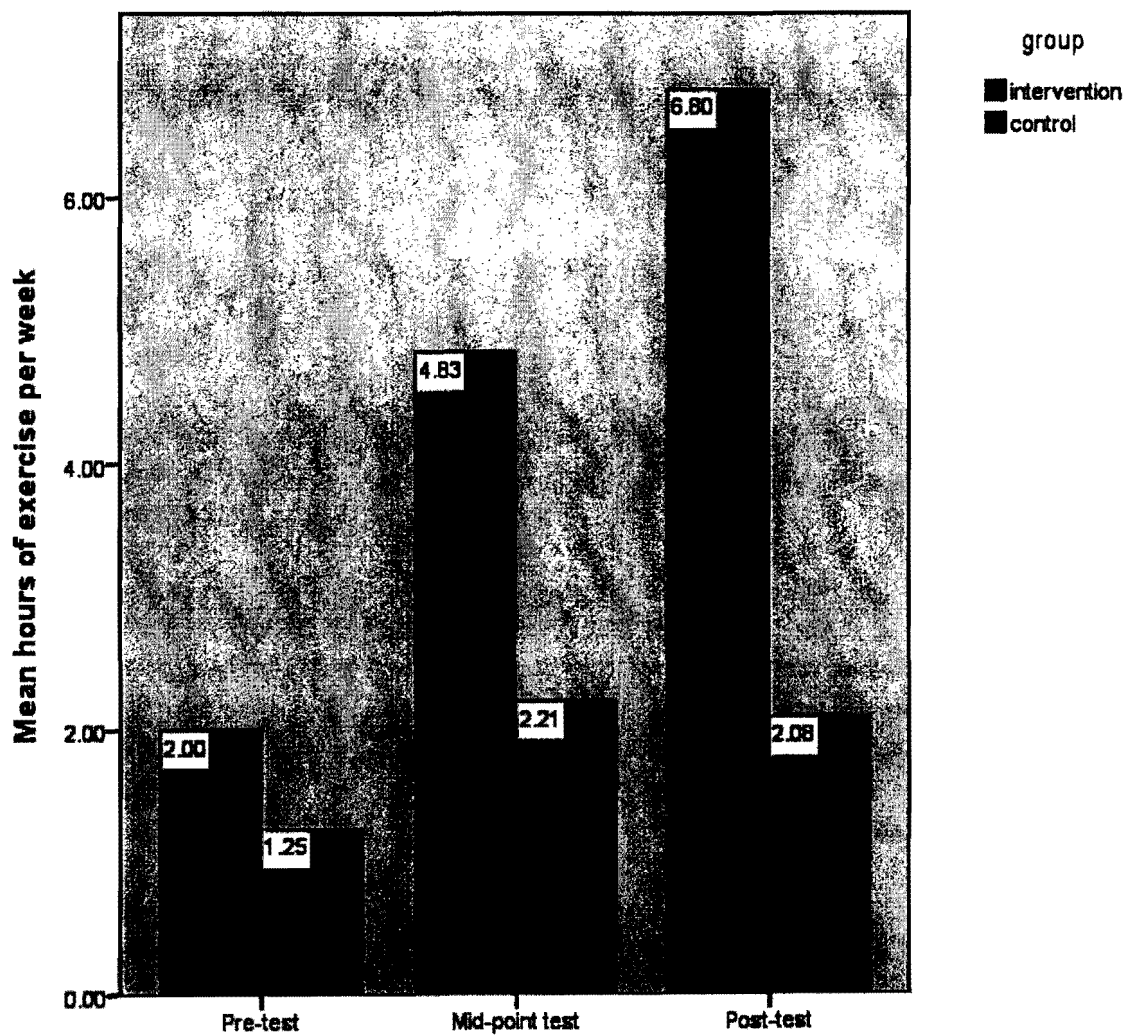


Figure 1. Exercise Adherence Data by Time and Group

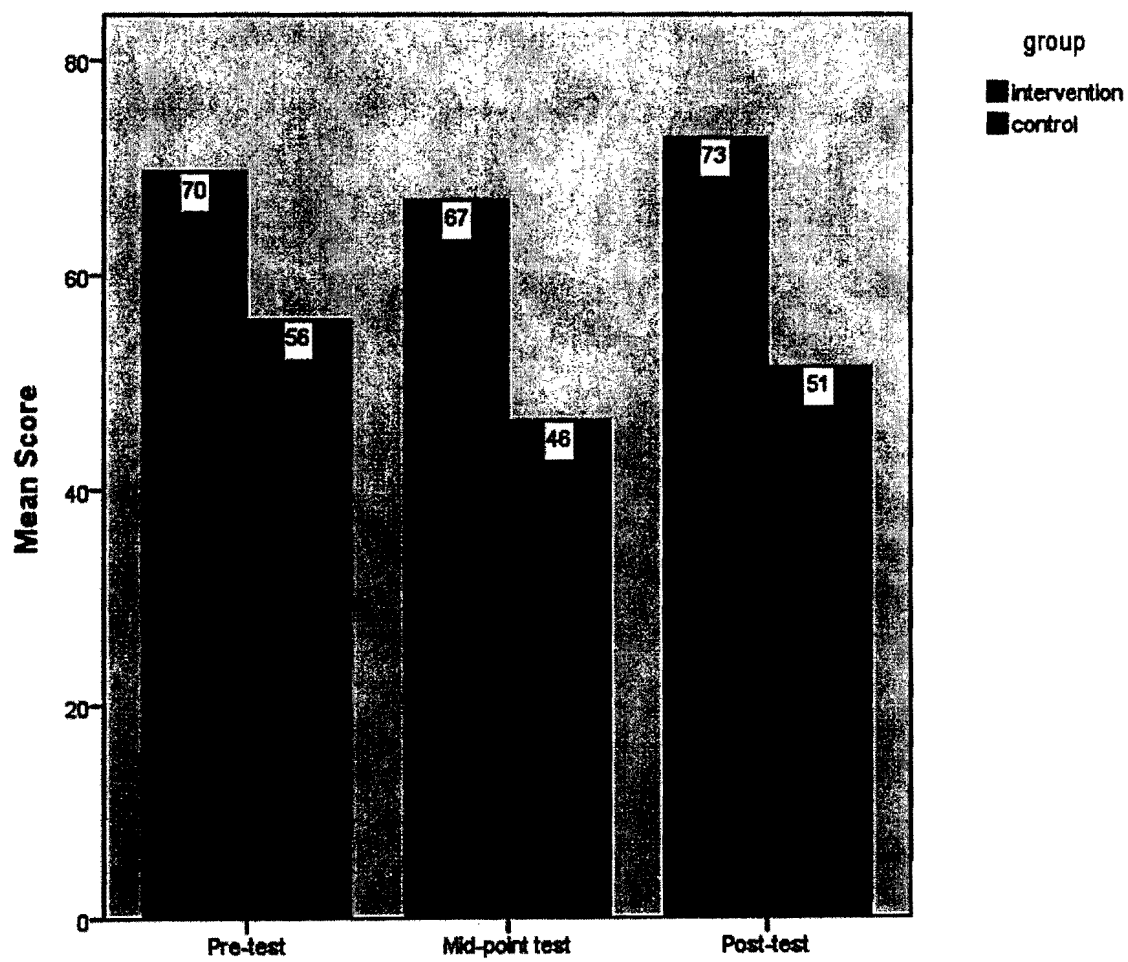


Figure 2. Exercise Self-efficacy Data by Time and Group

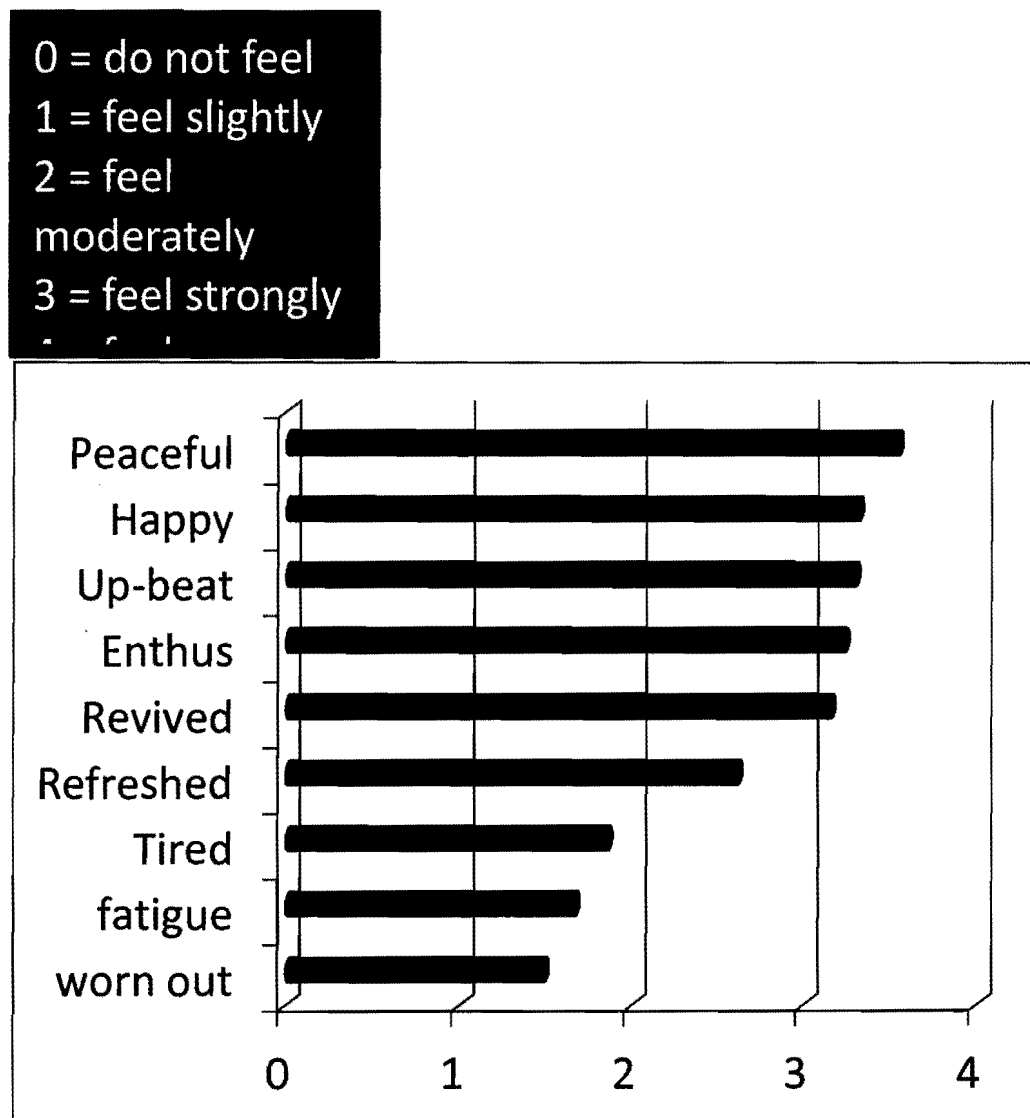


Figure 3. Mean Acute Feeling Response Immediately After Yoga Participation

**TABLE 3.** Group Environment Questionnaire Results

Constructs	Normative Values	Study Results
Individual Attraction to Group Social (ATG-S)	31.97	28
Attraction to Group Task (ATG-T)	30.87	<b><u>34</u></b>
Group Integration Social (GI-S)	24.22	14.33
Group Integration Task (GI-T)	29.47	<b><u>30.07</u></b>

\*Bold, underlined scores are at or above the norm



**TABLE 4.** Open Ended Questions

Emerging Themes	Sub-categories	Participant's Comments
Physical Effects	1. Less Pain  2. Improved physical capability	1. "I had pain in my right leg and the pain is gone."  2. "I feel stronger."
Emotional Effects	1. Improved self-perception  2. Improved self-management	1. "Yoga has made me feel stronger and more confident that exercise will be a more consistent part of my life."  2. "I feel relaxed and calm during the week."
Exercise Habits and Feelings	1. Positive feelings towards exercise  2. Positive changes in exercise habits	1. "I have an increased desire to exercise more frequently."  2. "I have been walking on

		my lunch hour.”
Health Behaviors	1.Attention to improvement in eating habits.	1.“I am eating healthier.” 1.“ I have better eating habits.”

\*Sub-category numbers correspond to participant comments

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Ethics Statement: This research was conducted in accordance with the Seton Hall University institutional review board and carried out with the ethical standards set forth in the Helsinki Declaration of 1975.

Appendix N

IRB Proposal

**SETON HALL UNIVERSITY IRB APPLICATION SHEET**

For office use only:

\_\_\_ Exempt

**Application must be typed.**

If more than one researcher, give information on a separate page for #1-4 for each researcher.

Indicate who Principal Investigator is.

1. NAME: Stephanie Bryan Tormey      HOME PHONE: (c) xxx-xxx-xxxx

EMAIL ADDRESS: yogastudy@aol.com

2. HOME MAILING ADDRESS: XXXX XXXXX XXXX XX XXXXXXXXXXXX XX

3. PLACE OF EMPLOYMENT: Kean University

4. POSITION OR JOB TITLE: Instructor WORK PHONE: (w) xxx-xxx-xxxx

5. TITLE OF STUDY: The relationship between yoga participation, psycho-social variables and exercise adherence

6. Study is (a) Thesis \_\_\_\_\_ (b) Dissertation  X  (c) Other [specify]  
\_\_\_\_\_ Pilot study

7. Does your research have a potential or actual financial interest of any kind (e.g. any form of payment for services, equity interests, intellectual property rights, etc.)?

Yes. (Please complete the Financial Conflict of Interest form at the end of this IRB application and submit with the application.)

X  No

8. Name of advisor, thesis or dissertation, class professor (If applicable): Dr. Pinto-Zipp  
School of Health and Medical Sciences

Dept: Phone: TEL: xxx-xxx-xxxx

9. Anticipated starting and completion dates:  Nov 2011 to Nov 2012

10. What is the purpose of the study? The purpose of the study is to explore the relationships between group yoga participation, psycho-social variables and exercise adherence over time.

11. What are the hypotheses or research questions:

The research questions are the following:

1. Is there a relationship between the amount of time in months and/or years that an individual participates in yoga classes and exercise adherence to physical activities?
2. Is there a relationship between the amount of time in months and/or years that an individual participates in yoga classes and exercise self-efficacy?
3. Is there a relationship between the amount of time in months and/or years that an individual participates in yoga classes and general well-being?
4. What is a yoga participant's perception of group cohesion?
5. Is there a significant linear relationship between exercise self-efficacy and exercise adherence among yoga participants?
6. Is there a significant linear relationship between exercise adherence and general well-being among yoga participants?
7. Is there a significant linear relationship between exercise self-efficacy and general well-being among yoga participants?
8. Is there a relationship between the amount of time an individual has performed yoga and mindful eating practices?
9. Is there a relationship between the amount of time in months and/or years and mindful eating practices?



10. What are the yoga participant's self-perceptions of the impact yoga has had on their health behaviors and exercise adherence?

12. Explain your qualifications for conducting this research. I am a practicing exercise physiologist with a master's degree in exercise science and certified yoga teacher with thirty-one years of experience as an exercise instructor. I am a doctoral candidate in the Graduate Program in Health Science; I passed the department candidacy exam in September 2010. In addition, I completed a pilot study in March 2011 investigating the effects of yoga on psychosocial variables and exercise adherence in a random controlled trial. The sample included 31 previously inactive adults over a ten-week time period, randomized to a control group and a yoga intervention group. The dependent variables were significantly responsive to the yoga intervention; most notably the intervention group significantly increased their physical activity and maintained that activity at a 5-week post-intervention data collection. As a result of the qualitative data collection in the pilot an emerging theme revealed that they yoga participants became more self-aware also referred to as mindful. In addition, the yoga participants reported an increased attention to their eating behaviors. As a result, I have added a mindful eating questionnaire to this research study. Based upon these pilot findings I, along with my committee, have developed the protocol presented in this IRB proposal.

13. Using citations from the professional literature, give the rationale and significance of the study. Attach reference list.

Inactivity has reached dramatic proportions in the United States, resulting in chronic illnesses and lifestyle diseases. Inadequate leisure-time physical activity is reported in 69% of adults eighteen years or older; only 31% of adults participate in moderate or vigorous activity to satisfy the guidelines for optimal health as presented by the Center for Disease Control (CDC) and the American College of Sports Medicine (ACSM) (Center for Disease Control, 2008). Epidemiological data has shown that physical inactivity increases the incidence of at least 17 chronic conditions, most of which are chronic diseases or may lead to chronic diseases (Booth, Gordon, Carlson & Hamilton, 2000). An increase in the volume of physical activity is correlated with a decrease in diseases associated with a sedentary lifestyle and an improvement in the ability to carry out activities of daily living (CDC, 2010). The benefits of regular physical activity are a reduced risk in developing one or more of the following maladies: hypertension, hyperlipidemia, obesity, overweight, cardiovascular disease, various forms of cancer, stroke, and type II diabetes (CDC, 2010). Unfortunately, the majority of American adults are not active enough to maintain health and vitality and are unable to implement a program of physical activity consistently and for the long-term. Nationally, when adults begin an exercise program, the corresponding drop-out rate is approximately 50% in the first six months of activity (Sallis, Havell, & Hovstetter, 1992); consequently exercise adherence is a key issue facing the American public. An intervention aimed at diminishing the various obstacles to exercise adherence should take into account a synthesis of factors that may be considered a mind-body solution (Bandura, 2005).

Some health psychologists who address a variety of health issues utilize the biopsychosocial model (Engel, 1977) as an approach to patient health management. The underlying premise supported by the biopsychosocial model is that physical health is formed through the interactions of the mind, the body, and the social environment; these components acting together to affect physical health outcomes (Suls & Rothman, 2004). Achieving regular physical activity may be possible as psychological and physiological barriers preventing

exercise adherence are ameliorated (Gauvin, Rejeski, & Norris, 1996). The exercise adherence literature has identified a number of barriers to regular physical activity. Some of these barriers include: a lack of exercise self-efficacy (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; McAuley, Lox, & Duncan, 1993; an unpleasant or uncomfortable acute exercise experience (Annesi, 2002; Gauvin et al, 1996; Godin, 1994) and lack of social support for physical activity (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003; Spink & Carron, 1992).

Yoga focuses on the mind and the body and is associated with the physical aspects of fitness including improved muscular strength, flexibility, balance, and coordination, and is strongly linked to improved mental development and exercise self-efficacy (Forge, 1997). A recent study found that individuals reporting involvement in a regular yoga practice had attenuated weight gain and more energy output through physical activity than those who did not do yoga (Kristal, Littmam, Benitez, & White, 2005). Exercise self-efficacy theory suggests that confidence in the ability to perform a behavior is positively correlated with the actual performance of that behavior (Bandura, 1977). Yoga practice or participation has resulted in an increased perception of physical capability (Schure et al., 2008) which may lead to improvements in exercise self-efficacy. A positive acute response to an activity can generate feelings of mastery, promoting the adoption and maintenance of physical activity (Gauvin and Rejeski, 1993). Individuals who score higher in a general well-being inventory are more likely to adhere to exercise (Stephens, 1988); a yoga session that is perceived as acutely pleasant and achievable may be positively perceived and ultimately impact general well-being and exercise adherence. Yoga can be performed in a group setting; group cohesion has been shown to impact exercise adherence behavior in exercise participants (Spink & Carron, 1992). The pilot study investigating the effects of yoga classes in previously inactive adults provides us with data supporting the use of a mind/body intervention such as yoga to enhance the adherence to exercise. Several limitations were noted in this pilot study including the small sample size and a shorter-term, five-week post intervention assessment of exercise adherence. Unfortunately,

exercise adherence is a long-term goal that most Americans continue to have difficulty maintaining. Investigating the relationship between consistent yoga participation and exercise adherence for a longer-term is necessary to understand the impact that yoga may have on permanent health behaviors. This proposed research is predicated on the significant findings of the pilot study, in turn expanding the data collection to further investigate the relationships among the independent variable and the dependent variables. The sample will include considerably more yoga participants who take classes with many different teachers, at various locations, while drawing data from multiple forms of yoga over longer periods of time with the intent of broadening the generalizability of the findings. This research may reveal that yoga is a useful mind-body intervention that promotes exercise adherence and healthy behaviors over the longer-term.

14. Describe the subjects, removing geographic identifiers that could compromise anonymity or confidentiality: Subjects will be adult men and woman between the ages of 18-70 who are participating in yoga at least once a week.

Age(s) of subjects: 18-80 years of age

Sample size: 180, Power .8, alpha  $p < .05$

15. From where and how will potential subjects be identified (e.g., outpatient list, class list, etc.)?

The PI will contact the decision maker of each establishment conducting yoga classes in the area and present the possibility of soliciting potential participants for the yoga research.

With permission, the PI will then post a flyer on the appropriate information board located in each waiting room site that will invite the yoga participants to become involved in the study.

How do you have access to this population? I will request access to the participants through the proper channels of each exercise establishment.

16. Do you have a supervisory and/or professional relationship with the subjects?      Yes  
\_\_\_\_\_ No X

If yes, please explain how this relationship will not compromise the voluntariness of the subjects' participation in the study.

17. Will data be collected from or about any of the following protected populations:

\_no\_\_ minors (under 18 years of age; specify age )

\_no\_\_ prisoners

\_no\_\_ pregnant women

\_\_no\_\_ fetuses

\_\_no\_\_ cognitively impaired persons

For additional requirements regarding these categories of protected subjects, consult and follow the IRB Guidelines.

18. What are your criteria for subject selection? Selection of subjects must be equitable and, in the case of protected populations [see #13 above], should reflect their special needs. IRB Guidelines also require researchers to be sensitive to the use of educationally and economically disadvantaged persons as subjects. If you are excluding women or minorities from your subject pool, you must include a scientific justification for such exclusion.

#### **Inclusion and Exclusion Criteria**

The inclusion criteria for the subject selection:

- 4) Adult yoga participants between the ages of 18 and 80
- 5) Participating in yoga class at least one class per week consistently; defined as one or more classes per week on a weekly basis
- 6) Participating in yoga classes in a commercial or recreation facility

The exclusion criteria for subject selection:

- 4) Pregnancy
- 5) Only participating in private yoga sessions

- 6) Attending yoga classes on an inconsistent basis; defined as less than one class per week on a weekly basis

19. How will subjects be recruited once they are identified (e.g., mail, phone, classroom presentation)?

Include copies of recruitment letters, flyers, or advertisements, or copy of script of oral request at time of recruitment.

Potential subjects will be solicited by recruitment flyer (Appendix A) placed in each exercise location and then by solicitation letter (Appendix B) affixed to the each survey packet.

20. Where will research be conducted? Surveys will be distributed at commercial and recreation exercise facilities throughout New Jersey.

21. Will deception be used? YES \_\_\_ NO X If YES, provide the rationale for the deception:

22. Please explain debriefing procedures, if any, to be used in this study:

The participants may request the results of the study; if so, they will be provided the results in aggregate at the conclusion of the study.

23. What methodology will be taken to insure the anonymity of the subjects and the confidentiality of the data (i.e., coding system, how and where data will be stored and secured, how data will be analyzed, who will have access to data, what will happen to data after the study is completed)? ~~Note: For security reasons, data can no longer be stored electronically on hard~~

drives of laptop or desktop computers. Data must now be stored electronically only on a CD or USB memory key and kept in a locked, secure physical site. Researchers should retain all data collected for at least 3 years after project completion.

All data collected will be completely anonymous. Each packet will be given a unique numerical code for organizational purposes and to insure confidentiality of the data; all of the collected data will be linked with this identifying code. Every paper survey and consent form will be marked with the unique confidential numerical code. The paper surveys will be stored in a locked filing cabinet and held in a secure place in the principle investigator's home office. Only the primary researcher will have access to the key to the cabinet that holds the survey packets. All statistical analysis of data conducted on a personal computer will be stored on USB memory key and kept at researcher's home office in a locked box. The data will be retained for at least three years after project completion; at that point all paper items from the study will be shredded and any memory stored on a USB will be purged.

24. Is a subject follow-up anticipated? YES \_\_\_ NO X If Yes, for what reason?

25. Describe the design and methodology, including all statistics, IN DETAIL. What exactly will be done to the subjects?

This is an exploratory mixed methods design. Correlational analysis will be conducted to describe the strength and direction of the relationships between the independent variable



and the dependent variables, as well as between the dependent variables. (Portney & Watkins, 2009). Qualitative data will be coded for emerging themes.

## **Procedure**

### **First Contact**

The principal investigator (PI) will contact commercial and recreation exercise sites that offer yoga classes via phone, email and/or in person. The PI will communicate with the decision maker of the establishment requesting the opportunity to solicit their yoga participants for possible involvement in the study. The PI will explain that recruitment will begin with flyers of solicitation posted in their waiting room directing potential participants to the coded survey packets placed in a common area held in a receptacle, accompanied by a return receptacle. A full explanation of the project will be offered to the decision maker and all questions answered. The decision maker will have the option to preview the recruitment flyer, solicitation letter, dependent variable surveys and open-ended questions. If consent is granted (Appendix I), the PI will arrange to deliver all materials to the establishment and commit to retrieving the completed surveys once a week for a period of one month.

The outside of the survey packet will be affixed with the solicitation letter (Appendix B). The order of surveys in the packet will be demographic survey (Appendix C), 7-day physical activity recall (Appendix H), two open-ended questions (Appendix D), general well-being schedule (Appendix E), exercise self-efficacy survey (Appendix F), group environment questionnaire (Appendix G) and mindful eating questionnaire (Appendix I). The time to complete the packet is approximately 25 minutes.

26. Indicate how hypothesis/question of research fit methodology and design.

The questions for this research probe the relationship between yoga and variables that have been previously associated with exercise adherence; for example, exercise self-efficacy (Bandura, 1977; McAuley, 1992; 1993; McAuley et al. 2003; Marcus, Eaton, Rossi, & Harlow, 1994), group cohesion (Annesi, 1999; Carron & Spink 1992; Carron et al. 1988) and, general well-being (Berger & Owen, 1988, 1992; Biddle, 2000; Forge, 1997; Kristal et al. 2005). This research is an expansion of the pilot study's findings in which ten-weeks of yoga participation had a positive, significant effect on exercise adherence at post test I, and was maintained at five-weeks post test II. The comparison of yoga participants by amount of time in months and/or years of regular yoga classes will investigate whether yoga participation may be associated with psycho-social health perceptions and exercise adherence over a longer term. (Portney & Watkins, 2009). The mindful eating questionnaire will also expand upon the pilot study results demonstrating that the yoga participants had an increased awareness of their eating habits. The open-ended questions allow for further collection of yoga participant's perceptions of the relationship between yoga and health-related behaviors including exercise adherence.

27. Give reliability, validity and norming information on all instruments.

### **General Well-Being Schedule**

The General Well-Being Schedule (GWBS) was designed by the National Center for Health statistics. There are six subscales including the constructs of energy level, satisfaction, freedom from worry, and self control. The survey consists of 18 items. A high score on the General Well-Schedule indicates an absence of bad feelings and the existence of positive feelings. National surveys have revealed that higher scores on the GWBS are associated with increased engagement in physical activity for both men and women across age groups. Fazio (1977) conducted a concurrent validation study for the General Well-Being Schedule and found the test re-test correlation was .851 for the entire scale; internal consistency was .912 for men and .945 for woman. The National Center for Health Statistics used a sample of 6,931 for the GWBS survey and have established meaningful norms. The time required to complete this survey is approximately 5-7 minutes.

### **Multidimensional Self-Efficacy for Exercise Scale**

The Multidimensional Self-Efficacy for Exercise Scale is an instrument designed to measure three subdomains of exercise self-efficacy, these are task self-efficacy, scheduling self-efficacy, and coping self-efficacy (Rodgers, Wilson, Hall, Fraser, and Murray, 2008). Exploratory factor analysis followed by confirmatory factor analysis demonstrated the expected factor structure. Subsequently the generalizability of the factor structure was confirmed with a random sample of 470 adults, and discriminant validity was demonstrated in this sample population through the instrument's ability to distinguish between exercisers and non-exercisers. Finally, the self-efficacy scale was responsive to changes in exercise experiences. The time required to complete this survey is approximately 3 minutes.

### **Group Environment Questionnaire**

The Group Environment Questionnaire (GEQ)(Carron, Brawley, & Widmeyer, 2002) is comprised of 18-items that are divided into four subscales which assess perceived group cohesiveness, they are: Individual Attraction to Group-task (ATG-T), Individual Attraction to

Group-social (ATG-S), Group Integration-task (GI-T), Group Integration-social (GI-S). The reliability coefficients as measured by Chronbach's Alpha are: ATG-T .75, ATG-S .64, GI-T .70, GI-S .76. The GEQ is reliable and has good internal consistency. "To date, there is evidence that the GEQ is a valid instrument for the assessment of perceived cohesion. There have been judgements of the GEQ's content validity as well as demonstrations of its criterion-related validity (concurrent and predictive) and its construct validity" (Widmeyer, Brawley, & Carron, 1985, p.50).

Modifications were made to the GEQ to accommodate its use with a group exercise class rather than a sports team, as it was originally designed. The wording changes to accommodate this fitness sample have been used elsewhere (Carron, Widmeyer, & Brawley, 1988; Carron & Spink, 1993; Spink & Carron, 1992); further, Carron & Spink (1992) investigated the internal consistency of the modified group environment questionnaire for use in fitness classes and found internal consistency values highly similar to those found with the extensively validated original version of GEQ. The Chronbach's alpha values of the four subscales for the modified version are .77, .61, .71, .77. Researchers have used GEQ to investigate group cohesion and exercise endurance (Annesi, 1999). The time required to complete this survey is approximately 5-7 minutes.

### **7-Day Physical Activity Recall**

The 7-Day Physical Activity Recall (Blair, S., 1984) is a physical activity recall survey. The subjects recall the amount of moderate and vigorous intensity physical activity performed during the past seven days. Dishman and Steinhardt (1988) found that 7-Day Recall of Physical Activity has high correlations with a concurrent 7-day diary of physical activity. While recording the free living physical activity patterns, the 7-day Re-call also effectively placed individuals into the appropriate activity level groups. "Intra-class reliability for repeated assessments of total (.89) and vigorous (.90) recall was high across seven weeks" (Dishman & Steinhardt, 1988, p. 14). Significant correlations have also been reported when Taylor, et al (1984) compared direct

measurement of physical activity through the electric monitoring of heart rate and 7-Day Recall of Physical Activity. The time required to complete this recall is approximately 2 minutes.

### **Mindful Eating Questionnaire**

The mindful eating questionnaire (MEQ) is a 28 item questionnaire that assesses an individual's awareness of sensations, emotions, motivations, and responses to eating; also referred to as feeding. There are four domains represented within the questionnaire, disinhibition, awareness, external cues, emotional responses, and distraction (Framson, et al., 2009). Responses are gathered in a four point scale ranging from never/rarely to usually/always. Chronbach's alpha is .64 and MEQ score is inversely related to body mass index demonstrating construct validity. The time required to complete this questionnaire is approximately 4 minutes.

### **Open Ended Questions**

The two open-ended questions posed for this research are based on those presented for the pilot. The pilot data revealed emerging themes supporting the positive effect of yoga on health behaviors, exercise adherence, and exercise self-efficacy. The questions are slightly different to accommodate for the differences in the sample and can be found in Appendix D. Approximate time for completion 3 minutes.

28. Describe any equipment that will come in contact with the subject. Brand name and model, as well as description of its function. If electrical equipment is connected directly to the subjects, as with GSR and EFF measures, assurances concerning the safety of the equipment (technician should certify that equipment was checked within the last month) should be included.

There is not equipment used for this research.

ATTACH ADDITIONAL SHEETS IF NECESSARY.

Include the necessary copies of any test instruments, questionnaires, etc.

**DO NOT ATTACH COPIES OF SECTIONS OF GRANT PROPOSALS, DISSERTATIONS OR**

**CLASS PROJECTS TO ANSWER THIS**

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IRB APPROVAL LETTER



Solicitation Letter

Hi my name is Stephanie Bryan Torney, I am a PhD candidate in the Graduate Department in Health Sciences at Seton Hall University. I am currently conducting a research study analyzing the relationship between yoga, health behaviors, and exercise adherence. I would like to inquire whether you might be interested in completing surveys investigating this relationship.

To be included in this study you need to currently attend yoga classes at least once per week and be between the ages of 18 and 70. If you don't attend at least one yoga class per week or you are pregnant, you will not be able to participate in this research.

Participation in this study is voluntary, by completing these surveys you are giving your consent to participate. There is no compensation for participation in the study. All data is completely confidential, will be stored in a locked file cabinet, will be reported in aggregate form with no identities required, and destroyed in less than three years after completion. Upon completion of these surveys, please return the surveys to the envelope and drop this package in the return receptacle. The surveys include a personal data survey, 7-day physical activity recall, two open-ended questions about yoga, general well-being schedule, exercise self-efficacy survey, group environment questionnaire and mindful eating questionnaire. The time to complete the packet is approximately 25-30 minutes.

The study is completely voluntary and can be discontinued at any point.

Thank you for participation in this study.

If more information is needed, please contact me:

Stephanie Torney  
Torneyst@shu.edu  
908-381-1238

[P. 473-313-6311]  
Seton Hall University  
Institutional Review Board

DEC 05 2011

Approval Date

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