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The Effects of Selected Exercise Modalities on Stress, Anxiety, and Depression Responses in the Elderly

Kimberlee Hoirup Bethany



THE FLORIDA STATE UNIVERSITY

COLLEGE OF EDUCATION

THE EFFECTS OF SELECTED EXERCISE MODALITIES
ON STRESS, ANXIETY, AND DEPRESSION RESPONSES IN THE ELDERLY

By

KIMBERLEE HOIRUP BETHANY

A Thesis submitted to the
Department of Educational Psychology and Learning Systems
in partial fulfillment of the
requirements for the degree of
Master of Science

Degree Awarded:
Summer Semester, 2005

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The members of the Committee approve the Thesis of Kimberlee Hoirup Bethany defended on June 1, 2005.

David Pargman
Professor Directing Thesis

Gershon Tenenbaum
Committee Member

Donald Kelly
Committee Member

Approved:

Frances Prevatt, Chair, Educational Psychology and Learning Systems

The Office of Graduate Studies has verified and approved the above named committee members.

In loving memory of my grandparents, Adrian and Edna Boyum.
You are the inspiration for my interest and work in this field.

ACKNOWLEDGEMENTS

I extend heartfelt thanks and appreciation to my major professor, Dr. David Pargman, and the members of my committee, Dr. Gershon Tenenbaum and Dr. Donald Kelly.

It has been an honor and a privilege to work with and learn from the three of you.

As well, I express my gratitude to my mom, Sandra Bethany, and to Michael Bonura.

Thank you for providing a support system
and for being my own private “graduate assistants.”

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ABSTRACT

The present study investigated the effect of 4 six-week exercise interventions on psychological health in the elderly. Participants (M age = 83; N = 42) were randomly assigned to one of four groups: yoga, aerobics, walking, and social games. Classes met 30 minutes, 3 days per week, for 6 weeks. ANCOVAs revealed significant group effects for all four DVs (stress frequency, stress severity, state anxiety, and depression), a significant time by group interaction for stress frequency, and a significant time effect for stress severity. Yoga participants experienced the most benefits. ANOVAs of the EMI-2 revealed decreases in motivation over the intervention. In post-intervention qualitative interviews, participants cited the instructor and social interaction with classmates as key factors in producing benefits.

INTRODUCTION

According to the Surgeon General's Report on Physical Activity, regular physical activity "reduces the risk of premature mortality in general, and of coronary heart disease, hypertension, colon cancer, and diabetes mellitus in particular" (U.S. Department of Health and Human Services, 1996, p. 4). Research has also verified the beneficial effects of exercise on psychological health and well-being across populations (see Salmon, 2000 for review) and within the elderly population (see Fox & Stathi, 2002 for review). For instance, regular physical activity is associated with reduced symptoms of anxiety and depression (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Ross & Hayes, 1988; Stephens & Craig, 1990). Berger (1994) found that noncompetitive, highly predictable, moderate intensity exercise performed for short periods of time lowers participants' stress levels. Additionally, it has been shown that physical activity is positively correlated with cognitive functioning in older adults (Emery & Blumenthal, 1991).

As the percentage of older adults in the United States continues to increase (U.S. Census Bureau, July, 2002), exercise research focusing on the elderly population is merited. According to the National Institute of Aging (NIA) Financial Year 2005 Justification, "79% of people age 70 and older have at least one of seven potentially disabling chronic conditions. The burden of such chronic conditions is felt not only by individuals but also by families, employers, and the health care system" (p. 12). Therefore, practices that increase the health of older adults are important for the fiscal and overall well-being of the individual and of the nation. The NIA Justification further indicates that "aging itself is not the cause of disease, disability, and frailty" (p. 6) and encourages research which will further illuminate how to prevent disease and maintain health and functional independence into old age.

Many forms of exercise are currently popular, and the group exercise format has expanded in recent years to include new offerings and to formulate regulated versions of traditional forms of exercise. For instance, the Aerobics and Fitness Association of America now certifies group fitness instructors in yoga and kickboxing, in addition to standard industry offerings such as aerobics and step aerobics. The International Fitness Professionals Association certifies instructors in Tai Chi and Qi Gong. Many gyms and fitness centers now offer a wide variety of classes to meet individual preferences and ability levels. Still, in spite of the rapid

expansion of the fitness industry, more than 60% of American adults are not regularly active, and a full 25% of American adults are completely sedentary (U.S. Department of Health and Human Services, 1996). Among the elderly, the population of completely sedentary individuals is even larger, with some surveys indicating that as much as 38.2% of the male population over the age of 75 and 54.3% of the female population over the age of 75 are completely inactive (U.S. Department of Health and Human Services).

Because such a large percentage of the population is insufficiently active, in spite of the broad ranging benefits of regular exercise on physical and psychological well-being, certain issues arise. First, because the elderly population is both the most sedentary portion of the population and one that is rapidly increasing, the investigation of exercise practices and attitudes within the elderly population is both of interest and necessary. Regular physical activity has potential for improving and maintaining health into old age. Second, among elderly individuals, it is important to understand motivation to begin and adhere to exercise regimens. It may be that the type of exercise program in which an individual engages influences his or her motivation to adhere and that different types of exercise programs produce different motivational profiles. Issues of motivation have relevance for encouraging physical activity among sedentary individuals. Third, while it is likely that all of the various forms of physical exercise offer some benefit, different forms of physical exercise provide varying benefits. Inquiry relative to the most effective forms of exercise in terms of promoting health is merited. This study focused on those benefits which are psychological in nature. Finally, since many of the physical fitness options at fitness and community centers are offered in a group exercise format, beneficial outcomes of exercise for the elderly may be related to the social interactions associated with such settings. If this social dimension is indeed a factor in the desirable results of exercise, then it follows that extraverts (who both prefer and benefit from social interaction) receive more benefits from the group exercise setting than introverts, and that conversely, introverts (who both prefer and benefit from individual activities) receive more benefits from individual exercise settings than extraverts. The following literature review will address issues directly or indirectly concerned with the alleged benefits of exercise among the elderly, including exercise motivation and the social factors associated with exercise.

CHAPTER 1

REVIEW OF LITERATURE

Defining Older Adults

While exercise has been shown to be vital for individuals of all ages, the primary focus of this research was on those benefits of exercise that apply to older adults. Various terms have been used to represent this population, such as “elderly,” “senior citizens,” or “older adults.” There is no clear consensus within the psychological research literature for the threshold age at which an individual becomes “elderly” or a “senior citizen.” Some studies used age 65, since this has traditionally been the age at which one becomes eligible for full Social Security benefits. However, according to Dorman (1995):

There is no biological reason to believe we ‘become old’ at age 65. The reason the age 65 is often used to define ‘old age’ is not because we biologically change at that age, but because the authors of the Social Security Act in 1935 had to pick an age for people to receive Social Security benefits. The authors randomly chose the age of 65 (because few people lived that long in 1935) and this number has been used to define ‘senior citizens’ ever since (p. 2).

The term “senior citizen” may also be defined by other criteria, such as whether or not an individual is retired from regular employment, has attained the age of 50 years (American Association of Retired Persons), is receiving Social Security benefits or pension (individuals are eligible for reduced SS benefits at age 62), resides in a nursing home or assisted living facility, uses the services of a senior citizen center, or any number of other factors.

Some researchers prefer to use the term “elderly.” Brown (1992) established a three-tiered system for categorizing elderly adults, which considers individuals between the ages of 65 – 74 as “young old,” those between 75 – 84 as “middle old,” and those 85 and older as “old-old.” This system of age categorization has important implications for interpretation of research findings, since results may not apply to all older adults. Some researchers remove the potential emotional connotations of specific words by defining the sample under scrutiny as “individuals age 65 – 80” or “individuals over 70 years old.”

Although people over the age of 65 only comprised 4% of the United States population in 1900, the population of elderly has risen steadily throughout the twentieth century. According to the U.S. Census Bureau (July, 2002), individuals age 65 years and older currently comprise 12.3% of the population, and are expected to constitute 20% of the population by the middle of the twenty-first century. Regardless of the name or label attached to such individuals, all will go through the relatively predictable process of aging, with its inevitable organic, structural, and functional decrements. These decrements include, for example, a decrease in muscular strength (Cartee, 1994; Lemmer, Hurlbut, Martel, Tracy, Ivey, Metter, Fozard, Fleg, & Hurley, 2000), an increase in stored body fat (Poehlman, Arciero, & Goran, 1994), a decrease in endurance, power, and flexibility (Cartee, 1994), general trends such as the slowing of cognitive and motor activities, a decline in central nervous system functioning, less efficient neural impulse transmissions, slower sensory and motor neural impulse conduction, and a decline in intelligence (see Berger, Pargman, & Weinberg, 2002 for review). However, there is great variability within the population of older adults, and both the onset and intensity of deterioration are person-specific (Birren & Schroots, 1996; Chodzko-Zajko, 1996). Berger, Pargman, and Weinberg identified two types of aging, namely primary aging processes and secondary aging processes. Primary aging processes are those which are related to age and independent of disease or environment (such as menopause). Secondary aging processes include environmental factors (such as cigarette smoking) and diseases (such as cancer). Primary aging processes increase vulnerability to environmental forces and disease; these secondary processes in turn accelerate the rate of primary aging. Spirduso (1995) has defined aging as the process which leads to functional impairment, loss of adaptability, and eventually death.

Because aging is inevitable, an issue of great importance for older adults is functional independence – the capacity of an individual to do things for oneself. Functional independence has important implications because it facilitates the attainment of an extended quality of life. Functional independence is also relevant for society as a whole, since those high in functional independence are less in need of physical and financial support from family and social and governmental systems. Regular exercise can exert a positive influence on aging and preserve functional independence in older adults (U.S. Department of Health and Human Services, 2001). A regular exercise program is critical for the well-being of every older adult. “As individuals live longer, we must determine the extent and mechanisms by which exercise and physical activity

can improve health, functional capacity, quality of life, and functional independence” (Bemben, 2001, p. 1). Therefore, research concerning exercise for the elderly is of critical significance.

Physical Benefits of Exercise

The research literature clearly indicates that regular exercise has many beneficial effects on health and well-being, both in the general adult population, and in the specific population of elderly adults. These benefits affect both psychological and physical health and well-being. For instance, participating in aerobic exercise such as walking, jogging, bicycling, aerobics, or swimming on a regular basis may postpone the inevitable age-induced diminishment of the central nervous system functioning (Chodzko-Zajko & Moore, 1994; Taylor, 1992). Aerobic exercise may also improve neurotransmitter functioning (Bauer, Rogers, Miller, Bove, & Tyce, 1989). Older adults who begin exercising improve cardiovascular functioning, increase maximum consumption of oxygen and stroke volume, decrease blood pressure, lower resting and submaximal heart rates, decrease body weight, improve lean body mass, and increase bone density (Mazzeo, Cavanagh, Evans, Fiatarone, Hagberg, McAuley, & Startzell, 1998). Regardless of age, adults who exercise are less likely to suffer from coronary heart disease (Blair, 1994). Furthermore, Buchner (1997) reported that more than 50% of adults suffer from some sort of sleep disturbance, of which exercise may be a possible cure. Exercise has been shown to decrease the amount of time needed to fall asleep, to increase the amount of sleep, and to improve the individual’s perception of feeling rested (King, Oman, Brassington, Bliwise, & Haskell, 1997).

Evans (1999) proposed that older adults benefit from regular exercise more than any other age group. The low functional independence and high rate of chronic disease so typical of older adults can be dramatically influenced by regular exercise. Evidence indicates that exercise can decrease the risk of developing disease and may even help to stop or reverse the progression of certain disease conditions (Blumberg, Kenney, Seals, & Spina, 1992). Finally, physically active adults over age 65 were twice as likely to die without disability as were older sedentary adults (Ferrucci, Izmerlian, Leverage, Phillips, Corti, Brock, & Guralnik, 1999; Leveille, Guralnik, Ferrucci, & Langlois, 1999). These findings indicate higher quality of life in the years approaching death.

Psychological Effects of Exercise

In addition to the well-documented physical health benefits of regular exercise, physical activity has been shown to be associated with a variety of psychological variables, including mood, stress reactivity, and cognitive functioning. While exercise often leads to improvements in physical fitness, such changes are not prerequisites for improved psychological well-being. For instance, a meta-analysis of The Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT) found that increases in quality of life due to exercise among frail elderly individuals were independent of changes in physical functioning (Schechtman & Ory, 2001). McAuley and Rudolph (1995) observed that improvements in cardiorespiratory fitness and improvements in psychological well-being, though both attributable to physical activity, were not necessarily correlated; older adults may feel better and improve their sense of well-being, even in the absence of improved physical fitness. The specific psychological effects of exercise are numerous and varied. These include decreased depression and anxiety, reduced stress levels, enhanced self-concept and body image, protection of cognitive performance, and improved life satisfaction and general well-being.

Depression and anxiety. Regular physical activity is associated with reduced symptoms of anxiety and depression (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Ross & Hayes, 1988; Stephens & Craig, 1990). In one Finnish study, physically active individuals and lifelong exercisers over age 65 reported fewer depressive symptoms than sedentary individuals over an 8-year period (Lampinen & Heikkinen, 2002). The potential of exercise to reduce the effects of depression is a particularly critical issue within the elderly population because depression has been identified as one of the two most common psychological impairments of advanced age (along with cognitive impairment) (Hagestad, 1987). In fact, while the National Institute of Health reports that 6% of women and 3% of men suffer from depression, depressive symptoms are reported by approximately 15% of the older population (Koenig & Blazer, 1992). In elderly individuals, depression may be confused with or exacerbated by dementia (DSM-IV-TR).

Like depression, anxiety is a psychological state which can be affected by exercise. Research findings have revealed that exercise, either aerobic or resistive format, can decrease anxiety levels (U.S. Department of Health and Human Services, 1996). In clinical populations, exercise can reduce state anxiety, trait anxiety, and physiological correlates of anxiety, including blood pressure (Martinsen, Hoffart, & Solberg, 1989; O'Connor, Raglin, & Martinsen, 2000;

Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). Non-clinical populations also benefit from anxiety reduction in response to exercise. For instance, one study of college women who were high in trait anxiety and expressed anxiety about their academic requirements experienced reductions in state anxiety after 20-minutes cycling sessions (Breus & O'Connor, 1998). The National Institute of Mental Health (1991) reports that between 7 - 15% of the population suffer from an anxiety disorder at any particular time.

With large portions of the population suffering from both depression and anxiety, the ability of exercise to moderate the effects of these psychological disorders is salient to the health and well-being of many individuals. Among elderly adults, research revealed that those involved in physical activity improved in happiness levels, self-esteem, well-being, self-concept, body image, locus of control, anxiety, and depression (Netz & Jacob, 1994). In one study, physically fit women with a mean age of 64.5 years showed immediate improvements in global mood after a 75-minute session of aerobic dance (Pierce & Pate, 1994).

Stress reduction. One psychological effect of exercise which may be particularly relevant to the modern era is its potential for reducing and/or moderating stress levels. Stress is a multi-faceted term which has several definitions. Selye (1983) defined stress as the body's non-specific response to any demand placed upon it. Through this viewpoint, stress has neither negative nor positive implications, but is a function of the imposition of a force or strain of some sort, which reflects its origins as a concept within the fields of physics and engineering. What most individuals commonly refer to as "stress" is really distress, which is "the negative aspects of stress" (Cox, p. 193). In fact, stress can be divided into distress and eustress, which is "the thrilling, highly desirable form of stress that often is associated with risk taking" (Cox, p. 193). For the purposes of this study, stress was used in the common way, in that the stress usually measured is actually "distress," or the negative components of stress.

According to Seaward (1997), between 70% - 80% of modern illnesses are stress-related. In fact, some research indicates that 90% of doctor's visits are for stress-related ailments (Bried, 2004). Stress is often found to be related to common minor illnesses, such as colds, flu, and canker / cold sores (Cohen & Williamson, 1991). Extensive stress over long periods of time may lead to problems with major illnesses such as high blood pressure, coronary heart disease, and even vulnerability to cancer (Blascovich & Katkin, 1993; Seaward, 1997a; Sternfeld, 1992). Berger (1994) found that non-competitive, highly predictable, moderate intensity exercise

performed for short periods of time lowers participants' stress levels, which indicates that exercise can be used as an effective stress management technique. Additionally, exercise has been found to be as effective in managing stress levels as other, more traditional stress management techniques, such as meditation and progressive relaxation (Bahrke & Morgan, 1978; Berger, Friedman, & Eaton, 1988; Long, 1993).

Emery, Schein, Hauck, and MacIntyre (1998) found that the combination of exercise, education, and stress management was found to be more significant in reducing anxiety and improving cognitive functioning among older adults with chronic obstructive pulmonary disease than were stress management and education interventions implemented without an exercise component. This indicates that exercise has powerful stress mitigating effects beyond its simple application as a stress management tool. Controlled experimental studies have been conducted, which investigated the effects of exercise on stress level reduction (Gill, 1989), and improvement of general well-being and quality of life (Krawczynski and Olszewski, 2000) in older individuals. Both studies reported statistically significant improvements in these areas. Sun, Dosch, Gilmore, Pemberton, and Scarseth (1996) likewise found that Tai Chi exercise over a 12-week period reduced stress levels in older adults more than a comparable non-exercising control group. Research by Krause, Goldenhar, Liang, Jay, et al. (1993) revealed that the stress mitigating effects of exercise for senior citizens were not limited to Americans. In their survey of 2,200 adults over age 60 in Japan, the researchers found that those who exercised frequently had lower levels of stress and psychological distress than non-exercisers. Further, King, Taylor, and Haskell (1993), revealed that exercise significantly reduced stress in older adults, especially in those who had smoking habits. These effects were not related to actual improvements in fitness or body weight.

Self-Concept and body image. While exercise results in positive benefits for physical fitness and body weight, many of the benefits of exercise, such as stress mitigation, can occur in the absence of measurable physiological adaptations to exercise. Even an individual's concept of her own body can change due to physical exercise. Self-concept refers to one's perception of the profile of roles with which one identifies. Positive self-concept may be positively associated with the ability to tolerate stress. Aerobic exercise has been shown to improve both self-concept and mood state (McInman & Berger, 1993). Moreover, aerobic exercise has been found to be a useful intervention for improving self-concept and body image in older adults. Riddick and Freitag

(1984) found that older women (ages 50 – 70 years) demonstrated improvements in body image after participation in an aerobic fitness program. Participants who were satisfied with their health and had friends in the same aerobic class had more positive body image than did participants who were either dissatisfied with health or had only one friend in class. As well, Hill, Storandt, and Malley (1993) demonstrated that a year-long endurance exercise training program created positive change in self-reported morale for older adults (1993).

Other perceptions about the body may also be related to exercise activity. Daltroy, Larson, Eaton, Phillips, and Liang (1999) assessed 289 community-dwelling elderly (aged 65 – 97) and compared self-reports of physical functioning with objective assessments of the performance and performance ability (made by trained observers). When controlling for actual physical capacity, lack of exercise was one of the factors that contributed to self-reports of greater disability. Other contributing factors included current joint pain or stiffness, use of prescription medication, urban dwelling, depression, female gender, lack of memory problems, and arthritis.

Exercise may also improve self-concept because it increases an individual's sense of personal control. While many older adults feel a loss of control over their independence and functional ability, older adults who exercise on a regular basis may feel a greater sense of control over their physical bodies and abilities (see Berger, Pargman, & Weinberg, 2002 for a review). As well, increased internal locus of control is related to physical exercise in older adults (Netz & Jacob, 1994; Perri & Templer, 1984-85) and related to improved self-concept.

Cognitive performance. Just as exercise can improve the way one thinks about oneself, it can improve the way one thinks in general. Research has shown that regular exercise may also prevent age-related cognitive declines. Physical activity is positively correlated with cognitive functioning in older adults (Emery & Blumenthal, 1991). Hill, Storandt, and Malley (1993) found significant differences on the Wechsler Memory Scale (WMS) Logical Memory subtest between 87 previously sedentary older adults who participated in a year-long endurance exercise training program and the non-exercising control group. The exercising adults did not show improvement in cognitive function; rather, the non-exercising control group showed a decline in performance from pre- to post-testing. This may indicate that exercise has protective effects for cognitive abilities in older adults. In fact, exercise may induce improvements in cognitive functioning among depressed older men and women, specifically for memory and executive

functioning (Khatri, Blumenthal, Babyak, Craighead, Herman, Baldewicz, King, Kierman, Oman, Kraemer, Hull, & Ahn, 2001). The authors concluded that exercise can influence specific areas of cognitive functioning among depressed older adults, although they pointed out the need for further research both to specify which cognitive processes are affected by exercise and the mechanisms underlying this process.

However, Madden, Allen, Blumenthal, and Emery (1989) found that 16 weeks of aerobic exercise training in a sample of 85 older adults did not result in improvement in reaction time or memory retrieval abilities. Thus, the apparent effects of exercise on cognitive performance in older adults are due either to extended training benefits or to cohort differences between physically active and sedentary individuals. Still, several studies revealed that even one session of low-intensity exercise can improve cognitive performance, specifically verbal memory, in older adults (Fontane, 1996; Molloy, Beerschoten, Borrie, Crilly, & Cape, 1988; Stones & Dawe, 1993).

Other cognitive functions may also improve due to physical activity, including color recognition (Spirduso & MacRae, 1991; Tomporowski & Ellis, 1986) and fluid intelligence (Dustman, Emmerson, & Shearer, 1994). Although the underlying mechanism for this improvement in cognitive functioning are unknown, several mechanisms have been proposed, including: increased oxygen transport to the brain, increased glucose transport to the brain, and increased self-esteem and decreased psychological stress (Elsayed, Ismail, & Young, 1980).

Life satisfaction and general well-being. It is reasonable to believe that if exercise has the capacity to improve an individual's health and well-being across a range of specific variables, including physical health, mood, stress reactivity, and cognitive functioning, then it should also improve overall and generalized health and well-being. In fact, several studies have validated this notion. Unger, Johnson, and Marks (1997) found in a 6-year follow-up of 7,527 respondents over age 70 that physical activity and social interaction each had independent effects in protecting older adults from declines in functional ability. They were particularly effective in buffering the negative effects of widowhood on physical functioning.

Exercise may also have effects on overall life satisfaction. In one study, 21 elderly institutionalized women (*M* age 77) participated in a three-month health promotion program, which incorporated cardiovascular risk assessments, health education and counseling, and Korean traditional dance. The participants in the program had significant reductions in total

cardiovascular risk, and improvements in both health behavior and life satisfaction at the end of the program. However, three months after the program ended, the positive effects had decreased (Kim, June, & Song, 2003). This may indicate that the positive effects of exercise on both physical and psychological health only last for the duration of the exercise intervention, and therefore may signify that exercise interventions need to be long-term and on-going.

Comparing the Effects of Different Exercise Modalities

Physical and mental changes associated with exercise may be dependent on the type of activity and the level and duration of training (Berger, 1996; Thayer 1996). While early research in the field often utilized aerobic exercise, inquiries into other forms of exercise, such as weightlifting and mind-body techniques (including yoga and Tai Chi) have provided further insights into the psychological benefits of exercise. Tsutsumi (1997) demonstrated that a 12-week strength training intervention (both high and low intensity forms) improved arm and leg muscle strength, body composition, mood states, physical self-efficacy, blood pressure reactivity, and self-reports of physical functioning and mental well-being, in a population of sedentary but healthy senior citizens (aged 60 – 84 years). Mihalko (1997) demonstrated similar positive results from a 12-week strength training program. Participants showed significant increases in muscular strength, efficacy perceptions relative to strength capabilities, and improvements in measures of Activities of Daily Living (ADLs). Improvements in ADLs were significantly predicted by improvements in balance due to exercise intervention. Perceptions of control and self-efficacy were significantly related to improved self-reports of ADL, independent of strength or balance changes.

Other researchers have examined the effects of moving mindfulness techniques, such as Qi Gong. Tsang, Mok, Yeung, and Chan (2003) demonstrated that elderly adults with chronic physical illnesses (*M* age 72.9 years) showed perceived improvement in physical health, psychological health, social relationship, and health in general (as reflected by scores on the Perceived Benefits Questionnaire and informal feedback) after 12-weeks of Qigong practice (the control group participated in traditional rehabilitation activities). Li, Duncan, Duncan, McAuley, Chaumeton, and Harmer (2001) showed similar results in a Tai Chi intervention in which 98 individuals (mean age 73.2 years) either participated in a Tai Chi exercise class or continued their daily routine activities for six months. At post-test, the Tai Chi participants had higher

levels of health perceptions, life satisfaction, positive affect, and well-being and lower levels of depression, negative affect, and psychological distress.

Introversion-Extraversion and Social Effects in Group Exercise

A discussion of the effects of specific forms of exercise on different variables must consider the inherent differences between individual exercise programs and group exercise programs. In the group exercise format, social factors may play as much of a role in the total result of the experience as the exercise itself, and some researchers have broached the topic as to whether some (or even all) of the benefits of exercise may come from social factors.

Social factors may provide exercise motivation. Two Chinese studies indicated that social factors and social interaction were relevant to older adults as reasons to engage in physical activity (Si & Zhang, 2004; Fang & Ji, 2003). Research within the leisure and recreation industry has indicated that the social support system available within a recreation environment or at a recreation agency is one of the factors which increases customer loyalty (Iwasaki & Havitz, 2004). Individuals who utilize a particular fitness facility stay more loyal to that facility if they have established a social network of friends and peers within that setting. Further research has found that social factors may be particularly important to exercise adherence within the African American community (Izquierdo-Porrera, Powell, Reiner, & Fontaine, 2002). When group cohesion and social factors were investigated as a component of exercise in an older adult population, the older adults indicated that social interaction was one of the three most important factors motivating them to attend fitness classes, along with functional fitness and general health (Estabrooks, 2000). Additionally, group integration was significantly related to class attendance, and when the group exercise format was set up with a team building condition, more participants attended class than in a control setting. Likewise, Gillett (1988) demonstrated in an exercise intervention with moderately overweight women that the social environment affected adherence; of eight factors identified as affecting adherence, three had social components (group homogeneity, carpooling, and social networks within the class). These studies indicate that social factors play a critical role in the motivation to adhere to exercise.

However, while it is clear that social factors do play a role in the outcome of an exercise intervention, particularly in terms of motivation and adherence, it is not clear how much of the beneficial effects of an exercise intervention are due to these social factors, and how much are

due to the exercise itself. To date, no research has clarified this relationship. The personality variable of extraversion-introversion may be a potential way to measure the effects of social benefits in the group fitness environment. According to traditional Jungian theory, the personality dimension of introversion-extraversion refers to the direction in which an individual prefers to focus his attention. An extravert focuses on the outer world of people and things, whereas an introvert prefers to direct attention toward the inner world of ideas (Myers & Myers, 1998). Jung theorized that extraverts are energized and gain benefits from social interaction, while introverts are energized by individual activity and actually suffer from depleted energy due to interaction with others (Benziger, 2004). Eysenck theorized that extraverts and introverts experience stimulus hunger and aversion respectively, due to cortex activity levels (Benziger, 2004). According to Eysenck's interpretation of introversion-extraversion, the critical issue involves stimulation of the autonomic nervous system (Eysenck & Eysenck, 1968). Eysenck proposed that extraverts experienced natural inhibition of cortex activity at the brain stem, which caused them to seek stimulation, therefore creating extraverted behavior. On the other hand, introverts had excessive cortex activity, and therefore too much excitation, which caused them to avoid stimulation. If some component of the benefits of exercise are due to social factors, then the group exercise format, which traditionally incorporates stimulation through social interaction, music, and an up-beat pace of activity, should provide more psychological benefits to extraverts than to introverts. Conversely, it may be that solitary forms of exercise, such as walking, would provide more beneficial effects for introverts, due to the removal of the excessive stimulation of the social environment. Although correlations between personality variables and other variables of interest are typically small, extraversion-introversion provides an interesting approach for assessing the social factors involved in the benefits of exercise. Additionally, these possibilities could have important implications for exercise prescriptions based on personality type.

Motivational Factors Affecting Exercise in Older Adults

Regardless of the type of exercise best suited to a particular individual, it is clear that exercise has positive benefits for every individual. And yet, in spite of all these positive benefits, only approximately 10% of persons age 65 or older exercise on a regular basis (Fiatarone & Garnett 1997). In fact, only 8% of individuals over age 65 engage in physically challenging activities three or more times per week for a minimum of 20 minutes per session, and 43% report

being completely sedentary (Woolf, Kamerow, Lawrence, & Medalie, 1990). Motivation may be defined either as the energy underlying an individual's behavior or the intensity or direction of behavior. An older individual's motivation to exercise or lack thereof, is a critical component in whether or not that individual will participate in regular physical activity.

The transtheoretical model of change (Prochaska & DiClemente, 1983) is often used to explain motivation for exercise behavior. The transtheoretical model proposes that change occurs in stages, and that movement through those stages may not be linear. The stages of the transtheoretical model are: (a) precontemplation, in which the individual does not intend to change high-risk behaviors, (b) contemplation, in which the individual is aware of the benefits of changing behavior, but also of the costs, and is thinking about the possibility of changing behavior within the next six months, (c) preparation, when the individual is planning to make a specific behavior change within the next month, (d) action, when the individual actually makes, or has recently made, specific and observable behavior change, (e) maintenance, which begins after six months of maintaining the behavior change, but lasts as long as the risk of returning to the old behavior remains, and (f) termination, which occurs only when the individual finally has no temptation to engage in the old behavior. Only 20% of individuals reach the termination stage. In a survey of 19,266 older adults (aged 50 – 75 years), the majority was found to be in the precontemplative stage for losing weight and exercise changes, making these behaviors a priority for intervention research (Nigg, Burbank, Padula, Dufresne, Rossi, Velicer, Laforge, & Prochaska 1999). Senior citizens who are not currently active may be particularly hampered by their opinions about exercise. In interviews of 41 adults aged 55 to 92, Cousins (2001) found that the physically non-active had more negative than positive thoughts about physical activity. Physically active older adults also had negative thoughts about exercise, but constructed a strong positive dialogue and every a solution for every mental barrier. This may indicate that helping older adults learn how to reframe their negative perceptions of exercise may be the key to helping them become more active.

When sedentary adults over age 60 years were asked what incentives would help them commit to an exercise program, three dominant themes arose: 25% indicated that they would become active for fitness and weight loss reasons; 25% indicated that they would become active in order to maintain their health; and a full 45% indicated that nothing would motivate them to exercise on a regular basis (Biddle, 1995). Other perceptions have been suggested as factors

contributing to low exercise rates among older adults, including an underrating of their physical ability level, an overestimation of the value of what exercise they already do, an exaggeration of the dangers of exercise, and age-related stereotypes (Berger, Pargman, & Weinberg, 2002). A survey of over 2,000 men and women over age 55 identified nine other reasons for older adults to be unmotivated to exercise, including: lack of an exercise companion, too convenient to watch television, fear of being injured, experienced soreness and discomfort when exercised previously, exercise is boring, no time available for exercise, “I never lose weight by exercising, so why bother?”, “exercise is too much like work,” and “I don’t feel the need to exercise” (Satariano, Haight, & Tager, 2000). To compensate for the multiple obstacles in exercising, older adults may find greater motivation to continue with exercise programs that emphasize functional exercises (i.e. those that relate to activities of daily living). Older adults may find functional independence a much stronger motivator for exercise than athletic skill. Exercise programs that work to enhance and improve balance, coordination, walking, stair-climbing, and picking up objects will help older adults maintain their ability to remain independent.

A survey of 2,200 elderly adults in Japan found that while regular exercise can help reduce stress levels, the relationship between exercise and stress may, in some cases, be bi-directional: for some types of stressors, stress may actually reduce the frequency of exercise (Krause, Goldenhar, Liang, Jay, et al., 1993). This finding may provide insight into the reasons for individuals to avoid exercising on a regular basis. Programs geared toward increasing physical activity among older adults should address those life stressors which might interfere with exercising.

If exercise itself becomes a stressor, individuals are less likely to exercise. However, when exercise takes on significance and meaning of its own, individuals are more likely to maintain their motivation for exercise. In a qualitative research study of mall walkers over the age of 60, Duncan, Travis, and McAuley (1995) found that committed mall walkers viewed their daily activity as “work” and in some ways considered it a replacement for the careers from which they were retired. Additionally, those who are committed to regular exercise frequently indicate enjoyment as an important component of participation in physical activity (Berger, 1996; Wankel, 1993). In general, people adhere to an exercise program because they consider it fun, and because it provides happiness and satisfaction (Kimiecik, 1998). Enjoyment is therefore an integral part of exercise motivation and should be a central component in designing any exercise

program. Because different types of fitness interventions offer different benefits, participants' perceptions of the exercise program, and therefore both their enjoyment of it and their motivation to continue, are likely to vary across exercise programs.

Purpose of the Study

Further research concerning the specific psychological benefits of selected forms of exercise for the elderly is warranted. Furthermore, an understanding of both the specific motivating factors bringing previously sedentary individuals into an exercise program and the impact of the type of exercise program on the individual's motivation to adhere throughout the intervention may clarify the exercise behaviors of the elderly. Since no studies comparing the effects of various exercise interventions on extraverts and introverts have been reported in the literature, a focus upon social factors involved in exercise benefits with regard to these psychological variables seems warranted. Therefore, the primary purpose of this research was to compare the effects of selected forms of physical exercise on selected psychological variables, specifically stress, anxiety, and depression, in a sample of older adults. In addition, the differences attributed to extraversion and introversion on these variables is of interest in this study. Finally, motivational factors reported by the study's participants as reasons for entering and adhering to a physical fitness program were identified and compared across exercise treatments.

Four hypotheses were established at the outset of this thesis research:

1. No significant differences among mean scores for participants in the three exercise interventions and one control group were expected at baseline.
2. All exercise interventions were expected to result in progressively reduced stress, anxiety, and depression levels over the course of the 6-week intervention, compared to the control condition.
3. Extraverted individuals would experience greater benefits from group fitness interventions. Introverts were expected to experience greater benefits from individual fitness interventions.
4. Motivation to continue with the program was not expected to be affected by treatment assignment.

CHAPTER 2

METHOD

Participants

Participants were 45 elderly individuals (ages 74 to 92; $M = 83.14$, $SD = 4.84$) from a Tallahassee area living community for older adults. Participants were predominantly female, retired, and widowed. All individuals resided in the same facility, which served to control for extraneous variables concerning location and living conditions. Participant demographic information is presented in Table 1.

Over the course of the intervention, three participants were removed from the study. One individual was transferred by her family to an assisted living facility that provided on-site medical care, and two individuals were moved to the hospital (one for a broken rib and the other for breathing problems). Forty-two participants completed their assigned intervention.

Table 1
Participants' (N = 42) Demographics

Factor	Category	<i>f</i>	%
Gender	Females	39	92.90
	Males	3	7.10
Marital Status	Married	4	9.50
	Divorced	2	4.80
	Widowed	36	85.70
Occupational Status	Part-time Work	1	2.40
	Retired	39	92.90
	Never Worked	2	4.80

Participants were very physically active, with 37 (88.10%) of them indicating that they exercised regularly, on average 4.25 days per week for 25.66 minutes. Table 2 presents participant pre-intervention exercise practices.

Table 2
Participants' (N=42) reported exercise practices

Factor	Mean	SD
Number of days exercising per week	4.25	2.33
Minutes per exercise session	25.66	20.39

Instrumentation

Six questionnaires were administered to the elderly. These included a medical history form, a demographic questionnaire, the Hassles Scale, the State-Trait Anxiety Inventory, the Beck Depression Inventory - II, the Exercise Motivations Inventory – 2, and the Eysenck Personality Inventory.

Medical history form (Appendix A). The medical history form indicates any current or chronic health conditions which might have affected ability to participate in the study. Individuals who were limited in their ability to participate in one or more of the groups (for instance, an individual in a wheelchair could not be part of the walking group), could not be randomly assigned and therefore were not allowed to participate in the study.

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

The Hassles Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981, revised by Gill, 1989; Appendix C). The Hassles Scale is an assessment of how stressfully an individual responds and reacts to his daily environment. The original Hassles Scale includes 117 daily events which describe interactions with the environment, and includes such items as “inconsiderate smokers,” “auto maintenance,” “preparing meals,” “shopping,” and “financial dealings with friends or acquaintances.” Participants were asked to indicate whether each event is considered “*not a hassle*,” “*somewhat a hassle*,” “*a moderate hassle*,” or “*a major hassle*” over the last month. The revised Hassles Scale contains 95 items from the original scale, with items unlikely to apply to senior citizens (such as raising children) omitted from the scale.

The Hassles Scale is used to calculate two scores. A frequency score is the number of events the individual indicated as a hassle (regardless of how much of a hassle the item is determined to be). This score reflects how many things bothered the individual over the past month. The lower the score, the lower the frequency of stress, and vice-versa. The intensity score

is the mean severity reported by the respondent for all hassles reported. The lower the score the lower is the intensity of stress and vice-versa.

Kanner, Coyne, Schaefer, and Lazarus (1981) reported a test-retest reliability coefficient of 0.79 for hassles frequency and 0.48 for hassles intensity. According to research by Farberow and Moriwaki (1975), the Hassles Scale is a valid measure of psychological stress in older adults, because the major concerns of older individuals are often related to performing everyday functional tasks (Gill, 1989).

State-Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, & Lushene, 1970; Appendix D). The STAI is a 40-item inventory, which assesses both state (how an individual feels at a particular moment in time) and trait (how an individual generally feels) anxiety. For the purposes of this research, only the 20-item A-State scale (X-1) was utilized. The A-State scale includes 20 items which direct the individual “to indicate how you feel right now, that is, at this moment.” Individuals are asked to rate these items from 1 (*not at all*) to 4 (*very much so*). Items include non-anxious responses such as “I feel calm,” “I feel secure,” and “I feel joyful,” as well as anxious responses such as “I am worried,” “I am jittery,” and “I feel high strung.” There are three steps in calculating a STAI-State score: (1) sum the weighted scores for the direct items (i.e. the items which indicate anxiety); (2) subtract the sum of the weighted scores for the reversed items (i.e. the items which do not indicate anxiety, such as “I am relaxed”); (3) Add the appropriate constant (+ 50 for the A-State subscale). Mean A-State scores range from 35.12 (undergraduate females) to 54.43 (depressive reaction psychiatric patients) (Spielberger, Gorsuch, & Lushene, 1970).

The exercise literature reviews indicate that the STAI is one of the most frequently used instruments for assessing the psychological benefits of exercise, although certain cautions are warranted, because the STAI has not been validated for exercise purposes (Gauvin & Spence, 1998). Still, the STAI has been established as a valid and reliable tool for assessing anxiety in research and in clinical populations (Gauvin & Spence). Test-retest of A-State is low (ranging from .16 to .54), indicating alterations in psychological state (Spielberger, Gorsuch, & Lushene, 1970). Internal consistency for the state dimension is reported as .82 (Gauvin & Spence, 1998).

Concurrent validity of the STAI was established with the IPAT Anxiety Scale, the Taylor Manifest Anxiety Scale, and the Zuckerman Affect Adjective Checklist. Correlations of the STAI with these measures were moderate to high for samples of college students and clinical

patients. Additionally, a sample of 977 college students was used to assess and establish construct validity of the STAI (Spielberger, Gorsuch, & Lushene).

Beck Depression Inventory-II (BDI-II, Beck, Steer, & Brown, 1996; Appendix E). The BDI-II is a 21-item self-report scale, which was developed as a standardized instrument to assess intensity and depth of common depressive symptoms, attitudes, and beliefs. The BDI-II is a revision of the original BDI; items on the BDI that were observed in long-term hospitalized patients, but not useful in assessing depression in outpatients and short-term inpatients, were replaced (Beck, Steer, & Brown, 1996). For each item, test takers are instructed to pick out the “one statement in each group which best describes the way you have been feeling the past week, including today.” The instructions also indicate that individuals are allowed to select multiple responses per item, if they seem to “apply equally well.” Items increase in severity from 0 to 3 (For example, 0 “I do not feel sad,” 1 “I feel sad,” 2 “I am sad all the time and I can’t snap out of it,” and 3 “I am so sad or unhappy I can’t stand it” or 0 “I make decisions as well as I ever could,” 1 “I put off making decisions more than I used to,” 2 “I have greater difficulty in making decisions than before,” 3 “I can’t make decisions at all anymore.” Item weights are then summed to determine the participant’s level of depression. The BDI-II contains guidelines for classifying scores as evidence of minimal, mild, moderate, intense, or severe depressive symptoms (Beck, Steer, & Brown, 1996).

The BDI-II is useful for both clinical and normal populations. Data from several research studies which utilized the BDI-II indicate support for its validity and reliability (Beck & Steer, 1993; Beck, Steer, & Garbin, 1988; Steer, Beck, Kovacs, & Garrison, 1985). The BDI-II has alpha coefficients for non-psychiatric populations, which range from .73 to .92 (Beck & Steer, 1993; Beck, Steer, & Garbin, 1988).

Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1968; Appendix F). The EPI consists of 57 yes/no items, designed to measure the pervasive, independent dimensions of extraversion-introversion (E) and neuroticism-stability (N). For the purposes of this study, the E-score and the lie scale were of relevance. On the EPI, the individual is instructed to indicate, for each item, if it represents “your usual way of acting or feeling.” The EPI instructions clearly specify that individuals should take the EPI quickly, in order to provide their first reactions, rather than a long thought process. Items include “If there is something you want to know about, would you rather look it up in a book than talk to someone about it?” “Are you mostly quiet

when you are with other people?” and “Do you prefer to have few but special friends?” Scoring is done with three hand overlay stencils (one for the extraversion scale, one for the neuroticism scale, and one for the lie scale). The score for each scale is the sum of these responses. Norms are available for American college students and selected occupational and clinical groups.

The EPI is a brief measure which can be administered in about 10 minutes. It is a fast and practical tool for assessment purposes. Additionally, it incorporates a lie scale, which identifies social desirability attempts by participants. Further, there are clear indications of it assessing traits (as opposed to states), because retest reliability after several months exceeded .85. Test-retest reliability assessments of the EPI conducted with almost 2000 individuals over nine-month and one-year periods ranged from .84 to .97, and internal consistency ranged from .74 to .91. The EPI is built upon a strong theoretical framework, and a great deal of research has established the experimental validity of the instrument and of the concepts of extraversion-introversion (Eysenck & Eysenck).

Exercise Motivations Inventory - 2 (EMI-2; Markland, 1997; Appendix G). The EMI-2 was used to identify motivational factors involved in the decision to begin exercising and adhere to an exercise program. The EMI is a 51-item inventory which assesses 14 subscales: Stress Management, Revitalization, Enjoyment, Challenge, Social Recognition, Affiliation, Competition, Health Pressures, Ill-Health Avoidance, Positive Health, Weight Management, Appearance, Strength & Endurance, and Nimbleness. Respondents indicate whether each item applies to their reasons for exercising along a 6-point scale ranging from 0 (*not at all true for me*) to 5 (*very true for me*). Items include “to stay slim” (Weight Management), “to show my worth to others” (Social Recognition), “to help manage stress” (Stress Management), and “to have fun being active with other people” (Affiliation). Each scale includes 3 to 4 items, and scale scores are obtained by calculating mean scores for the items related to each scale.

The EMI was constructed based on the exercise literature concerning adherence, as well as an open-ended inquiry with 76 participants as to why they exercised. Additionally, Duda and Tappe’s Personal Incentives for Exercise Questionnaire (1989) was used as a foundation for building the EMI (Ostrow, 1996). Seventy-six items were assessed by experts in the field of exercise psychology, motivation, and test construction, and an assessment of internal consistency reduced the original items to the 44 on the inventory. A factor analysis yielded a model with 12 factors accounting for 69.40% of the variance. The EMI has relatively strong reliability, with

Cronbach alpha coefficients ranging from .63 to .92 for the 12 subscales, in a sample of 249 participants, with test-retest reliability (n=57) over a month interval of .59 to .88. Further, the authors of the EMI reported that discriminant validity of the measure was supported. Additionally, content or face validity was established by a review of the EMI by a panel of 5 expert judges (McCullagh & Noble, 1998).

Qualitative interviews. At the end of the intervention, short, semi-structured qualitative interviews were conducted with each of the participants to assess their general perceptions of the program. Each participant was asked the following questions:

- To what degree did you like the class?
- How did you feel about the program?
- What did you enjoy most about the program?
- What did you enjoy least about the program?
- Was there anything missing from the program?
- How significantly do you feel the program affected your physical well-being?
- How significantly do you feel the program affected your psychological well-being?

Task Manipulation

Four interventions were established: a chair yoga class (group fitness intervention), a chair aerobics class (group fitness intervention), a walking program (individual fitness intervention), and a game playing group (non-exercise control), which allowed participants to experience the social aspect of the intervention without the exercise component. The rationale for choosing each of these interventions was as follows.

Chair yoga program. The chair yoga intervention was chosen based on the American College of Sports Medicine Position Stand for Exercise and Physical Activity in Older Adults (Mazzeo et al., 1998). The ACSM Position Stand indicates that although most exercise programs begin with endurance and aerobic activities, elderly individuals would actually gain the most benefits from an exercise program which begins with strength and balance activities. This would allow the elderly to develop the requisite abilities for participating in aerobic activity (Mazzeo et al., 1998). Therefore, a chair yoga class which focused on strength and balance activities was implemented as one of the exercise interventions. It provided a predominantly seated exercise program, although some standing balance exercises were performed, utilizing the chair back for

stability.

Each session began and ended with 2 to 3 minutes of meditation and breathing exercises. The exercise program was based on the *Easy Does It Yoga Trainer's Guide*, which is a safe and effective yoga program specifically developed for senior citizens. Soft, relaxing music was utilized, in accordance with standard protocol for yoga classes. Also, since fitness classes geared toward older adults generally include a social component, interaction and discussion among class members during the activity were encouraged.

Chair aerobics program. The chair aerobics intervention was selected because the most common type of exercise intervention is aerobic training (Mazzeo et al. 1998). Chair aerobics provides a gentle aerobic activity which accommodates even those elderly individuals who have physical limitations. In accordance with International Fitness Professionals Association (2001) safety guidelines for working with the elderly, each chair aerobics session began with a 5 minute warm-up and ended with a 5 minute cool-down. The middle 20-minute portion of each class focused on gentle, moderate aerobic activity, in the style of group fitness "Sit and Be Fit" or "Senior Seated Aerobics" classes. Richard Simmons *Platinum Sweat*, an aerobic program specifically geared toward individuals between the ages of 59 and 99, was used as a model. Individuals were reminded that it was acceptable to rest as needed, throughout the duration of the session. Each session included some standing activities (such as Charleston, cha-cha, and grapevines), alternating with seat work (such as seated leg lifts and upper body activity). All standing activity was done near the chair, so that support for balance was available, if necessary. Upbeat music from the proper time period for the participants was utilized (such as Big Band era swing music), in accordance with standard protocol for Chair Aerobics classes. Also, since seated aerobics classes geared toward older adults generally include a social component, interaction and discussion among class members during the activity was encouraged.

Walking program. The walking program was selected because it is an aerobic activity which is frequently recommended for elderly individuals (Mazzeo et al., 1998; U.S. Department of Health and Human Services, 2001; U.S. Department of Health and Human Services, 1996). Walking is inexpensive and convenient (no equipment required), low-impact (no stress on the joints), and weight-bearing (important for preventing / improving osteoporosis), and therefore is both accessible and beneficial for almost all elderly individuals.

The walking program was an individual exercise program, with instructor guidance and

support. Individuals assigned to the Walking Program intervention were provided with a specific route. Chairs were available along the route for resting. Both indoor and outdoor walking paths were available, to prevent weather conditions from interfering with the walking program. Participants were encouraged to walk for as much of each 30-minute session as possible, but to rest as much as needed. At each session, the instructor provided guidance about that day's walking assignment. The instructor also provided guidance about proper walking shoes and other equipment, walking form, and offered motivation and encouragement to the walking participants. Interaction among the group members as a whole was not fostered or cultivated; however, interaction between walkers did occur. To foster an exercise treatment which was both safe and effective, the walking program followed guidelines outlined by *Prevention Magazine* (Spilner, 2000) and FC&A Medical Publishing (Wood, 2004).

Game playing group. The game playing intervention was selected as a control activity which allowed social interaction without physical activity. Various games (such as dominoes, Chinese checkers, scrabble, and Rummy Cube) were introduced to the participants in the control group. The instructor facilitated and participated in each 30-minute session. Social interaction among the participants was encouraged.

Procedure

After Human Subjects Committee approval was obtained (Appendix H), the researcher approached elderly living centers to establish communication. When a facility was identified, elderly participants were recruited. Confidentiality of participants was maintained, and both the identity of the facility and the individuals was concealed. To control for the variable of instructor personality, the same individual (the researcher) taught the chair yoga and chair aerobics classes, and directed the walking program and game playing group. To control for diurnal influences, the classes were conducted at times as similar as possible, given that the same instructor taught/coordinated all four programs.

The ACSM Position Stand (Mazzeo et al., 1998) and the National Institute on Aging (June, 2001) recommend that older adults perform endurance exercise a minimum of 3 days per week with 30 minutes per session, but cautioned that older individuals should gradually increase their endurance activity up to at least 30 minutes per exercise session. According to the ACSM (Mazzeo et al., 1998) most exercise interventions with older adults are conducted for periods

ranging from 6 weeks to 2 years; six weeks appears to be the shortest duration in which an intervention can produce an effect. This research project provided 30 minute sessions, three times per week, for six weeks. The participants were briefed on the importance of attending all exercise sessions. Participants were also asked not to discuss the intervention with each other, in order to prevent the effects of social influence.

To accommodate both physically fit and physically unfit individuals, the fitness schedule was adaptable to the individual's ability level. Each fitness intervention lasted 30 minutes, but participants were encouraged and reminded to rest as needed during each exercise session. Chairs were provided in the walking area to facilitate resting for the walking program participants. Additionally, in the chair yoga and chair aerobics classes, modifications of exercises were offered to accommodate all class members.

Assessments were conducted pre-intervention, with the participants filling out the entire battery of tests, both the trait measures (EPI) and the state measures (STAI - State; BDI; Hassles; EMI-2). Additionally, demographic data (including age, gender, occupational status, marital status, and current exercise program) were collected. Individuals were also asked to fill out a medical history form, which was reviewed in order to assess the appropriateness of participation in the study. Participants were asked to read and sign an explanation and consent form (Appendix I). Legal guardian consent forms (Appendix J) were available as well, for the legal guardians of any participants who had been declared dependents.

After pretest, before group assignment, the EPI and the BDI for each participant were scored. A referral protocol had previously established the procedure to be followed for any individuals either indicating suicidal ideation or scoring within the range of severe depression on the BDI (see Appendix K). No individuals in this intervention met the criteria for referral, and all volunteers were accepted as participants. The EPI was scored by a colleague of the researcher (to prevent instructor bias in treatment based on knowledge of participant extraversion or introversion). Participants were placed in groups according to a stratified random assignment procedure, which attempted to create approximately equal distributions of extraverts, introverts, and non-differentiated individuals within all four groups.

At the end of each week of intervention, assessment was conducted, with individuals completing the entire battery of state measures (STAI-State, BDI, Hassles, EMI-2). Additionally, at the end of the intervention, short semi-structured qualitative interviews were conducted with

each of the participants to assess their perceptions and general perceptions of the program. The research design is indicated in Figure 1.

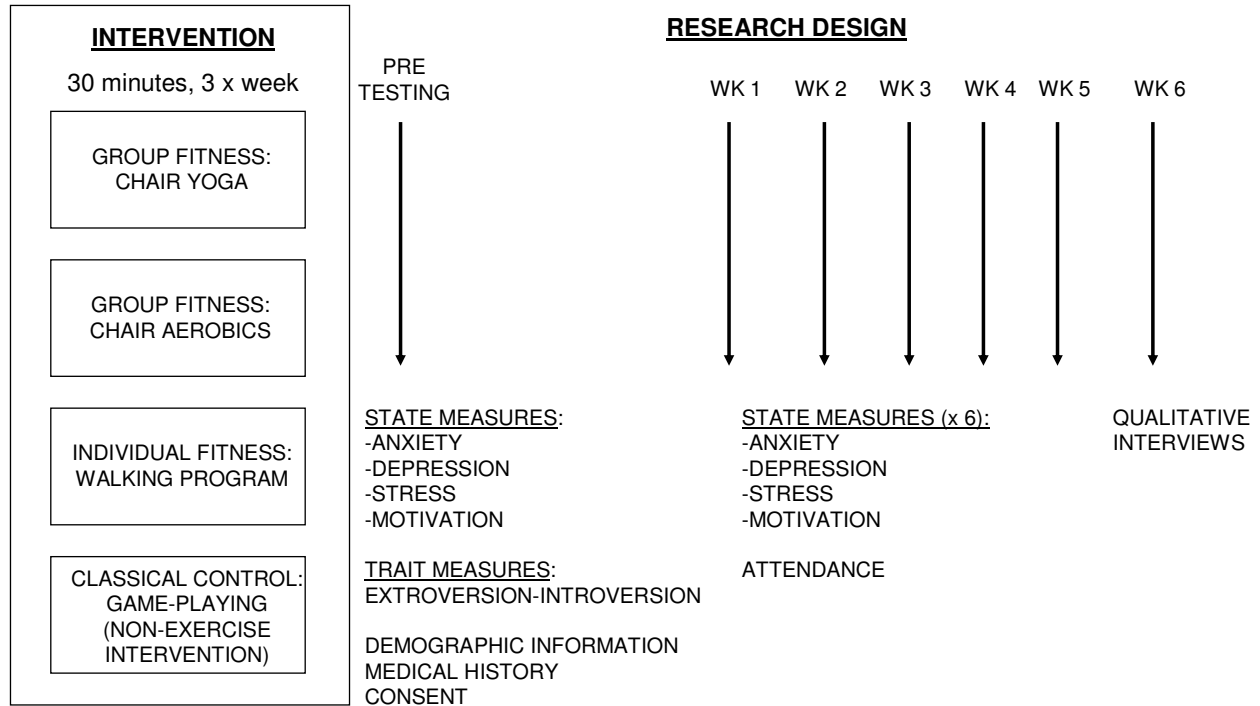


Figure 1: Treatment assignment and research design

Data Analysis

The first hypothesis, which stated that no significant differences among mean scores for participants in the three exercise interventions and one control group would be observed at baseline data collection, was tested using a multivariate analysis of variance for stress, anxiety, and depression levels at baseline measures.

The second hypothesis, which stated that all exercise interventions would result in progressively reduced stress, anxiety, and depression levels over the course of the 6-week intervention, was tested using a RM Analysis of Covariance (ANCOVA) for each dependent

variable (i.e., stress, anxiety, and depression). Time (including the six data points) was the within repeated factor, while treatment (3 levels and control) was the between-subjects factor and the pretest score was the covariate.

The third hypothesis stated that extraverted individuals would enjoy greater benefits from group than individual fitness interventions and that introverts would enjoy greater benefits from individual than group fitness interventions. Small sample size prevented a clear distinction between extraverted and introverted elderly individuals. Therefore, ANCOVAs were not run to test this hypothesis; descriptive statistics were compiled for each of the four dependent variables, across the group assignment by extraversion-introversion dichotomy, and pre and post-intervention results are presented.

The fourth hypothesis, which stated that motivation to continue with the program would not be affected by the treatment assignment, was tested using a RM ANOVA for the DV of motivation. Time was the within repeated factor (7 data points) and treatment (3 levels and control) was the between-subjects factor.

CHAPTER 3

RESULTS

Preliminary Analysis

Equality of groups at baseline. The first hypothesis assumed that non-significant differences would emerge among mean scores for the three exercise interventions and the control group across all DVs at baseline, as a consequence of randomized assignment to the four groups. This hypothesis was tested using a multivariate analysis of variance (MANOVA) for stress frequency, stress severity, anxiety, and depression measures at baseline. Skewness and kurtosis was within the range of (-2) to 2; kurtosis of the BDI of the walking group, was 2.63. Box's Test of Equality of Covariance Matrices indicated that the observed covariance matrices of the dependent variables were equal across groups, Box's $M = 38.833$, $F(30, 3893.37) = 1.04$, $p = .41$. Additionally, Levene's test of equality of variances showed non-significant ($p > .05$) differences among the four groups' variances on each of the four pretest measures, indicating that variances were equal. Therefore, the data appear to meet the assumptions for multivariate analysis.

Overall, Wilk's $\lambda = .76$, $F(12, 92.89) = 0.85$, $p = .60$, indicated non-significant differences among groups at pretest on the four variables. Between-subject effects for each of the dependent variables were also tested. Differences across groups were non-significant for all measures except the stress severity score, $F(3, 38) = 2.94$, $p = .05$. However, this significant difference cannot be accepted due to non-significant overall MANOVA results. Thus, randomization resulted in equality of means across groups at baseline. However, because inspection of the comparisons across groups for each dependent variable (see Table 3) did reveal some differences, pretest scores were used as a covariate in all further analyses.

Table 3
Descriptive statistics within groups for each dependent variable.

Variable	Mean	SD	Skewness	Kurtosis
Stress Frequency				
Yoga	27.46	18.05	0.71	-0.28
Aerobics	19.00	12.48	0.80	0.52
Walking	24.00	12.41	0.38	0.26
Games	24.70	17.64	0.52	-1.62
Stress Severity				
Yoga	1.38	0.38	1.13	0.27
Aerobics	1.88	0.64	0.91	-0.12
Walking	1.37	0.31	1.03	1.31
Games	1.56	0.42	-0.13	-1.32
State Anxiety				
Yoga	35.64	8.82	-0.03	-1.46
Aerobics	29.73	8.78	0.75	-0.80
Walking	33.10	8.94	0.20	-1.26
Games	35.80	9.68	-0.03	-1.69
Depression				
Yoga	8.64	4.41	0.73	-0.51
Aerobics	6.55	3.42	-0.26	0.31
Walking	8.20	4.67	1.35	2.63
Games	8.60	5.04	0.06	-1.20

Attendance. To assure that experimental effects were not due to differences in attendance, the relationship between attendance rate and group assignment was estimated using a nonparametric χ^2 test. Cross tabulation results are presented in Table 4 as the percentage of each group's session attendance. Means and *SDs* for attendance (sessions) are presented in Table 5.

Table 4
The percentage of each group attending each possible number of total classes.

Total # classes attended	Yoga	Aerobics	Walking	Games
6	0%	0%	10%	30%
7	0%	0%	0%	10%
8	0%	0%	0%	0%
9	9.10%	0%	30%	10%
10	9.10%	18.20%	10%	0%
11	9.10%	18.20%	0%	20%
12	9.10%	0%	20%	10%
13	0%	18.20%	0%	0%
14	18.20%	9.10%	0%	10%
15	0%	36.40%	30%	0%
16	9.10%	0%	0%	0%
17	27.30%	0%	0%	10%
18	9.10%	0%	0%	0%

Table 5
Attendance rates across groups.

Group	<i>n</i>	<i>M</i>	<i>SD</i>
Yoga	11	14.09	3.18
Aerobics	11	12.91	2.07
Walking	10	11.20	3.12
Games	10	9.90	3.78

The Pearson χ^2 indicated that the relationship between attendance and group assignment tended toward significance, $\chi^2 (N = 42, df = 33) = 45.93, p = .07$. An analysis of variance (ANOVA) pertaining to the mean difference in attendance resulted in statistically significant differences, $F(3, 38) = 3.77, p = .02$. LSD post-hoc contrasts indicated that significant ($p < .05$) differences were noted between the yoga and walking groups; the yoga and games groups; and the aerobics and games groups. The games group attended less sessions than the aerobics group by an average of 3.01 days ($p = 0.03$), and less than the yoga group by an average of 4.20 days ($p = 0.003$). Additionally, the walking group attended less sessions than the yoga group by an average of 2.89 days ($p = 0.04$). All other attendance differences were non-significant.

Intervention Effects on Stress, Anxiety, and Depression

The second hypothesis stated that all exercise interventions would result in progressively reduced stress, anxiety, and depression levels over the course of the 6-week intervention. This hypothesis was tested using a Repeated Measures (RM) Analysis of Covariance (ANCOVA) for each dependent variable (i.e., stress, anxiety, and depression), using the pretest score as a covariate. Time (including the six data points) was the within repeated factor, while treatment (3 levels and a control) was the between-subjects factor.

The mean pretest and post-test scores for each dependent variable are presented in Table 6, and the results of the RM ANCOVA for the four variables are presented in Table 7

Table 6
Pre and post-intervention descriptive statistics for each dependent variable, in the four groups.

Variable	<i>n</i>	Pretest		Post-test	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Stress Frequency					
Yoga	11	27.45	18.05	9.73	7.62
Aerobics	11	19.00	12.48	13.09	11.09
Walking	10	24.00	12.41	17.20	12.48
Games	10	24.70	17.64	27.70	18.58
Overall	42	23.76	15.15	16.67	14.15
Stress Severity					
Yoga	11	1.38	0.37	1.35	0.32
Aerobics	11	1.88	0.64	1.65	0.56
Walking	10	1.37	0.31	1.39	0.30
Games	10	1.56	0.42	1.64	0.37
Overall	42	1.55	0.49	1.51	0.42
State Anxiety					
Yoga	11	35.64	8.82	26.36	8.59
Aerobics	11	29.73	8.78	29.00	6.72
Walking	10	33.10	8.94	32.50	7.49
Games	10	35.80	9.68	36.70	9.62
Overall	42	33.52	9.07	30.98	8.77
Depression					
Yoga	11	8.64	4.41	2.82	3.28
Aerobics	11	6.55	3.42	5.00	2.97
Walking	10	8.20	4.69	6.40	5.32
Games	10	8.60	5.04	8.50	5.50
Overall	42	7.98	4.33	5.60	4.69

Table 7
ANCOVA results for the four dependent variables.

Variable	Effect	Wilk's λ	<i>F</i>	<i>df</i>	<i>p</i>	η^2
Stress Frequency	Time	.93	0.52	5, 33	.76	.07
	Group		2.79	3, 37	.05	.18
	Time by group	.49	1.80	15, 91.5	.05	.21
Stress Severity	Time	.58	4.72	5, 33	.002	.42
	Group		2.79	3, 37	.05	.18
	Time by group	.67	0.95	15, 91.5	.51	.13
State Anxiety	Time	.88	0.87	5, 33	.52	.12
	Group		3.48	3, 37	.03	.22
	Time by group	.69	0.90	15, 91.5	.60	.12
Depression	Time	.77	1.96	5, 33	.11	.23
	Group		3.58	3, 37	.02	.23
	Time by group	.57	1.40	15, 91.5	.16	.17

Two significant effects were obtained, relative to stress frequency. The group effect, $F(3, 37) = 2.79, p = .05$, is presented in Figure 2. LSD Post-hoc contrast indicated that the significant differences were noted between the yoga group and the game group. The estimated marginal mean for the yoga group was 13.93 ($SE = 2.82$), while the game group had a mean stress frequency of 25.61 ($SE = 2.93$), therefore indicating that the yoga group had significantly less frequent stress than the game group. Non-significant differences indicated that the yoga group had a mean stress score lower than any other group and that both the aerobics and walking groups had less frequent stress than the games group. Mean stress frequency levels for the aerobics and walking groups were 20.35 ($SE = 2.83$) and 20.35 (2.93) respectively.

The time by group effect, $\lambda = .49, F(15, 91.5) = 1.80, p = .05$, is presented in Figure 3. The greatest reduction in stress frequency occurred for the yoga group. Stress frequency in this group reduced by 66.12%. The least change occurred for the games group, which increased in stress frequency by 12.15%. The aerobics group and the walking group decreased stress frequency by 31.11% and 28.33% respectively.

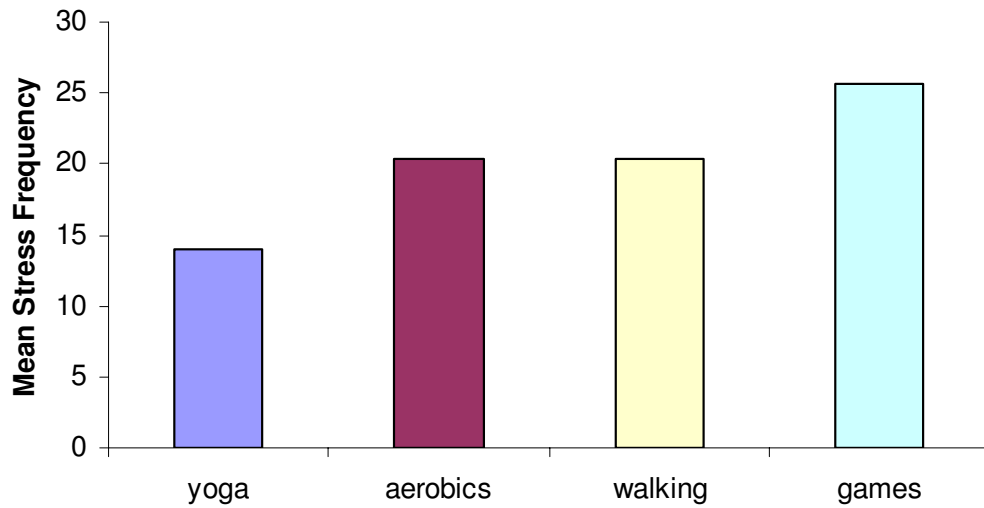


Figure 2: Bar graph representing the mean stress frequency values of the 4 groups.

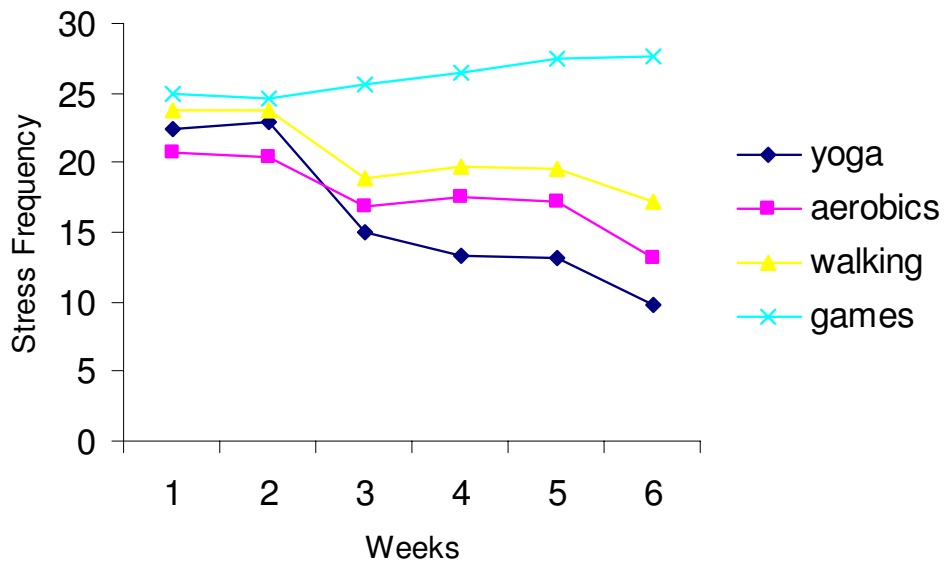


Figure 3: Stress frequency throughout the 6 weeks for each of the 4 studied groups.

For stress severity, two significant effects emerged. The group effect, $F(3, 37) = 2.79, p = .05$, is presented in Figure 4. LSD post-hoc analysis revealed significant ($p < .05$) differences between the yoga group and the games group, and between the walking group and the games

group. The yoga group's mean stress severity ($M = 1.20$, $SE = 0.09$) was 0.36 standard deviations smaller ($p = .01$) than the games group's mean ($M = 1.26$, $SE = 0.09$). The walking group's mean stress severity (1.27 , $SE = 0.10$), was 0.29 standard deviations smaller than the games group's mean ($p = .04$). The yoga group had less stress severity than either the aerobics ($M = 1.38$, $SE = 0.10$) or the walking group, and the aerobics group had less stress severity than the games group, but these differences were non-significant.

The time effect, $\lambda = 0.58$, $F(5, 33) = 4.72$, $p = .002$, is presented in Figure 5. Across all groups, stress severity decreased by 0.26 (week one, $M = 1.51$, $SE = 0.05$; week six, $M = 1.25$, $SE = 0.07$). This is an overall reduction in stress severity of 16.98% over the course of the intervention. The lowest stress severity score occurred at week five ($M = 1.22$, $SE = 0.06$), which is a 19.03% reduction in stress severity.

The time by group non-significant effect, $\lambda = 0.67$, $F(15, 91.5) = 0.95$, $p = .51$, is presented in Figure 6. The yoga group showed the greatest reduction over the course of the intervention (28.75%), followed by the walking group (17.83%), then the aerobics group (15.38%), and finally the games group (7.23%).

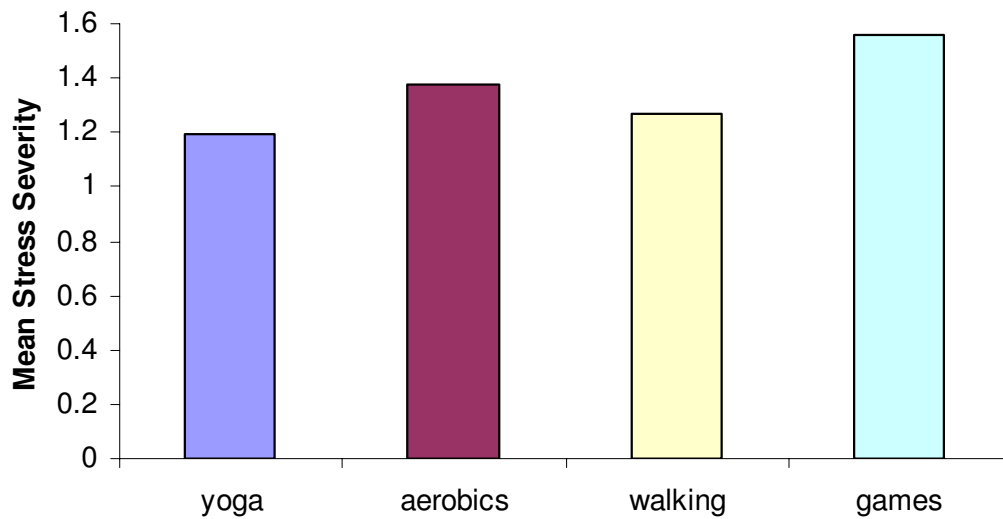


Figure 4: Bar graph representing the mean stress severity values of the 4 groups.

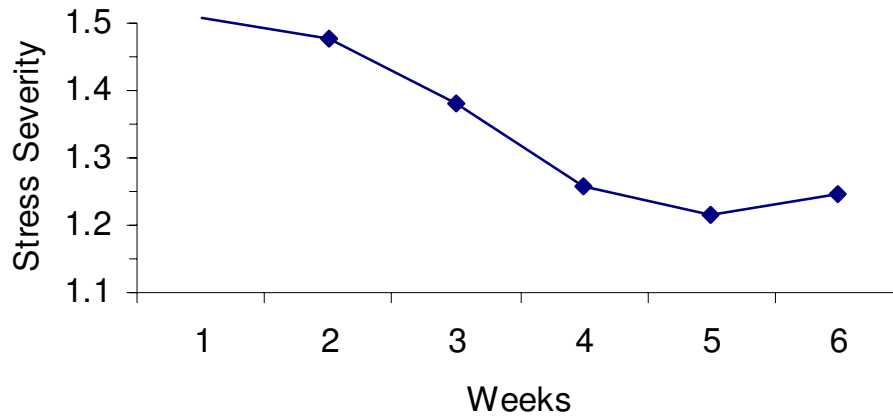


Figure 5: Overall change in stress severity throughout the 6 weeks.

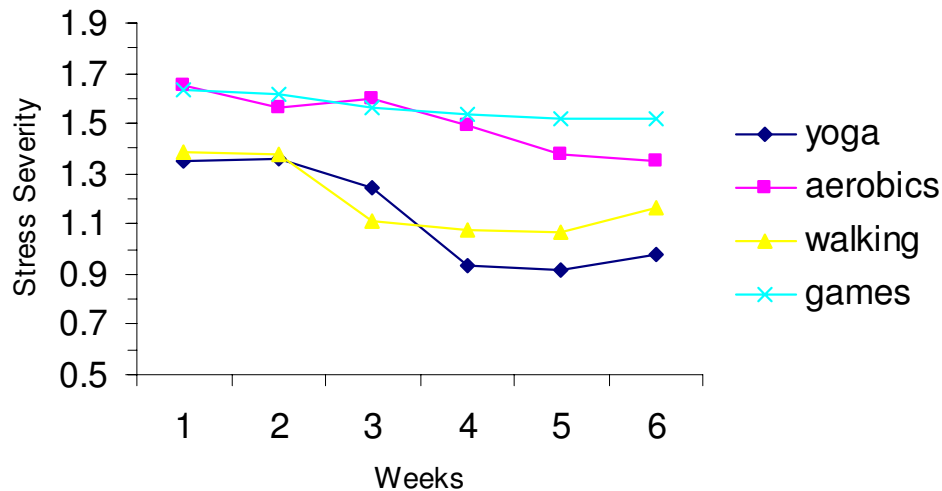


Figure 6: Stress severity throughout the 6 weeks for each of the 4 studied groups.

For state anxiety, only the group differences resulted in a significant ($p < .05$) effect, $F(3, 37) = 3.48$. The LSD post-hoc contrast indicated significant ($p < .05$) differences between the yoga group's mean state anxiety and state anxiety for all other groups. The effect size difference between the yoga group and the aerobics, walking, and games groups were 3.84 ($SE = 2.20$), 4.66 ($SE = 2.20$) and 6.89 ($SE = 2.19$) respectively. State anxiety group effects are presented in Figure 7.

The time by group non-significant effect, $\lambda = .69$, $F(15, 91.5) = 0.90$, $p = .57$ is presented

in Figure 8. The yoga group showed the greatest reduction over the course of the intervention (18.60%), followed by the walking group (6.85%) and then the aerobics group (2.18%). The games group showed a 2.56% increase in state anxiety over the course of the intervention.

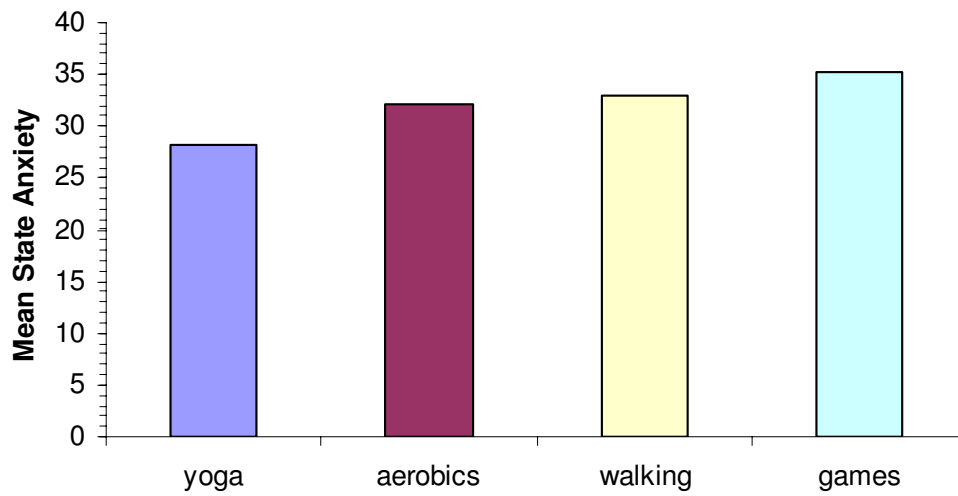


Figure 7: Bar graph representing the mean state anxiety of the 4 groups.

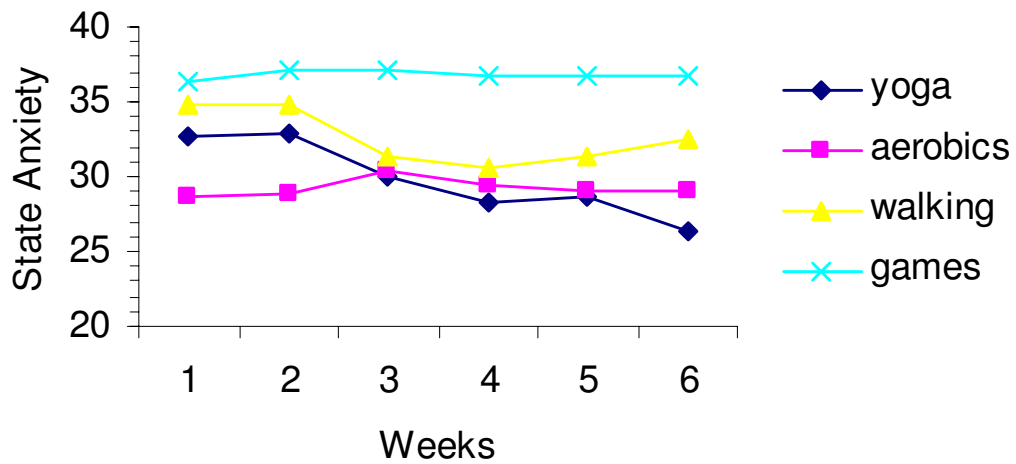


Figure 8: State anxiety throughout the 6 weeks for each of the 4 studied groups.

For depression, only significant ($p < .05$) group effects emerged, $F(3, 37) = 3.58$. LSD post hoc analysis indicated that all significant contrasts occurred between the yoga group and the other three groups. The yoga group had mean depression lower than the walking, aerobics, and games groups by 1.78 ($SE = 1.02$), 1.91 ($SE = 1.01$), 3.32 ($SE = 1.02$) respectively. Depression group effects are presented in Figure 9.

The time by group non-significant effects, $\lambda = .57$, $F(15, 91.5) = 1.40$, $p = .16$, are presented in Figure 10. The yoga group showed the greatest reduction over the course of the intervention (67.78%), followed by the aerobics group (20.75%), then the walking group (15.59%) and then the games group (0.86%).



Figure 9: Bar graph representing the mean depression scores of the 4 groups.

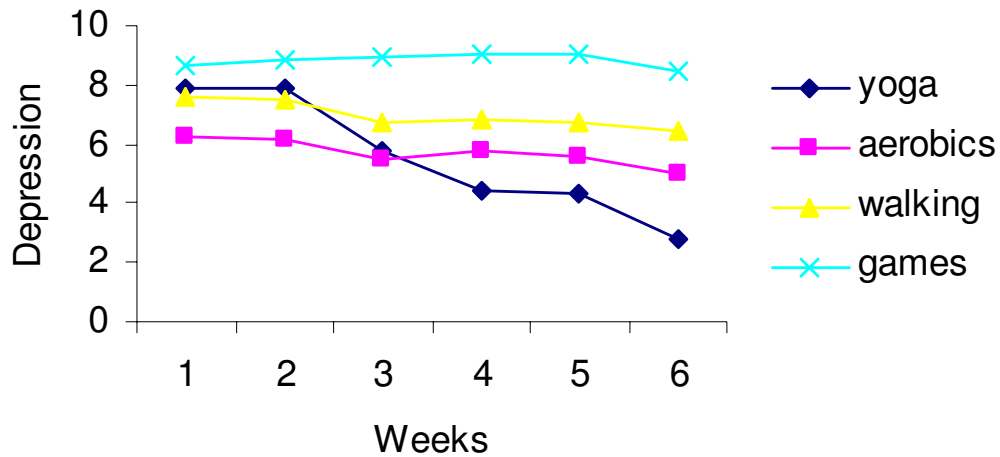


Figure 10: Depression throughout the 6 weeks for each of the 4 studied groups.

Introversion-Extraversion and Treatment

The third hypothesis stated that extraverted individuals would enjoy greater benefits from group than individual fitness interventions and that introverts would enjoy greater benefits from individual than group fitness interventions. Small sample size prevented a clear distinction between extraverted and introverted elderly individuals. Additionally, initial stratified assignment of participants was based on extraversion and introversion scores as defined by the normed scales of the EPI, which resulted in six extraverts, 25 introverts, and 11 non-differentiated individuals; all of these individuals were evenly distributed across groups. An analysis based on the 33% split resulted in some group size differences; therefore, ANCOVAs were not run to test this hypothesis. Descriptive statistics were compiled for each of the four dependent variables, across group assignment by the extraversion-introversion dichotomy. Pre and post-intervention results are presented in Table 8. Figures 11 – 14 (Appendix L) present time by group interactions for each dependent variable, across the extraversion-introversion dichotomy.

Table 8
*Pre and post-intervention descriptive statistics across groups,
 by the extraversion-introversion dichotomy, for each dependent variable.*

Variable	E-I Dichotomy	n	Pretest		Post-test	
			M	SD	M	SD
Stress Frequency						
Yoga	Extra	4	22.75	24.30	5.75	7.04
	Intro	4	34.50	16.86	13.50	7.33
Aerobics	Extra	4	20.50	16.46	11.25	7.50
	Intro	1	23.00		14.00	
Walking	Extra	3	27.67	15.04	11.00	4.40
	Intro	5	17.80	9.65	16.40	12.50
Games	Extra	2	18.50	0.71	17.50	2.12
	Intro	4	17.25	16.56	27.25	20.68
Overall	Extra	14	22.54	16.24	10.46	6.78
	Intro	13	22.79	14.79	18.50	13.92
Stress Severity						
Yoga	Extra	4	1.48	0.42	0.88	0.63
	Intro	4	1.28	0.22	1.19	0.17
Aerobics	Extra	4	2.03	0.78	1.26	0.32
	Intro	1	1.26		1.07	
Walking	Extra	3	1.24	0.24	1.35	0.43
	Intro	5	1.35	0.23	0.99	0.60
Games	Extra	2	1.59	0.44	1.92	0.03
	Intro	4	1.38	0.35	1.30	0.31
Overall	Extra	14	1.61	0.56	1.26	0.53
	Intro	13	1.33	0.24	1.14	0.39
State Anxiety						
Yoga	Extra	4	30.25	10.15	20.25	0.50
	Intro	4	42.50	6.03	33.50	9.68
Aerobics	Extra	4	30.75	10.21	29.50	6.46
	Intro	1	29.00		25.00	
Walking	Extra	3	37.33	12.90	31.33	6.43
	Intro	5	28.80	7.01	32.40	10.07
Games	Extra	2	30.50	10.61	30.50	10.61
	Intro	4	34.50	11.39	34.75	11.84
Overall	Extra	14	32.08	9.89	27.23	7.12
	Intro	13	34.36	9.38	32.86	9.55
Depression						
Yoga	Extra	4	9.25	4.79	1.75	1.71
	Intro	4	10.25	4.79	5.25	4.27
Aerobics	Extra	4	6.25	1.71	5.75	1.71
	Intro	1	12.00		6.00	
Walking	Extra	3	7.67	4.51	6.00	4.00
	Intro	5	9.60	5.50	7.00	7.18

Table 8 continued

Variable	E-I Dichotomy	<i>n</i>	Pretest		Post-test	
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Games	Extra	2	11.00	7.07	11.00	4.25
	Intro	4	5.75	4.57	6.21	5.22
Overall	Extra	14	8.23	4.13	5.38	4.25
	Intro	13	8.86	4.88	6.21	5.22

Due to small sample size and the lack of statistical power and analysis, any conclusions concerning the extraversion-introversion dichotomy in this intervention must be approached with caution. However, certain observations can be made. Extraverts appeared, both at pre and post-testing, to demonstrate better psychological health than introverts, with lower depression, state anxiety, and stress frequency scores. Although extraverts had lower stress frequency levels at both pre and post-testing, they experienced higher levels of stress severity. Additionally, overall mean scores seem to indicate that the extraverts benefited more from the intervention. Across all interventions, extraverts improved their stress frequency scores by 53.59%, compared to 18.82% reduction for introverts. Across groups, extraverts reduced their state anxiety by 15.12% and their depression by 34.63%, compared to 4.31% and 29.91% respectively for the introverts. However, for stress severity, extraverts increased by 20.75%, while introverts reduced the severity of stress by 5.8%.

Group effects for extraverts indicated that yoga reduced stress frequency, stress severity, state anxiety, and depression by 74.73%, 40.54%, 33.06% and 81.08%, respectively; as compared to 60.87%, 7.03%, 21.18% and 48.78% for introverts in the yoga group. Extraverts in the aerobics group saw reductions of 45.12%, 32.93%, 4.07% and 8.00%, as compared to aerobics group introverts, who reduced stress frequency by 39.13%, stress severity by 15.08%, state anxiety by 13.79%, and depression by 50.00%. For the walking group, extraversion-introversion dichotomy comparisons indicated that the extraverts reduced stress frequency by 60.25%, increased stress severity by 8.87%, and reduced state anxiety and depression by 16.07% and 21.97%. Introverts reduced stress frequency by 7.8% and stress severity by 26.67%, increased state anxiety by 12.5%, and reduced depression by 27.08%. Finally, the games group saw stress frequency reduce by 5.4% for extraverts and increase by 57.97% for introverts. Stress

severity increased by 20.75% for extraverts and decreased by 5.80% for introverts. State anxiety and depression did not change for games group extraverts (0%); for introverts, state anxiety and depression both increased slightly (0.70% and 8.00%, respectively).

Motivation to Adhere to the Program

The fourth hypothesis stated that motivation to continue with the program would not be affected by the treatment assignment. This hypothesis was tested using a RM ANOVA for each type of motivation. Time was the within repeated factor (7 data points) and treatment (3 levels and a control) was the between-subjects factor. Pre and post-test means for each type of motivation are presented in Table 9 and Figures 15 – 28 (Appendix M). ANOVA results for the change in each type of motivation are presented in Table 10.

Table 9
Pre and post-intervention descriptive statistics by group for each motivation variable.

Variable	n	Pretest		Post-test	
		M	SD	M	SD
Weight Management					
Yoga	11	10.00	7.31	6.55	4.59
Aerobics	11	9.36	8.05	7.55	8.07
Walking	10	15.80	3.49	11.80	7.11
Games	10	13.56	6.82	12.89	6.79
Overall	42	12.02	6.98	9.49	7.04
Ill Health Avoidance					
Yoga	11	10.36	4.57	7.82	4.33
Aerobics	11	12.45	3.39	10.27	4.47
Walking	10	12.60	2.80	9.10	5.04
Games	10	12.50	2.64	11.20	4.54
Overall	42	11.95	3.47	9.57	4.61
Revitalization					
Yoga	11	9.27	4.73	6.27	5.41
Aerobics	11	8.91	4.61	8.09	3.91
Walking	10	9.00	4.90	5.90	5.88
Games	10	8.30	4.37	8.10	4.12
Overall	42	8.88	4.50	7.10	4.82
Appearance					
Yoga	11	10.64	6.56	7.45	4.72
Aerobics	11	9.36	7.17	8.00	7.07
Walking	10	13.20	4.96	9.30	5.72
Games	10	10.40	5.48	10.10	5.86

Table 9 continued

Variable	<i>n</i>	Pretest		Post-test	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Overall	42	10.86	6.09	8.67	5.78
Social Recognition					
Yoga	11	4.82	4.29	2.09	3.78
Aerobics	11	3.09	5.91	2.64	6.04
Walking	10	6.60	4.86	3.80	4.94
Games	10	5.60	5.44	5.90	5.72
Overall	42	4.98	5.13	3.55	5.20
Stress Management					
Yoga	11	9.36	6.23	4.64	5.78
Aerobics	11	8.55	7.09	8.18	6.97
Walking	10	11.60	5.80	7.70	6.63
Games	10	8.90	6.71	9.30	5.70
Overall	42	9.57	60.6	7.40	6.32
Positive Health					
Yoga	11	12.27	2.65	9.45	4.30
Aerobics	11	12.18	3.89	10.91	4.76
Walking	10	12.20	3.29	9.80	5.51
Games	10	12.00	4.59	12.30	2.75
Overall	42	12.17	3.53	10.60	4.43
Strength and Endurance					
Yoga	11	14.00	3.71	10.27	5.10
Aerobics	11	14.73	6.18	13.55	6.11
Walking	10	14.20	3.82	11.20	6.88
Games	10	14.40	2.95	13.50	2.64
Overall	42	14.33	4.23	12.12	5.43
Enjoyment					
Yoga	11	10.73	5.66	6.82	8.61
Aerobics	11	12.73	6.45	12.36	6.98
Walking	10	12.40	5.66	9.50	8.34
Games	10	10.40	6.82	11.00	6.24
Overall	42	11.57	6.02	9.90	7.63
Affiliation					
Yoga	11	6.00	4.58	3.18	5.71
Aerobics	11	8.55	7.24	8.64	6.44
Walking	10	8.00	5.16	6.40	5.78
Games	10	8.80	6.55	10.00	6.16
Overall	42	7.81	5.87	7.00	6.37
Health Pressures					
Yoga	11	3.36	3.04	1.27	2.37
Aerobics	11	6.36	3.01	6.00	3.92
Walking	10	6.20	3.74	3.90	3.45
Games	10	10.60	3.41	8.50	4.17
Overall	42	6.55	4.10	4.86	4.34

Table 9 continued

Variable	<i>n</i>	Pretest		Post-test	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Competition					
Yoga	11	4.73	2.69	2.91	4.23
Aerobics	11	4.64	4.20	6.27	6.26
Walking	10	5.50	4.67	5.30	6.06
Games	10	7.50	6.45	8.90	6.72
Overall	42	5.55	4.62	5.79	6.05
Nimbleness					
Yoga	11	11.09	3.94	8.73	4.08
Aerobics	11	10.00	5.22	9.91	4.50
Walking	10	11.10	4.82	9.60	5.44
Games	10	11.20	3.52	11.40	2.55
Overall	42	10.83	4.30	9.88	4.23
Challenge					
Yoga	11	7.37	5.94	2.91	5.45
Aerobics	11	7.82	6.70	6.82	5.98
Walking	10	9.00	6.51	7.10	7.37
Games	10	9.70	6.75	9.60	5.27
Overall	42	8.43	6.38	6.52	6.32

Table 10
ANOVA results for the fourteen motivation variables.

Variable	Effect	Wilk's λ	<i>F</i>	<i>df</i>	<i>p</i>	η^2
Weight Management	Time	.78	2.47	4, 34	.06	.22
	Group		2.69	3, 37	.06	.18
	Time by group	.79	0.71	12, 90.25	.74	.08
Ill Health Avoidance	Time	.73	3.30	4, 35	.02	.27
	Group		0.12	3, 38	.95	.01
	Time by group	.72	1.01	12, 92.89	.44	.10
Revitalization	Time	.72	3.46	4, 35	.02	.28
	Group		0.13	3, 38	.94	.01
	Time by group	.78	0.77	12, 92.89	.70	.80
Appearance	Time	.86	1.47	4, 35	.23	.14
	Group		1.06	3, 38	.38	.08
	Time by group	.76	0.84	12, 92.89	.62	.09
Social Recognition	Time	.74	3.10	4, 35	.03	.26
	Group		1.42	3, 38	.25	.10

Table 10 continued

Variable	Effect	Wilk's λ	F	df	p	η^2
Stress Management	Time by group	.64	1.42	12 , 92.89	.17	.14
	Time	.66	4.52	4 , 35	.01	.34
	Group		0.50	3 , 38	.68	.04
Positive Health	Time by group	.63	1.48	12 , 92.89	.15	.14
	Time	.59	6.10	4 , 35	.001	.41
	Group		0.09	3 , 38	.97	.01
Strength and Endurance	Time by group	.75	0.88	12 , 92.89	.57	.09
	Time	.70	3.69	4 , 35	.01	.30
	Group		0.03	3 , 38	.99	.00
Enjoyment	Time by group	.56	1.93	12 , 92.89	.40	.18
	Time	.81	2.03	4 , 35	.11	.19
	Group		0.32	3 , 38	.81	.03
Affiliation	Time by group	.69	1.18	12 , 92.89	.31	.12
	Time	.80	2.17	4 , 35	.09	.20
	Group		1.03	3 , 38	.39	.08
Health Pressures	Time by group	.77	0.79	12 , 92.89	.66	.08
	Time	.75	2.96	4 , 35	.03	.25
	Group		6.12	3 , 38	.20	.33
Competition	Time by group	.59	1.69	12 , 92.89	.08	.16
	Time	.89	1.06	4 , 35	.39	.11
	Group		1.65	3 , 38	.20	.12
Nimbleness	Time by group	.60	1.65	12 , 92.89	.09	.16
	Time	.77	2.64	4 , 35	.05	.23
	Group		0.57	3 , 38	.64	.04
Challenge	Time by group	.61	1.58	12 , 92.89	.11	.15
	Time	.86	1.46	4 , 35	.23	.14
	Group		0.97	3 , 38	.42	.07
	Time by group	.73	0.99	12 , 92.89	.46	.10

Significant ($p < .05$) effects emerged for time on the following types of motivation: ill health avoidance; revitalization; social recognition; stress management; positive health; strength and endurance; health pressures; and nimbleness. For each significant change, the mean strength across groups was reduced over the course of the six week intervention. No significant group effects or group by time interaction effects emerged.

Participant Perceptions of the Intervention

Short structured interviews were conducted with every participant at the end of the intervention. Interview responses were compiled into 154 raw items. Some items were assigned multiple codes as appropriate, resulting in 235 item assignments. Data were analyzed across all four groups and a hierarchy of response categories was identified. Three major response themes emerged: (a) participant perceptions of the benefits of the exercise intervention, (b) participant perceptions of causation of exercise benefits, and (c) participant complaints about the program. Group differences in the frequency of response per theme were assessed with the Pearson χ^2 test.

Participant perceptions of the benefits of the exercise intervention comprised the majority of the total responses (57.45%). Within this theme, there were three categories of exercise benefits identified (physical benefits; enjoyment; and mental benefits). Figure 29 presents the three categories of exercise benefits identified, and the percentage of total benefit responses that each represents.

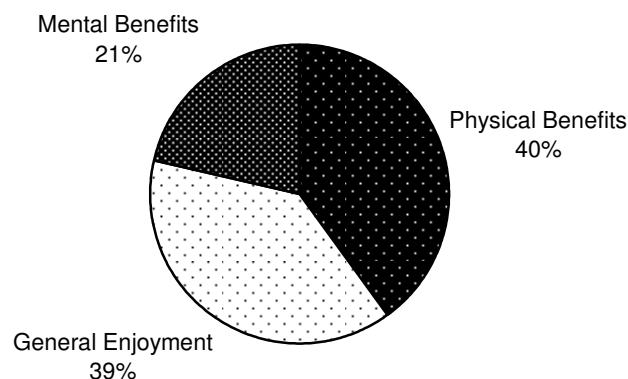


Figure 29: Pie chart representing participants' perceptions of exercise benefits (%).

Overall, participants indicated that they received the most benefits from the program in terms of their physical health (40% of benefit responses), followed by enjoyment (38.52%) and then mental benefits (21.48%). Pearson χ^2 revealed significant ($p < .05$) differences between groups in the frequency of responses for each category of benefits. The frequency and ratio of response for each type of benefit is presented in Table 11. For physical benefits, $\chi^2 (N = 42, df = 12) = 52.26, p = .01$, yoga group members perceived the most benefits. Yoga group members indicated, on average, that they received 2.55 physical benefits from the intervention, as compared to 1.73 physical benefits for aerobics group participants, and 1 and 0.30 physical benefits for participants of the walking and games groups. Yoga group members also expressed the most mental benefits, $\chi^2 (N = 42, df = 9) = 22.41, p = .01$. The yoga group perceived an average of 1.18 mental benefits, as compared to 0.82, 0.40, and 0.10 for the aerobics, walking, and games group participants. Aerobic group members expressed the most enjoyment benefits, however; $\chi^2 (N = 42, df = 6) = 12.76, p = .05$. Aerobic group participants made an average of 1.64 statements concerning enjoyment of the program, as compared to 1.60 for walkers, and 1.45 and 1 for yoga and games group members respectively.

Table 11
Perception of benefits by group.

Group	<i>n</i>	<i>Physical</i>		<i>Mental</i>		<i>Enjoyment</i>	
		<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>
Yoga	11	28	2.55	13	1.18	16	1.45
Aerobics	11	19	1.73	9	0.82	18	1.64
Walking	10	10	1	4	0.40	16	1.60
Games	10	3	0.30	1	0.10	10	1

Across all four groups, in descending order from the most frequent response, physical health benefits specifically identified were: general physical benefits; flexibility (“It made me less stiff and my joints a lot more flexible.”); stamina (“The walking gave me more stamina.”), balance (“I have more balance now when I walk. I don’t worry so much about falling as I have in the past.”), improvement of health problems (“It was very helpful to ease the pain of arthritis.”), strength (“I feel a difference after one month. I expect to continue to strengthen my muscles and become more agile. I am age 90, but can easily keep up with the class.”), breathing (“The breathing exercise was very good for me. I have weak lungs and I felt so much better after the

work out.”), weight loss (“I think my tummy is a little firmer.”), increased physical awareness (“It made me more aware of my body parts and realize simple exercise could alleviate some problems and make slow organs jump start.”), and energy levels (“I enjoyed the energizing effect each exercise had on my body and thus on my spirit.”). One individual attributed increased energy levels to the fact that the exercise program improved her sleep quality. Another aerobics participant indicated that even her low attendance did not negatively affect the potential of the program to improve her physical health: “Even though I had to be absent several times due to family commitments, I think to some extent the class ‘woke up’ my body and made me feel better.”

Significant group differences were found only for the general health benefits category, χ^2 ($N = 42$, $df = 6$) = 12.76, $p = .05$. Physical health benefits are presented in Figure 30. The frequencies and ratios of health benefits expressed per category for each group are presented in Table 12.

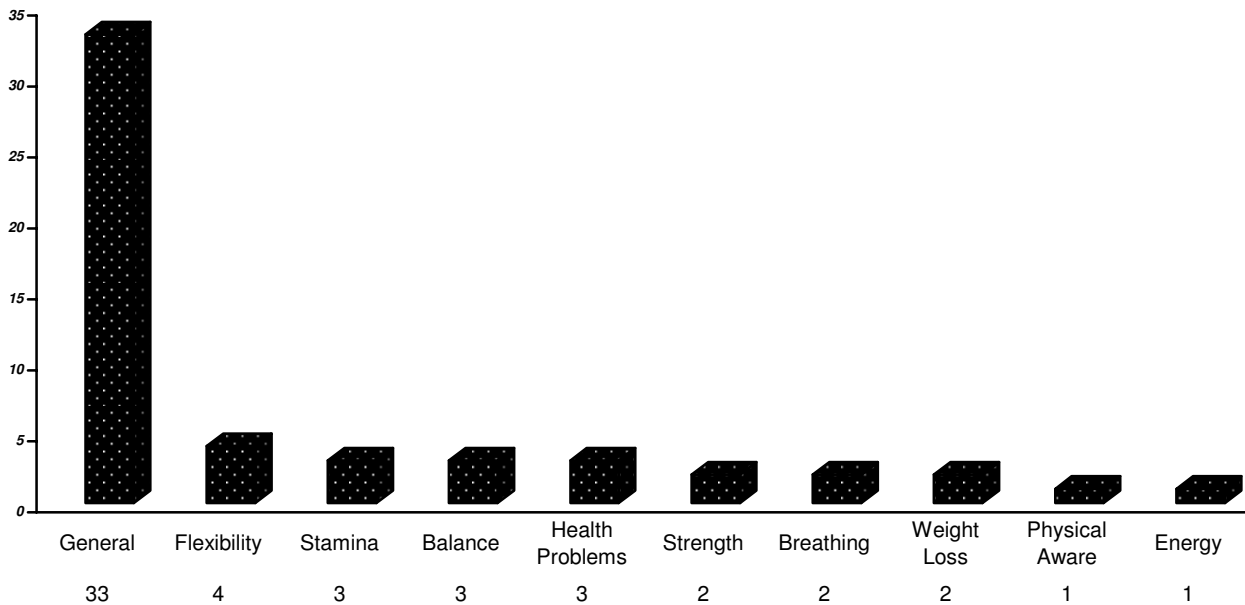


Figure 30: Bar graph representing participant perceptions of the physical benefits of exercise and the frequency of physical benefit responses relevant to each category.

Table 12
Perception of physical benefits by group.

Group	n	Gen		Stam		Stren		Flex		Breath		Bal		Aware		Hlt. Pr		Wt. Lo		Ener	
		f	f/n	f	f/n	f	f/n	f	f/n	f	f/n	f	f/n	f	f/n	f	f/n	f	f/n	f	f/n
Y	11	16	1.45	2	0.18	2	0.18	1	0.09	1	0.09	1	0.09	0	0	2	0.18	2	0.18	1	0.09
A	11	11	1	0	0	1	1	2	0.18	0	0	2	0.18	1	0.09	1	0.09	1	0.09	0	0
W	10	7	0.70	0	0	0	0	1	0.10	1	0.10	0	0	0	0	1	0.10	0	0	0	0
G	10	3	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Participant statements concerning the enjoyment of exercise represented 38.52% of respondent perceptions of exercise benefits. The majority of responses in this category (76.92%) were general comments about exercise being fun or pleasurable; 13.46% of responses in this category indicated that the specific exercise intervention played a role in changing the participant’s perception of exercise as a fun activity; and 9.62% of the responses in this category referred to exercise as an entertainment activity.

Participant perceptions of the mental benefits of exercise comprised 21.48% of benefit responses. Participants identified general mental benefits such as “contentment,” “raise my spirits,” or “elation”; these were 58.62% of mental benefit responses. Respondents indicated that the exercise program improved self-perceptions involving self-esteem, self-efficacy, and self-confidence (24.14% of mental benefit response) and that exercise made them more relaxed (17.24% of mental benefit responses). No significant differences were found between groups, as to the frequency of responses indicating mental benefits. Mental benefits are presented in Figure 31. Table 13 presents the frequencies and ratios of mental benefit responses given per group.

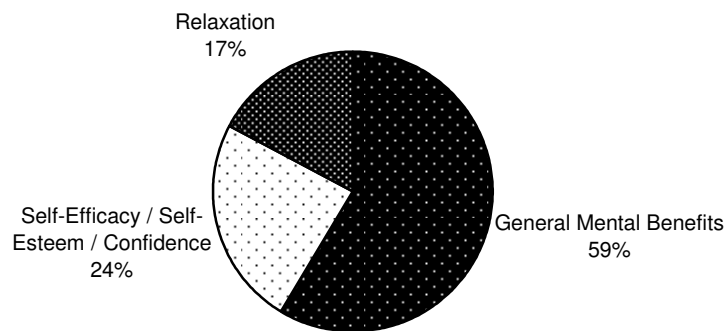


Figure 31: Pie chart representing participants’ perceptions of mental exercise benefits (%).

Table 13
Perception of mental benefits by group.

Group	n	General		Self-Efficacy		Relaxation	
		f	f/n	f	f/n	f	f/n
Yoga	11	5	0.45	4	0.36	4	0.36
Aerobics	11	7	0.64	1	0.09	1	0.09
Walking	10	3	0.30	1	0.10	0	0
Games	10	1	0.10	0	0	0	0

Participant perceptions of causation of benefits were 21.70% of the total responses. Of these responses, 54.90% were related to the instructor. For instance, one participant said, “The best part of the program was the leader. [The instructor] was interested in us and wanted us to receive the most from the program.” Other participants (17.65%) indicated that program characteristics (such as the exercise classes being age-appropriate and the availability and accessibility of exercise classes in the living facility) were responsible for benefits. Social interaction with other classmates was also cited as a cause of exercise benefits (15.69%). Finally, several participants indicated that the exercise class increased their motivation to exercise, which improved the potential for exercise benefits (11.76%). Significant group differences were found for social interaction responses, $\chi^2 (N = 42, df = 3) = 8.04, p = .05$. Yoga participants perceived more program benefits coming from social interaction with classmates than did the participants in the other three groups. Participant perceptions of the causation of exercise benefits are presented in Figure 32. Table 14 presents frequencies and ratios of responses per category of benefit causation by group.

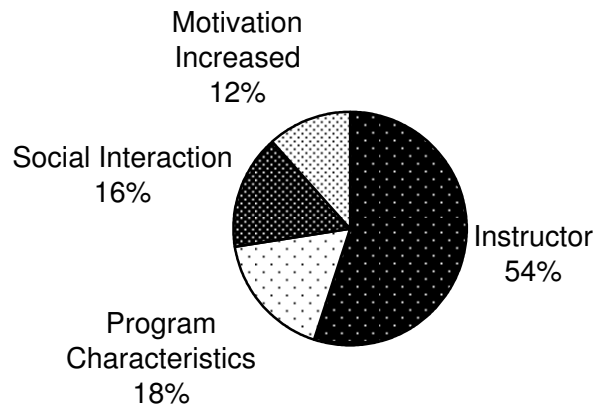


Figure 32: Pie chart representing participants' perceptions of reasons for exercise benefits (%).

Table 14
Perception of benefit causation by group.

Group	n	Instructor		Program		Social Int.		Motivation Inc.	
		f	f/n	f	f/n	f	f/n	f	f/n
Yoga	11	12	1.09	2	0.18	5	0.45	3	0.27
Aerobics	11	11	1	4	1.36	1	0.09	4	0.36
Walking	10	10	1	3	0.30	2	0.20	2	0.20
Games	10	9	1	0	0	1	0.10	0	0

Participant complaints composed 20.85% of the total responses. However, 53.06% of the complaint responses were coded as “positive complaints.” The distribution of complaints is presented in Figure 33. Positive complaints included statements in which the participant specifically said there were no complaints about the program. One additional response in this category was by a participant who said that what she enjoyed least about the program was “leaving it.” Another complaint category focused on the physical limitations experienced by participants (20.41%), such as fatigue, laziness, discomfort when exercising, or sensory impairments. Several participants in the program had hearing loss, and the effectiveness of their hearing aides was mixed. Another participant mentioned the visual limitations of the program: “I didn’t feel like I could follow the instructor all the time. I could follow her if I could see her, but I couldn’t follow the others if they blocked my view of the instructor, because they did it

backwards.”

This complaint was also related to another class of participant complaints, logistical issues (18.37% of complaints), which included environmental issues such as the size of the classroom and the noise of the room air conditioner. Two participants had logistical complaints about the scheduling of classes, four complained about their personal reasons which caused absences, and one indicated that she did not like her group assignment (she was in the games group).

Four participants made specific complaints in the form of suggestions for improving the program. One participant from the walking group indicated that though she enjoys hall walking, she would have preferred to walk outside. The facility had a walking track around the building which was used by the group during nice weather, but inclement weather kept most of the walking sessions inside the building. A participant from the yoga group said, “If there was a way to include the music in the background, I liked that way, which we had but sometimes could hardly hear it due to air conditioning and due to drink machine.” Another yoga participant indicated that though he enjoyed the yoga class, “I think it should be done in conjunction with an aerobics class.” Finally, an aerobics participant said “I wished we’d had some written instructions which explained the benefits of the exercises.” During orientation to the program, participants received paperwork explaining the general benefits of exercise and were informed that they could request more information from the instructor at any time during the program, and several participants made requests for exercise information related to their specific health conditions. This participant did not approach the instructor for information at any time during the intervention.

No significant differences were found between groups, as to the distribution of complaint categories. Ratios and frequencies of complaint responses by group are presented in Table 15.

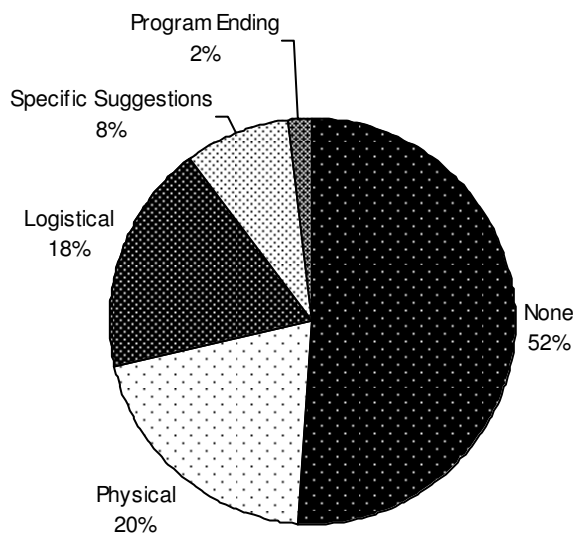


Figure 33: Pie chart representing participants' complaints about the intervention (%).

Table 15
Complaints by group.

Group	<i>n</i>	None		Sadness		Physical		Logistical		Specific	
		<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>	<i>f</i>	<i>f/n</i>
Yoga	11	8	0.73	1	0.09	7	0.63	3	0.27	3	0.27
Aerobics	11	11	1	0	0	3	0.27	2	0.18	0	0
Walking	10	6	0.60	0	0	0	0	2	0.20	2	0.20
Games	10	9	0.90	0	0	0	0	1	0.10	0	0

CHAPTER 4

DISCUSSION

The present study investigated the impact of a six-week exercise intervention on the psychological health of senior citizens. Specifically, a sample of old elderly individuals ($N = 42$) were randomly assigned to one of four groups: yoga, aerobics, walking, and games. Classes were held three times per week, 30 minutes per session, over the duration of the six-week intervention. Four research hypotheses were tested. The first hypothesis assumed no significant differences between groups at baseline. It was proposed in the second hypothesis that the three exercise interventions would be significantly more effective in reducing stress, anxiety, and depression than would the non-exercise control group. As well, it was hypothesized that the personality trait of extraversion would affect program results, with extraverts receiving greater benefits from social activities and introverts receiving greater benefits from individual activities. Finally, motivation was measured throughout the intervention to assess changes in motivation over the course of the intervention, based on treatment assignment.

Intervention Effects on Stress, Anxiety, and Depression

It was initially hypothesized that each variable would demonstrate significant time by group interaction effects. It was proposed that all three exercise interventions would show a stronger effect over the course of the six weeks than the games (non-active control) group. This hypothesis was confirmed only for stress frequency; post-hoc analysis revealed a significant contrast between the yoga group and the games group, with the yoga group experiencing reduced stress to a greater extent over the course of the six weeks.

Although the proposed hypothesis was not confirmed, it is clear that some effect did occur over the course of the intervention. At pretest there were no overall differences between groups. Among the dependent variables, there were pretest differences between groups only for stress severity. In contrast, at the end of the intervention, there were significant group effects for all four DVs (stress frequency, stress severity, state anxiety, and depression), as well as a significant time by group interaction for stress frequency and a significant time effect for stress severity. Specifically, group assignment explained 18% of the variance of stress frequency, 18%

of the variance of stress severity, and 22% and 23% of the variance of state anxiety and depression, respectively. Additionally, the time by group interaction explained 21% of the variance in stress frequency and the effect of time explained 42% of the variance of stress severity. Although the differences in rate of change between groups were not strong enough to achieve significance, the mean scores for all four DVs across the intervention were significantly different among groups.

Causation of Intervention Effects on Stress, Anxiety, and Depression

Mindfulness in physical activity. The only significant post-hoc comparison was for the time by group interaction effect, for the contrast between the yoga group and the games group. The yoga group's marginal mean was 11.68 lower than the games group. All four DVs had significant group effects, and in each case, yoga had the lowest score of all groups, indicating less stress/anxiety/depression, and therefore greater mental health. Additionally, although these differences were not significant, for all four DVs, post-hoc analysis revealed that yoga had lower marginal means than any of the other groups. These results were supported by qualitative interview results; yoga participants reported more of both physical and mental benefits than members of the other three groups, and these differences were statistically significant. These findings indicate that the yoga intervention was in some way inherently different than the other exercise groups.

Researcher / instructor characteristics may have been responsible for the increased effectiveness of yoga in improving psychological health in class members. The researcher / instructor is a certified yoga instructor with over 15 years of yoga experience. However, the researcher / instructor also has eight years of experience teaching in the general fitness industry, and has earned four different non-yoga fitness certifications. Additionally, the researcher / instructor made a strong effort to treat all groups and all individual participants equally. Post-intervention qualitative interviews indicated that members of all four groups felt a sense of affiliation with the instructor; participant perceptions of the intervention are discussed in a later section.

The researcher / instructor spent an equal amount of time interacting with each group. The yoga and aerobics classes were both taught by the same instructor, throughout the duration of the experiment. For the walking group, the researcher / instructor met with the group at the

beginning of the 30 minute session. Any participant questions or concerns were addressed at this time. Participants were allowed to decide on indoor (hall walking) or outdoor (path walking), based on weather conditions. The instructor walked with the group, placing herself in the middle of the class. However, although participants were instructed to set their own comfortable walking pace, they tended to exhibit a preference to walk as a group. Generally, all group members and the instructor walked in a cluster. Finally, for the games group, the instructor was an active participant. A variety of games were available, and participants were allowed to select the game for each session. Games included: Chinese Checkers, Scrabble, Rummy Cube, and Dominoes. Dominoes was the preferred game among participants, and most game sessions were conducted with all group members and the instructor playing a large round of Mexican Trains (a form of Dominoes). The instructor spent equal amounts of time and interaction with all four groups.

If the instructor's yoga experience did indeed affect experimental outcomes, then it would be difficult to remove this confounding variable. If, for instance, four instructors were used for the intervention, each of whom was an expert only in his/her particular field, then instructor personality would be introduced as a confounding variable. Perhaps, in the future, a larger study will allow investigation of the instructor variable with an eight-group intervention: four groups taught by four instructors, and four groups taught by one instructor.

However, as stated previously, the researcher / instructor made a strong attempt to treat all groups equally. Perhaps, then, there is something inherently different in the nature of yoga which made it more effective than the other exercise interventions. Traditional yoga philosophy indicates that difference is mindfulness, a practice of complete present moment awareness (Lasater, 2000). Yoga class members are encouraged to focus on breathing techniques as they exercise, rather than allowing the mind to wander. Inherent in present moment awareness is acceptance of things as they are (i.e., acceptance of the present, rather than craving for change in the future). (Lasater, 2000). Yoga philosophy teaches that this acceptance frees the individual from stress, anxiety, and unhappiness. When the individual accepts that the present moment is exactly as it is supposed to be – in other words, there is no need for change – then the individual is freed from psychological pains such as stress, anxiety, and depression (Devananda, 1983). Yoga also provides the tools and environment to help the mind (and the body) heal itself (Payne & Usatine, 2002). For older adults facing physical health impairments, loss of independence, the death of loved ones, and their own impending death, this acceptance might be a profound tool for

increasing psychological well-being (Devananda). If the elderly person can accept his/her current situation and enjoy the present moment, without fear or anxiety about tomorrow, he/she can perhaps achieve greater happiness. One yoga participant's qualitative interview seemed to speak to this point, "because I am 84 and live in a retirement facility with my husband for the past four years, some of our life has become very simple and without hassles. Being in our 80s, we have decided to 'accept' things that we cannot change."

Research on the effect of mindfulness practices, such as yoga and Tai Chi, has produced evidence of the positive effects. For instance, research with dance students found that yoga and meditation were associated with positive psychological effects (West, Otte, Geher, Johnson, & Mohe, 2004; Elkins, 2003). Furthermore, when medical school students practiced mindfulness-based relaxation protocols during exam period, overall psychological distress decreased (Shapiro, Schwartz, & Bonner, 1998). Yoga was also found to improve mood and reduce depression (Woolery, 2004) and improve cardiovascular health (Jayasinghe, 2004). A meta-analysis by Eppley, Abrams, and Shear (1989) found that relaxation techniques, including meditation, were effective in reducing anxiety. Particularly relevant to older individuals, psychiatrist Kabat-Zinn and colleagues found evidence that mindfulness techniques may work as pain management strategies (Kabat-Zinn, Massion, Kristeller, Peterson, Fletcher, Pbert, Lenderking, & Santorelli, 1992; Kabat-Zinn, Lipworth, & Burney, 1985; Kabat-Zinn, Lipworth, Burney, & Sellers, 1987).

It is important to note that the yoga class did not include any discussion of yoga theory. Participants were not instructed in the philosophy of mindfulness; in fact, the words "mindfulness," "acceptance," and "present moment awareness" were never used in the class or in any discussion with class members. The class was instructed only in the physical practice of yoga – how to do the exercises and how to do the accompanying breathing techniques. This teaching technique is in line with traditional yoga teaching practices, which hold that only after the physical practice of yoga has been mastered should the spiritual and philosophical issues be addressed (Swenson, 2001).

Attendance differences between groups. Attendance differences between groups were tested with an ANOVA. A significant effect emerged, and post-hoc comparisons found significant differences in attendance between the yoga and games group (mean attendance rate of 14.09 versus 9.90, out of 18 sessions possible); between the yoga and walking groups (mean

attendance rate of 11.20); and between the aerobics (mean attendance rate of 12.91) and games groups. This significant effect is potentially problematic. It is possible that the observed differences were due to group differences in attendance, rather than intervention characteristics. The yoga group had lower mean effect scores than any other group, on all four DVs. This effect could be due to the inherent characteristics of yoga discussed earlier, or to the differences in attendance.

The attendance differences between groups raise another issue: the possibility that the characteristics of each group affected the participant's motivation to adhere to the program. While it may be that the types of exercise affected motivation to adhere, it may also be that the characteristics of the senior living facility at which the research was conducted are responsible for the group attendance differences. The facility had a well-developed activities program. However, pre-intervention, there was only one instructor-led fitness offering at the facility (a 30-minute per week Tai Chi class). Other fitness activities (without instructors) included a chair exercise video (played twice per week in the television room by a resident of the facility), a Saturday morning hall walking group, and three fitness machines in the activities room. Therefore, regular, on-going instructor-led fitness classes were new to the facility. In contrast, walking was a frequent activity for many of the participants. The facility had a 1/3 mile cement walking path encircling the building, and long hallways provided indoor walking space in inclement weather. Many of the residents indicated prior to introduction of the intervention that they walked regularly. Similarly, games and game activities were frequently offered at the facility. A bridge club met two evenings per week and several groups of residents had weekly matches of Rummy Cube and Dominoes. The activity calendar also included weekly sessions of prize bingo, trivia challenge, and Saturday afternoon games. Therefore, participants had many opportunities to walk and play games, but aerobics and yoga were novel offerings at the facility. This may have increased motivation to attend for yoga and aerobics participants.

Limitations of Intervention Effects on Stress, Anxiety, and Depression

Sample characteristics. A meta-analysis of intervention studies concerning physical activity and psychological well-being in advanced age revealed that exercise does have a small but significant effect ($d^e = 0.19$) in older adults without clinical disorders (Netz, Wu, Becker, & Tenenbaum, 2005). The present sample may have been too small to achieve statistical

significance of true effects of this size. Additional sample characteristics may have limited the potential of the intervention to have a significant effect. “Many well-being measures, specifically emotional well-being measures, are designed for use in clinical populations ... it might well be the case that older adults without clinical disorders do not suffer depression, confusion, and anger to the extent that physical activity will result in a positive effect” (Netz et. al. 2005, pp. 27 - 28). This sample demonstrated very positive psychological health at pretest. For the overall sample, pretest measures indicated a mean stress frequency of 23.76 ($SD = 15.15$); stress severity of 1.55 ($SD = 0.49$); state anxiety of 33.52 ($SD = 09.07$); and depression of 7.98 ($SD = 4.33$). There were no indications of suicidal ideation from any of the participants at any point over the course of the intervention. The highest individual depression score was 18, indicating only mild depression. The Netz et. al. (2005) meta-analysis found no treatment-control differences on depression, anger, or confusion, and indicated that the non-clinical disorders nature of the study population led to a floor effect. Although the current sample did improve on all four measures of psychological well-being used in the study, it may be that there was insufficient room for improvement, due to low pretest measures, and therefore the potential for significant effects was reduced.

Also, the mean age of the study sample may have contributed to a reduced potential for significant effects. Exercise intervention research with aging populations indicates that younger people are more likely to experience significant effects. In their meta-analysis, Netz et. al. (2005) found a “gradual decrease in the effect size of physical activity on well-being as one ages” (p. 26). The meta-analysis revealed that in exercise interventions among older individuals, the late middle age subgroup (mean age less than 65) had a mean change of 0.33 SD, while old-old samples (mean age greater than 74) had a mean change of only 0.11 SD. Since the present sample had a mean age of 83.14, it may be that the potential for significant effects was limited by sample characteristics.

Another potentially limiting characteristic of the sample was the level of pre-intervention physical activity. At pretest, 37 participants (88.10%) indicated they were engaged in some physical activity. The sample had a pre-intervention exercise regimen of 4.25 days per week for 25.66 minutes per session. Meta-analysis (Netz et. al. 2005) revealed larger effects for sedentary, as compared to non-sedentary, individuals, in fixed-effect tests (0.35 versus 0.17). The pre-intervention exercise practices of the sample may also have reduced the size of the effects.

Therefore, small group size limited experimental power, and sample characteristics (including non-clinical sample, age, and physical activity levels) reduced the size of the effects. Thus, these factors may explain why the significant effects in this study were limited.

Life circumstances. One variable which the study was unable to control was the life circumstances of study participants. Because the significant effects of exercise are small, the potential for exercise to make a difference in an individual's psychological well-being is limited. For instance, one female participant of the walking group indicated in her post-intervention interview that she enjoyed the intervention and felt it affected her in a positive manner. However, her scores went up on all four DVs over the course of the six-week intervention. She indicated on her post-intervention Hassles Inventory that her young granddaughter had recently been diagnosed with epilepsy, "so I now have my granddaughter's condition to think about, or worry about."

Other participants were limited in both their experience of the intervention and the results of the intervention, due to health impairments. Individuals in the group exercise classes with sensory impairments (vision and hearing) indicated that the classroom circumstances (air conditioner noise, glaring fluorescent overhead lights) sometimes prevented them from fully participating in the program. Other individuals suffered from physical impairments, such as arthritis or injuries, which limited their ability to participate in the program to the fullest extent. However, every exercise was presented with modifications, so that all participants could participate in the entirety of every class. For instance, in the chair yoga and chair aerobics classes, some exercises were presented with both standing and seated options, and participants were asked to use their discretion as to which version was most appropriate for their ability level. However, even those individuals limited by physical conditions improved in their ability to participate over the duration of the intervention. One male yoga participant began the six-week intervention in an electric wheelchair. Although he could walk, he indicated that due to leg pain, he preferred to avoid doing so. During the first three weeks of class, he never left his wheelchair. In the fourth week of class, however, he moved from his wheelchair to one of the standard classroom chairs, and stood for all of the standing exercises. He continued to do so throughout the rest of the intervention. Another participant, a 90-year old woman in the aerobics class, indicated that her participation was limited by severe arthritic pain, but that persistence was helping her overcome her physical limitations, "I enjoyed it all, even though it hurts due to

arthritis. But when the exercise is over, I feel looser and better and I know it is helping me. I can feel a difference in my muscles each week and the exercises get a little easier to do. Also, each week the pain either gets better or becomes less important – easier to bear.”

Acceptance of older age. It may be that the reason the psychological health of the oldest old is minimally affected by exercise interventions is because they experience higher levels of life-satisfaction than do younger individuals. In older adults, life-satisfaction may not be related to physical functioning; as well, older adults who are less concerned with physical functioning may indicate more life satisfaction than those older adults who place high value on physical functioning and suffer from impairments in functioning (Rejeski & Mihalko, 2001). With old age, psychological well-being becomes more complex, especially as functional and social losses are endured (Netz et. al. 2005). Netz et. al. propose that “the absence of exercise effects on life-satisfaction in a population without clinical disorders may result from a relatively high level of life-satisfaction the older adults regularly experience” (p. 24).

One female participant in the yoga group began the intervention with minimal scores for all four psychological measures (i.e., no indication of stress, depression, or anxiety). This individual moved to the facility on her children’s request after a stroke. She continued to quilt on a regular basis and to participate in volunteer activities 2 - 3 times per week. She wrote on her pretest Hassles Scale: “I really have no responsibilities living at [the facility]. It has made life much easier and worry free for me.” This facility was very clean and very well-managed. Individuals lived in their own apartments (studios and one and two bedroom units were available) with kitchenettes. The facility provided three full meals per day, and snacks (fresh fruit, coffee, and popcorn) were always available. Though individuals were responsible for their own laundry, cleaning was provided on a weekly basis. The facility offered many activities, including on-site games, fitness, and learning and discussion groups, as well as outings to cultural events, and a shuttle to shopping, doctor’s appointments, the library, and banking. The facility included a small chapel which offered a variety of religious services, as well as a hair salon. The facility offered a great deal of living support and very few restrictions on independence. Most of the residents had chosen to move to the facility of their own accord and many still had their own cars. The majority of the residents expressed a high amount of satisfaction with their living conditions. Perhaps the quality of living at this facility was sufficiently high as to have left little room for improvement in psychological well-being. Future

research directions might investigate the interaction between the type of senior living community and the effect of an exercise intervention on psychological health.

Intervention Effects across the Introversion-Extraversion Dichotomy

An additional hypothesis of the current study was that extraverts would benefit more from social groups (group exercise and games), and that introverts would benefit more from individual exercise (walking). This hypothesis was not tested for two reasons. First, sample sizes were too small, once the groups were split according to the extraversion-introversion dichotomy. Second, participants in the walking group demonstrated a high preference for walking together and interacting during walking sessions. Therefore, through participant behavior, this individual activity evolved into a social group activity. Because this hypothesis could not be tested statistically, any discussion of this topic must be approached with caution. However, certain observations should be noted.

First, according to the normed values of the Eysenck inventory, this sample appears to be unusual. In general, the middle 40% of the population are considered non-differentiated, and the bottom and upper 30% are introverted and extraverted, respectively (Eysenck & Eysenck, 1968). In this sample, 59.52% were introverts, and only 14.29% were extraverts (the remaining 26.19% were non-differentiated). This may reflect the advanced age of the population; according to Eysenck and Eysenck, “there is a significant trend for extroversion to decline with advancing age” (p. 15). Eysenck indicated that any reasons for this trend were speculative. Eriksson’s stages of psychosocial development may provide insight into this issue; perhaps with older age, as individuals enter the self-evaluation inherent in the integrity versus despair stage of life, a turning inward leads to introversion. However, current research contradicts this possibility. A meta-analysis of 152 longitudinal studies of personality variables found that adult personality traits tended to be consistent; personality scores in old age were correlated with previous measurements, ranging from .54 during the college years to .64 at age 30, and finally .74 between ages 50 and 70 (Roberts & DelVecchio, 2000). Roberts and DelVecchio indicated that the Big Five variables were consistent across longitudinal test-retest measures, and that extraversion and agreeableness were the most consistent. This research implies that population differences in percentages of extraverts and introverts is not due to changes in the extraversion trait within individuals. However, of the studies included in the meta-analysis, the oldest age at

which a study was initiated was 73. Therefore, the sample of the current study may be older than previous investigations of extraversion, and it may be that a shift in extraversion occurs at a much later point in old age. Further research into this topic may be warranted.

The second issue of interest is the patterns which seemed to emerge in the results. For the overall comparisons across groups, at both pre and post-intervention, extraverts had lower rates of stress frequency, state anxiety, and depression than did introverts. Additionally, for stress frequency, state anxiety, and depression, the extraverts demonstrated a larger relative reduction over the intervention than did the introverts. However, for stress severity, extraverts had higher pre and post-test scores than did introverts, and extraverts actually increased in stress severity over the six week intervention by 20.75%, while introverts decreased stress severity by 5.8%. For stress, then, this pattern may indicate that though extraverts did not experience stress as frequently, their experience of each stressor was stronger. In general, however, the extraversion/introversion dichotomy reflected that extraverts had lower levels of stress, anxiety, and depression, and that the psychological health of extraverts responded more to exercise than did the psychological health of introverts. Eysenck initially indicated that extraversion was related to increased psychological functioning (Eysenck & Eysenck, 1968).

Current research also reflects the tendency of extraverts to demonstrate superior psychological health, with the exception of outwardly manifesting psychological disorders. A meta-analysis of 33 experimental studies concerning the Five Factor Model and clinical disorders reported a small, but significant, effect for the extraversion dimension, with low extraversion scores (i.e., scores indicating introversion) more related to clinical disorders (Malouff, Thorsteinsson, & Schutte, 2005). The meta-analysis found that lower levels of extraversion are particularly related to mood disorders, but that in contrast to the typical pattern, externalizing and conduct disorder symptoms are more related to higher levels of extraversion.

Group differences also occurred across the extraversion-introversion dichotomy. For extroverts, yoga was the most effective intervention, causing the greatest percent reductions in all four DVs. For introverts, yoga was most effective for stress frequency and state anxiety; walking was most effective for stress severity; and aerobics was most effective for depression. Overall, increased scores only occurred for extraverts on stress severity. But group increases occurred on multiple DVs. Extraverted walkers and game players increased in stress severity. Introverted walkers increased in state anxiety, and introverted game players increased in stress

frequency, state anxiety, and depression. No increases in the DVs were noted for any participants in the yoga or aerobics groups. Further research which investigates extraversion-introversion differential responses in psychological well-being due to different modalities of exercise may be warranted.

Exercise Motivation across the Intervention

ANOVAs revealed statistically significant main effects for time for eight of the fourteen types of motivation. Stress management and positive health were significant at the $p < .01$ level; ill health avoidance, revitalization, social recognition, health pressures, strength and endurance, and nimbleness were significant at the $p < .05$ level. For all significant results, post-intervention mean scores were lower than pre-intervention mean scores, which indicates that the participants were less motivated to exercise for that reason at the end of the intervention than they were at the beginning of the intervention. Overall motivation scores also decreased. It is unclear why the profile of exercise motivation changed across the intervention and especially why the strength of motivation would reduce in response to exercise. Perhaps participants had pre-intervention excitement about beginning a new program, and the excitement wore off over the course of the intervention, reducing motivation. Netz et. al. (2005) found in their meta-analysis that longer interventions were actually associated with less positive change in well-being. They proposed that “after relatively little exercise activity, individuals can realize the increased weight they can lift or the increased distance they can walk, which may stimulate an increased sense of control and general well-being” (Spirduso, 1995, p.26). Perhaps, then, if individuals increase their sense of well-being in response to exercise after a relatively short time, they feel that exercise will provide no further benefits and therefore is no longer necessary. This may reduce the strength of motivation to exercise.

Another possible explanation for this reduction in motivation over the course of the intervention is that participants felt discouragement concerning the impending end of the program, as evidenced by comments in the qualitative interview. Participants felt sad that the intervention ended and indicated that the alternative exercise videos would not be a sufficient substitute. Finally, it may be that elderly individuals who begin to exercise develop motivations to exercise, which this instrument does not measure. Participants indicated a strong effect due to social factors (classmates and the instructor) in their qualitative interviews. Enjoyment and social

affiliation are two of the variables which did not significantly reduce over the course of the intervention. There may be additional social variables which are related to motivation to adhere to exercise in senior citizens. Additional research concerning the profile of senior citizen exercise motivation is warranted.

Participant viewpoints of motivation. Only a very small portion (2.55%) of total responses in qualitative interviews addressed the issue of motivation. Six individuals in the study (14.29% of participants) indicated their motivation to exercise increased, due to the program, “it made me aware that I need to be more disciplined and continue exercising,” stated one participant. Both the instructor and the social interaction with classmates were cited as motivational factors for attending class. (“The instructor really made it worthwhile. I never wanted to miss a class.” “I enjoyed being in the classes. It gave me an inspiration to be with people.”)

Participant Perceptions of Exercise

Perceptions of psychological benefits. Both qualitative and quantitative results indicated that enjoyment was an important part of the intervention experience. On the EMI, the enjoyment subscale did not show a statistically significant reduction over the course of the intervention (in contrast to many of the other forms of motivation, which reduced in mean strength over the six weeks). Individuals also indicated in qualitative interviews that enjoyment was a primary benefit of the program (38.52%). Most of these individuals (76.92%) said that the intervention itself was a fun experience. For instance, “I totally enjoyed the whole experience of the class from beginning to end.” Another participant assessed not just her enjoyment of the program, but the entire facilities assessment of the program: “More interest was shown by the residents in this program than any other activity program.” A few responses in this category (13.46%) indicated a change in participant perception of exercise. For instance, one female participant of the yoga class said: “Not being a big fan of exercise, I enjoyed this more than any previous experience in an exercise class.” An aerobics participant, who had no pre-intervention exercise practices, expressed a similar perception, “I believe it got me interested in exercise again,” she said. Finally, a small portion of these responses (9.62%) referred to exercise as an entertainment activity, “it was entertaining as well as physically challenging,” one aerobics participant indicated. A yoga participant reflected this sentiment: “it was done with skill and good humor,

which made it fun.” Participant enjoyment of an exercise program is particularly important, because enjoyment has been identified as one of the primary motivators for adhering to an exercise program (Wankel, 1993).

Finally, psychological benefits composed the remaining 21.48% of benefit responses. General mental benefits comprised 58.62% of participant responses in this category. Participants mentioned that the intervention “raised my spirits,” and led to “contentment.” One individual stated that, “The program affected me psychologically, since the connection with the physical is so strong. I feel some elation.” Another individual said that, due to the exercises, “I seem to be mentally more loose.” General mental benefits were followed by improved self-perception (including self-esteem, self-efficacy, and self-confidence). One individual commented that she enjoyed “the feeling that I am improving.” Another participant, an 84-year-old in the aerobics group, expressed “pride over trying to do the ‘impossible’.” Other individuals cited increased self-efficacy in specific domains, such as walking. Finally, mental benefits cited by participants included relaxation. One participant stated that “my body always feels very relaxed after each exercise program.” For one participant, the relaxed feeling was a change from the experience of pre-exercise lethargy. “I’m tired after class, but not from not doing and being bored,” she said.

Although some participants did indicate that they experienced psychological benefits due to the intervention, participant responses concerning this issue were only 12.34% of all coded items. This low rate of participants’ responses concerning perceptions of mental benefits indicates that it is unlikely that effects were due to social desirability or a desire to please the instructor. For instance, one participant said, “I felt physical results, yes, but not much psychological changed for me.” Another participant indicated that she did not experience psychological differences due to the intervention because, “I am not a worrier.” In fact, in one case, the participant perceived no physical benefit when his scores on the four DVs indicated otherwise. Over the six-week intervention, he gradually went from a STAI score of 45 to 20; a BDI score of 16 (Mild Depression) to 0; a Hassles Frequency of 58 to 3; and a Hassles Severity of 1.121 to 1. However, when asked in the qualitative interview about the affects of the program on his psychological well-being, this individual replied, “not much, I consider myself well balanced.” Exercise may therefore have positive effects on psychological well-being, even in the absence of individual awareness. Further investigation comparing quantitative assessments versus participant perceptions of improvement may be warranted.

Social interaction effects. Of the comments concerning participant perceptions of the causation of exercise benefits, 54.90% of responses were related to the instructor. Comments included: “The leader herself had a desirable sense of humor, a pace of rhythm, and an attractive personality that lifted our spirits.” “The enthusiasm and personality and unhurried pace of our leader were factors that tended to raise my spirits, make me feel confidence in myself, optimism, and a sense of can-do.” “[The instructor] was perfect in all ways. Well trained, very pleasant, and good humored. She enjoyed her work and we responded famously to her.” “Exercising was fun, especially because the instructor liked being with us.” “The program is just great and having the instructor made it worthwhile to be at every class. She made it so enjoyable to work out. I’m really sorry she will be leaving us here at the facility. I have an exercise tape, but it’s no fun compared to her classes.” This strong participant perception of instructor influence of intervention effect may reflect the literature on psychotherapy outcomes. For instance, research indicates that while psychotherapy techniques account for only 15% of therapeutic outcomes, the relationship between therapist and client may account for as much as 30% of change (Lambert, 1992). The importance of the relationship between therapist and client in determining psychotherapy success may have a parallel relationship in the fitness industry. Qualitative research concerning leadership style of fitness instructors working with older adults suggests that participants perceive effective leaders as properly qualified, able to develop a personal bond with participants, and able to facilitate group demonstration of collective accomplishments (Estabrooks, Munroe, Fox, Gyurcsik, Hill, Lyon, Rosenkranz, & Shannon, 2004). It is possible that the sense of affiliation with and respect for his/her fitness instructor that an individual feels affects the efficacy of that fitness program in producing psychological results. Certainly, affiliation with the instructor could impact the individual’s motivation to attend the class, and increased attendance may improve the potential for effects. Therefore, instructor characteristics and participant affiliation with the instructor are both likely to have at least an indirect effect on the psychological benefits of exercise.

In addition to the instructor characteristics, social interaction with class mates was cited as a cause for exercise benefits (15.69% of responses in this category). One participant indicated “it was motivating to be with other class members who are similar to myself in age range and other features, and several who I count as friends.” Other participants indicated that, “exercising with my friends was fun,” and “the class members are fun and nice.” Overall, then, between

responses concerning the instructor and classmates, 70.59% of participant attributions concerning the benefits of exercise are related to social factors. Only 17.65% of the responses concerning causation of benefits attributed results to program characteristics (such as the age appropriateness of the classes, the availability and accessibility of classes in the living facility, and specific exercise or instructional techniques). This is reflective of Lambert's (1992) assertion that techniques are responsible for only 15% of psychotherapy outcomes. Statements indicating that increased motivation to exercise increased the potential for benefits to occur comprised 11.76% of statements concerning causation of exercise benefits. This may also be reflective of Lambert's model, which indicated that 15% of psychotherapy outcomes are due to the client's expectation that improvement will occur (i.e., a placebo effect).

Overall, qualitative interview results indicate that participants perceived most of their benefits as coming from social variables (the instructor and the group members). The EMI results also reflected this result; the changes in the EMI affiliation subscale over the six week intervention were not statistically significant. The social component of any exercise program is critical. In his dissertation research, for instance, Estabrooks (2000) found that when exercise participants were exposed to a team building condition, they attended significantly more classes and were more likely to return to the exercise program after a ten-week hiatus. Additionally, Bailey and McLaren (2005) concluded that merely performing activities with others was not associated with either a sense of belonging or mental health. They found, instead, that facilitation of belongingness among participants was a necessary component of an exercise program intended to improve mental health in older adults. Future research is warranted concerning the impact of cohesion among class members and individual affiliation with the instructor in adhering to and benefiting from a fitness program.

Environmental variables. The final category of participants' responses in the qualitative interviews concerned complaints about the program. Overall, 49 responses (20.85% of total responses) were related to complaints, but 26 of these (53.06% of all complaints) were positive complaints (indicating a specific statement from the participant concerning the absence of complaints; or a statement by one participant that her only complaint was that the program was ending, and she had to leave it). The majority of negative complaints were related to individual characteristics which affected the intervention (vision and hearing impairment, fatigue, laziness), and logistical and environmental variables. Several individuals expressed frustration at

environmental characteristics (such as the size of the space and the noise of the air conditioner). This may indicate the importance of selecting an appropriate environment when conducting fitness classes. However, in a senior citizen living facility, such as this one, classes are often conducted in the general activity room (as was done in this study). The activity room included a television, three exercise machines, four long tables and chairs for games, a collection of books and magazines, a popcorn stand and a soda machine, and sign-up sheets for activities and shuttle service. Generally, non-participating residents were respectful of the program and did not enter the activity room during classes, although there were exceptions. Generally, fitness classes are taught in a fitness environment, which includes sound-proofed walls, a high-quality music system, and quality equipment. This may not be possible for exercise classes on-site in senior living facilities, and instructors may have to accept that their impact will always be limited by the environmental variables inherent in the location.

Summary and Conclusions

The results indicate several future research directions. First, it is possible that if the study was replicated with a larger sample, statistically significant results would be identified. Post-hoc analysis did indicate some differences between groups, and it may be that the yoga intervention was inherently different from the other exercise formats. Mindfulness-based exercise research may have implications for improving quality of life among older individuals. Second, because attendance rates were significantly different between groups, it appears that certain programs were more popular than others. A further investigation into the characteristics of the popular programs may provide insight into the factors which encourage exercise adherence among the elderly. Additionally, because eight of the fourteen motivational profiles reduced in strength over the course of the intervention (and none increased), it is apparent that overall motivation to exercise decreased in strength over the course of the intervention. However, it may also be that motivation shifted to domains which the EMI does not assess.

Third, the demographic information concerning the participants of this study indicated that the sample included a larger portion of introverts and a smaller portion of extraverts than is normally found in the population. It is unknown whether changes in extraversion occur with aging, or if this sample demonstrated unusual characteristics. Previous research indicated a lack of personality change across the lifespan (Roberts & DelVecchio, 2000); however, this was

found with a younger population of elderly individuals than used in this study. Personality characteristics of the population may have implications for the type of exercise which is most appropriate.

Finally, the instructor variable was identified as a critical component of the fitness program. This supports previous research, which emphasized the importance of social interaction and instructor leadership as components of effective exercise programs. The majority of the students in this study cited the instructor as a source of exercise benefits. The ability of the instructor to cultivate a sense of student-instructor trust and group affiliation may be an important factor in promoting exercise enjoyment and therefore adherence among the elderly. Future research studies are needed in order to fully understand the impact of the instructor on participant fitness.

Previous research indicated that exercise has a small but significant effect on the health and well-being of the elderly. The results of this study, though limited by issues of power, supported this finding. However, as discussed previously, exercise participation rates were low among elderly individuals. Further research is needed to enhance our understanding of the exercise motivations of elderly individuals, the characteristics of the exercise programs to which elderly participants are most likely to adhere, and the instructor traits and social dynamics which are most likely to encourage continued exercise participation. The overall implication of this research study is that an improved understanding of the unique attributes of the older population may lead to the development of more effective exercise programs, targeted to increase motivation and adherence, and therefore fitness and functional independence of the elderly.

APPENDIX A
Medical History Form

HEALTH HISTORY

Name:

Age:

Sex:

Current Weight:

Desired Weight:

Personnel Physician:

Physician's Address:

Directions: Please answer the following questions to the best of your knowledge about yourself.

Check below any medical condition, treatment or problems that concern you.

I. HEART and CIRCULATORY

- A. ____ Heart Attack, Heart disease or any other heart related problems
- B. ____ Heart Valve Problems
- C. ____ Heart Murmur
- D. ____ Enlarged Heart
- E. ____ Irregular Heart Beat
- F. ____ Atherosclerosis
- G. ____ Stroke
- H. ____ High Blood Pressure (controlled)
- I. ____ High Blood Pressure (uncontrolled)
- J. ____ Rheumatic Fever
- K. ____ Cardiac Surgery
- L. ____ Coronary Bypass
- M. ____ High Triglyceride Level
- N. ____ High Cholesterol Level
- O. ____ Varicose Veins
- P. ____ Anemia
- Q. ____ Hemophilia
- R. ____ Diabetes (controlled)

- S. Diabetes (uncontrolled)
- T. Phlebitis, Emboli (blood clots)
- U. Other, Specify _____

II. RESPIRATORY

- A. Emphysema
- B. Bronchitis
- C. Pneumonia
- D. Asthma: _____ (childhood) _____ (currently)
- E. Lung Disease
- F. Other, Specify _____

III. OTHER DISEASE or ALIMENTS

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

Please explain any conditions you checked YES in I-III above:

IV. HAVE YOU RECENTLY HAD:

- A. _____ Chest Pain
- B. _____ Shortness of Breath Upon Exertion
- C. _____ Heart Palpitations
- D. _____ Cough on Exertion
- E. _____ Cough Up Blood
- F. _____ Swollen, Stiff or Painful Joints
- G. _____ Dizziness
- H. _____ Lightheadedness
- I. _____ Fainting
- J. _____ Back Problems
- K. _____ Gastrointestinal Disturbances (nausea, vomiting, diarrhea, abdominal pains)

Please explain any conditions you checked in IV above:

V. FAMILY MEDICAL HISTORY (Immediate Relatives)

- A. _____ Heart Attack, Heart Disease or other heart related problems
- B. _____ Stroke
- C. _____ Atherosclerosis
- D. _____ High Blood Pressure
- E. _____ Diabetes
- F. _____ Lung Disease
- G. _____ Respiratory Problems
- H. _____ Heart Surgery or
- I. _____ Heart Related Surgery
- J. _____ Other, Specify: _____

VI. TOBACCO

A. Do you currently smoke or use tobacco products?

_____ Yes _____ No

B. What type?

_____ Cigarette

_____ Pipe

_____ Cigar

_____ Chewing tobacco

C. How long? _____

D. Amount smoked per day? _____

E. If you do not currently smoke, have you ever?

_____ Yes _____ No

F. If YES, how long ago did you quit? _____

VII. EXERCISE

A. Do you exercise? _____ Yes _____ No

B. What kind of exercise do you presently engage in?

C. Is your level of effort: _____ minimal _____ moderate _____ high

D. How often do you exercise? _____ days per week

E. How long do you exercise? _____ minutes per day

Please list any prescription medications, vitamin/nutritional supplements, over-the-counter medications you are currently

Taking or have taken in the last 7 days (don't forget to include hormones, headache/migraine medications, etc.):

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

Date of last physical examination? _____

Results: _____

Date of last EKG _____

Results: _____

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

Signature: _____ **Date:**

Signature of Parent/Guardian: _____

Date: _____

(required for participants under 18 years of age)

APPENDIX B
Demographic Information Form

APPENDIX C
Hassles Scale

Hassles are irritating, frustrating, and distressing demands that can range from annoyances to major pressures, problems, or difficulties.

Listed on the following pages are a number of minor events which may occur daily. Please circle the appropriate number to indicate whether each event was either, “not a hassle” “somewhat of a hassle” “a moderate hassle” or “a major hassle” over the last month.

0 = not a hassle
 1 = somewhat a hassle
 2 = A moderate hassle
 3 = A major hassle

1	Misplacing or losing things	0	1	2	3
2	Troublesome neighbors	0	1	2	3
3	Social obligations	0	1	2	3
4	Inconsiderate smokers	0	1	2	3
5	Troubling thoughts about your future	0	1	2	3
6	Thoughts about death	0	1	2	3
7	Health of a family member	0	1	2	3
8	Not enough money for clothing	0	1	2	3
9	Not enough money for housing	0	1	2	3
10	Concerns about owing money	0	1	2	3

11	Concerns about money for emergencies	0	1	2	3
12	Someone owes you money	0	1	2	3
13	Financial responsibility for someone who doesn't live with you	0	1	2	3
14	Smoking too much	0	1	2	3
15	Use of alcohol	0	1	2	3
16	Personal use of drugs	0	1	2	3
17	Too many responsibilities	0	1	2	3
18	Care for pet	0	1	2	3
19	Planning meals	0	1	2	3
20	Concerned about the meaning of life	0	1	2	3
21	Trouble relaxing	0	1	2	3
22	Trouble making decisions	0	1	2	3
23	Problems getting along with fellow residents / neighbors	0	1	2	3
24	Home maintenance (inside)	0	1	2	3

25	Not enough money for basic necessities	0	1	2	3
26	Too many interruptions	0	1	2	3
27	Unexpected company	0	1	2	3
28	Too much time on hands	0	1	2	3
29	Having to wait	0	1	2	3
30	Concerns about accidents	0	1	2	3
31	Being lonely	0	1	2	3
32	Not enough money for health care	0	1	2	3
33	Fear of confrontation	0	1	2	3
34	Financial security	0	1	2	3
35	Silly practical mistakes	0	1	2	3
36	Inability to express yourself	0	1	2	3
37	Physical illness	0	1	2	3
38	Side effects of medication	0	1	2	3
39	Concerns about medical treatment	0	1	2	3

40	Physical appearance	0	1	2	3
41	Fear of rejection	0	1	2	3
42	Sexual problems that result from physical problems	0	1	2	3
43	Sexual problems other than those resulting from physical problems	0	1	2	3
44	Concerns about health in general	0	1	2	3
45	Not seeing enough people	0	1	2	3
46	Friends or relatives too far away	0	1	2	3
47	Preparing meals	0	1	2	3
48	Wasting time	0	1	2	3
49	Auto maintenance	0	1	2	3
50	Filling out forms	0	1	2	3
51	Problems with employees	0	1	2	3
52	Declining physical abilities	0	1	2	3
53	Being exploited	0	1	2	3
54	Concerns about bodily functions	0	1	2	3

55	Rising prices of common goods	0	1	2	3
56	Not getting enough rest	0	1	2	3
57	Not getting enough sleep	0	1	2	3
58	Problems with your children	0	1	2	3
59	Problems with persons younger than yourself	0	1	2	3
60	Problems with your lover	0	1	2	3
61	Difficulties seeing or hearing	0	1	2	3
62	Overloaded with family responsibilities	0	1	2	3
63	Too many things to do	0	1	2	3
64	Unchallenging work	0	1	2	3
65	Concerns about meeting high standards	0	1	2	3
66	Financial dealings with friends or acquaintances	0	1	2	3
67	Trouble with reading, writing, or spelling abilities	0	1	2	3

68	Too many meetings	0	1	2	3
69	Problems with divorce or separation	0	1	2	3
70	Trouble with arithmetic skills	0	1	2	3
71	Gossip	0	1	2	3
72	Legal problems	0	1	2	3
73	Concerns about weight	0	1	2	3
74	Not enough time to do the things you need to do	0	1	2	3
75	Television	0	1	2	3
76	Not enough personal energy	0	1	2	3
77	Concerns about inner conflicts	0	1	2	3
78	Feel conflicted over what to do	0	1	2	3
79	Regrets over past decisions	0	1	2	3
80	The weather	0	1	2	3
81	Nightmares	0	1	2	3
82	Concerns about getting ahead	0	1	2	3

83	Difficulties with friends	0	1	2	3
84	Not enough time for family	0	1	2	3
85	Transportation problems	0	1	2	3
86	Not enough money for entertainment and recreation	0	1	2	3
87	Shopping	0	1	2	3
88	Prejudice and discrimination from others	0	1	2	3
89	Property, investments, or taxes	0	1	2	3
90	Not enough time for entertainment and recreation	0	1	2	3
91	Concerns about news events	0	1	2	3
92	Noise	0	1	2	3
93	Crime	0	1	2	3
94	Traffic	0	1	2	3
95	Pollution	0	1	2	3
96	Have we missed any of your hassles? If so, write them in:	0	1	2	3

97 One more thing: Has there been a change in your life that affected how you answered this scale? If so, tell us what it was:

APPENDIX D
State-Trait Anxiety Inventory

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

Not at all	Somewhat	Moderately	Very much
------------	----------	------------	-----------

I Feel Calm -----	(1)	(2)	(3)	(4)
I Feel Secure -----	(1)	(2)	(3)	(4)
I Feel Tense -----	(1)	(2)	(3)	(4)
I Feel Regretful -----	(1)	(2)	(3)	(4)
I Feel At Ease -----	(1)	(2)	(3)	(4)
I Feel Upset -----	(1)	(2)	(3)	(4)
I Am Presently Worrying Over Possible Misfortunes -----	(1)	(2)	(3)	(4)
I Feel Rested -----	(1)	(2)	(3)	(4)
I Feel Anxious-----	(1)	(2)	(3)	(4)
I Feel Comfortable-----	(1)	(2)	(3)	(4)
I Feel Self Confident-----	(1)	(2)	(3)	(4)
I Feel Nervous-----	(1)	(2)	(3)	(4)
I Am Jittery -----	(1)	(2)	(3)	(4)
I Feel "High Strung"-----	(1)	(2)	(3)	(4)
I Am Relaxed -----	(1)	(2)	(3)	(4)
I Feel Content -----	(1)	(2)	(3)	(4)
I Am Worried -----	(1)	(2)	(3)	(4)
I Feel Over Excited and "Rattled" -----	(1)	(2)	(3)	(4)
I Feel Joyful -----	(1)	(2)	(3)	(4)
I Feel Pleasant-----	(1)	(2)	(3)	(4)

APPENDIX E
Beck Depression Inventory – II

Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group.

Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

Past failure

- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

Guilty Feelings

0 I don't feel particularly guilty.

1 I feel guilty over many things I have done or should have done.

2 I feel quite guilty most of the time.

3 I feel guilty all of the time.

Punishment Feelings

0 I don't feel like I am being punished.

1 I feel I may be punished.

2 I expect to be punished.

3 I feel I am being punished.

Self-Dislike

0 I feel the same about myself as ever.

1 I have lost confidence in myself.

2 I am disappointed in myself.

3 I dislike myself.

Self-Criticalness

0 I don't criticize or blame myself more than usual.

1 I am more critical of myself than I used to be.

2 I criticize myself for all of my faults.

3 I blame myself for everything bad that happens.

Suicidal Thoughts or Wishes

0 I don't have any thoughts of killing myself.

1 I have thoughts of killing myself, but I would not carry them out.

2 I would like to kill myself.

3 I would kill myself if I had the chance.

Crying

0 I don't cry anymore than I used to.

- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

Agitation

- 0 I am no more restless or wound up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

Loss of Interest

- 0 I have not lost interest in other people or activities.
- 1 I am less interested in other people or things than before.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

Indecisiveness

- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have much greater difficulty in making decisions than I used to.
- 3 I have trouble making any decisions.

Worthlessness

- 0 I do not feel I am worthless.
- 1 I don't consider myself as worthwhile and useful as I used to.
- 2 I feel more worthless as compared to other people.
- 3 I feel utterly worthless.

Loss of energy

- 0 I have as much energy as ever.
- 1 I have less energy than I used to have.

- 2 I don't have enough energy to do very much.
- 3 I don't have enough energy to do anything.

Changes in Sleeping Pattern

- 0 I have not experienced any change in my sleeping pattern.
- 1 I sleep somewhat more than usual.
- 1 I sleep somewhat less than usual.
- 2 I sleep a lot more than usual.
- 2 I sleep a lot less than usual.
- 3 I sleep most of the day.
- 3 I wake up 1-2 hours early and can't get back to sleep.

Irritability

- 0 I am no more irritable than usual.
- 1 I am more irritable than usual.
- 2 I am much more irritable than usual.
- 3 I am irritable all the time.

Changes in Appetite

- 0 I have not experienced any change in my appetite.
- 1 My appetite is somewhat less than usual.
- 1 My appetite is somewhat greater than usual.
- 2 My appetite is much less than before.
- 2 My appetite is much greater than usual.
- 3 I have no appetite at all.
- 3 I crave food all the time.

Concentration Difficulty

- 0 I can concentrate as well as ever.
- 1 I can't concentrate as well as usual.
- 2 It's hard to keep my mind on anything for very long.

3 I find I can't concentrate on anything.

Tiredness or Fatigue

0 I am no more tired or fatigued than usual.

1 I get more tired or fatigued more easily than usual.

2 I am too tired or fatigued to do a lot of the things I used to do.

3 I am too tired or fatigued to do most of the things I used to do.

Loss of Interest in Sex

0 I have not noticed any recent change in my interest in sex.

1 I am less interested in sex than I used to be.

2 I am much less interested in sex now.

3 I have lost interest in sex completely.

APPENDIX F
Eysenck Personality Inventory

Here are some questions regarding the way you behave, feel and act. After each question is a space for answering “Yes” or “No”.

Try and decide whether “Yes” or “No” represents your usual way of acting or feeling. Then blacken in the space under the column headed “Yes” or “No”.

Work quickly, and don’t spend too much time over any question; we want your first reaction, not a long drawn-out thought process. The whole questionnaire shouldn’t take more than a few minutes. Be sure not to omit any question. Work quickly, and remember to answer every question. There are no right or wrong answers, and this isn’t a test of intelligence or ability, but simply a measure of the way you behave.

Do You Often Long For Excitement? -----	Yes	No
Do You Often Need Understanding Friends to Cheer you up?-----	Yes	No
Are You Usually Carefree?-----	Yes	No
Do You Find It Very Hard To Take no for An Answer?-----	Yes	No
Do You Stop And Think Things Over Before doing Anything?-----	Yes	No
If You Say You Will Do Something Do You always Keep Your Promise, No Matter how Inconvenient It Might Be To Do So?-----	Yes	No
Does Your Mood Often Go Up And Down?-----	Yes	No
Do You Generally Do And Say Things quickly Without Stopping To Think?-----	Yes	No
Do You Ever Feel “Just Miserable” For No good Reason?-----	Yes	No
Would You Do Almost Anything For A Dare?-----	Yes	No
Do You Suddenly Feel Shy When You Want to Talk To An Attractive Stranger?-----	Yes	No

Once In A While Do You Lose Your Temper and Get Angry-----	Yes	No
Do You Often Do Things On The Spur Of The Moment? -----	Yes	No
Do You Often Worry About Things You Should not Have Said Or Done?-----	Yes	No
Generally Do You Prefer Reading To Meeting People? -----	Yes	No
Are Your Feelings Rather Easily Hurt?-----	Yes	No
Do You Like Going Out A Lot?-----	Yes	No
Do You Occasionally Have Thoughts And ideas that You Would Not Like Other People to Know About?-----	Yes	No
Are You Sometimes Bubbling Over With Energy and Sometimes Very Sluggish?-----	Yes	No
Do You Prefer To Have Few But Special Friends?-----	Yes	No
Do You Daydream A Lot?-----	Yes	No
When People Shout At You, Do You Shout Back?-----	Yes	No
Are You Often Troubled About Feelings Of Guilt?-----	Yes	No
Are All Of Your Habits Good And Desirable Ones?-----	Yes	No
Can You Usually Let Yourself Go And Enjoy yourself A Lot At A Party-----	Yes	No
Would You Call Yourself Tense Or “Highly Strung”?-----	Yes	No
Do Other People Think Of You As Being Very Lively?-----	Yes	No
After You Have Done Something Important, Do You Often come Away Feeling You Could Have Done Better? -----	Yes	No
Are You Quiet When You Are With Other People?-----	Yes	No
Do You Sometimes Gossip?-----	Yes	No
Do Ideas Run Through Your Head So That You cannot Sleep?-----	Yes	No
If There Is Something You Want To Know About, Would you Rather Look It Up In A Book Than Talk to Someone About It?-----	Yes	No

Do You Get Palpitations or Thumping In Your Heart?-----	Yes	No
Do You Like The Kind Of Work That You Need To pay Close Attention To?-----	Yes	No
Do You Get Attacks of Shaking or Trembling?-----	Yes	No
Would You Always Declare Everything At The Customs Even if You Knew That You Could Never Be Found Out?-----	Yes	No
Do You Hate Being With A Crowd Who Play Jokes on One Another?-----	Yes	No
Are You An Irritable Person?-----	Yes	No
Do You Like Doing Things In Which You Have to Act Quickly?-----	Yes	No
Do You Worry About Awful Things That Might Happen?-----	Yes	No
Are You Slow And Unhurried In The Way You Move?-----	Yes	No
Have You Ever Been Late For An Appointment Or Work?-----	Yes	No
Do You Have Many Nightmares?-----	Yes	No
Do You Like Talking To People SO Much That You Would never Miss A Chance Of Talking To A Stranger?-----	Yes	No
Are You Troubled By Aches And Pains?-----	Yes	No
Would You Be Very Unhappy If You Could Not See Lots of People Most Of The Time?-----	Yes	No
Would You Call Yourself a Nervous Person?-----	Yes	No
Of All Of People You Know Are There Some Whom you Definitely DO Not Like?-----	Yes	No
Would You Say You Were Fairly Self-Confident?-----	Yes	No
Are You Easily Hurt When People Find Fault With You or Your Work?-----	Yes	No
Do You Find It Hard To Really Enjoy Yourself At a Lively Party?-----	Yes	No
Are You Troubled With Feelings Of Inferiority?-----	Yes	No
Can You Easily Get Some Life Into A Rather Dull Party?-----	Yes	No
Do You Sometimes Talk About Things		

You Know Nothing About?-----	Yes	No
Do You Worry About Your Health?-----	Yes	No
Do You Like Playing Pranks On Others?-----	Yes	No
Do You Suffer From Sleeplessness?-----	Yes	No

APPENDIX G

The Exercise Motivations Inventory

On the following pages are a number of statements concerning the reasons people often give when asked why they exercise. Please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement is true for you personally, or would be true for you personally if you did exercise.

If you do not consider a statement to be true for you, circle the '0'.

If you think that a statement is very true for you, circle the '5'.

If you think that a statement is partly true for you, then circle the 1, 2, 3, or 4 according to how strongly you feel that it reflects why you exercise or might exercise.

Remember, we want to know why you personally choose to exercise or might choose to exercise, not whether you think the statements are good reasons for anybody to exercise.

Personally, I exercise (or might exercise):	Not at all true for me					Very true for me
To stay slim.	0	1	2	3	4	5
To avoid ill health.	0	1	2	3	4	5
Because it makes me feel good.	0	1	2	3	4	5
To help me look younger.	0	1	2	3	4	5
To show my worth to others.	0	1	2	3	4	5
To give me space to think.	0	1	2	3	4	5
To have a healthy body.	0	1	2	3	4	5
To build up my strength.	0	1	2	3	4	5
Because I enjoy the feeling of exerting myself.	0	1	2	3	4	5
To spend time with friends.	0	1	2	3	4	5
Because my doctor advised me to exercise.	0	1	2	3	4	5
Because I like trying to win in physical activities.	0	1	2	3	4	5
To stay/become more agile.	0	1	2	3	4	5
To give me goals to work towards.	0	1	2	3	4	5

To lose weight.	0	1	2	3	4	5
To prevent health problems.	0	1	2	3	4	5
Because I find exercise invigorating.	0	1	2	3	4	5
To have a good body.	0	1	2	3	4	5
To compare my abilities with other peoples'.	0	1	2	3	4	5
Because it helps to reduce tension.	0	1	2	3	4	5
Because I want to maintain good health.	0	1	2	3	4	5
To increase my endurance.	0	1	2	3	4	5
Because I find exercise satisfying in and of itself.	0	1	2	3	4	5
To enjoy the social aspects of exercising.	0	1	2	3	4	5
To help prevent an illness that runs in my family.	0	1	2	3	4	5
Because I enjoy competing.	0	1	2	3	4	5
To maintain flexibility.	0	1	2	3	4	5
To give me personal challenges to face.	0	1	2	3	4	5
To help control my weight.	0	1	2	3	4	5
To avoid heart disease.	0	1	2	3	4	5
To recharge my batteries.	0	1	2	3	4	5
To improve my appearance.	0	1	2	3	4	5
To gain recognition for my accomplishments.	0	1	2	3	4	5
To help manage stress.	0	1	2	3	4	5
To feel more healthy.	0	1	2	3	4	5
To get stronger.	0	1	2	3	4	5
For enjoyment of the experience of exercising.	0	1	2	3	4	5
To have fun being active with other people.	0	1	2	3	4	5
To help recover from an illness / injury.	0	1	2	3	4	5
Because I enjoy physical competition.	0	1	2	3	4	5
To stay / become flexible.	0	1	2	3	4	5
To develop personal skills.	0	1	2	3	4	5
Because exercise helps me to burn calories.	0	1	2	3	4	5
To look more attractive.	0	1	2	3	4	5

To accomplish things that others are incapable of.	0	1	2	3	4	5
To release tension.	0	1	2	3	4	5
To develop my muscles.	0	1	2	3	4	5
Because I feel at my best when exercising.	0	1	2	3	4	5
To make new friends.	0	1	2	3	4	5
Because I find physical activities fun, especially when competition is involved.	0	1	2	3	4	5
To measure myself against personal standards.	0	1	2	3	4	5

APPENDIX H
Human Subjects Committee Approval



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

APPROVAL MEMORANDUM

Date: 1/18/2005

To:
Kimberlee Bethany
940 Spottswood Drive
Tallahassee FL 32308

Dept.: **EDUCATION**

From: **John Tomkowiak, Chair**

A handwritten signature in cursive script that reads "John Tomkowiak M.D.".

Re: **Use of Human Subjects in Research**
The effects of selected exercise modalities on stress, anxiety, and depression responses in the elderly

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on **12/8/2004**. Your project was approved by the Committee.

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

If the project has not been completed by **12/7/2005** you must request renewed approval for continuation of the project.

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

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

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

cc: David Pargman
HSC No. 2004.843

APPENDIX I
Explanation and Consent Form

INFORMED CONSENT FORM

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

This research is being conducted by Kimberlee Bethany, who is a graduate student in Sport and Exercise Psychology at Florida State University. I understand the purpose of her research project is to better understand how regular exercise affects feelings and attitudes. In addition to general health care practices it is exploring several different forms of exercise, including chair yoga, chair aerobics, walking, and a non-exercise control group, which will play cards and games. I understand that if I participate in the project I may participate in 6 weeks of exercise. I understand that if I choose to participate in the project, I may be assigned to the card playing group instead of to an exercise group.

I understand I will be asked to fill out paper and pencil questionnaires on 7 different occasions. I may also be asked to participate in an interview. The total time commitment would be 90 minutes per week for 6 weeks of exercise, plus 7 sessions of approximately 45 minutes for the questionnaires. I will have the opportunity to receive printed information about the benefits of exercise. My questions about exercise will be answered by the researcher or she will refer me to a knowledgeable source.

I understand my participation is totally voluntary and I may stop participation at anytime. All my answers to the questions will be kept confidential, to the extent allowed by law, and identified by a subject code number. My name will not appear on any of the results. No individual responses will be reported. Only group findings will be reported.

I understand there is a possibility of a minimal level of risk involved if I agree to participate in this study. I might experience physical or emotional discomfort while exercising, although the risks of physical injury will be minimized as much as possible. The researcher will be available to talk with me about any emotional or physical discomfort I may experience while

participating, and to help me make decisions concerning continued participation in the study which are best for my health and well-being. I am also able to stop my participation at any time I wish.

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

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

I understand that I may contact Kimberlee Bethany, Florida State University, College of Education, (850) 980 – 5225, or her major professor, Dr. David Pargman, Stone 307-H, (850) 644-8793, for answers to questions about this research or my rights. Group results will be sent to me upon my request.

I have read and understand this consent form.

_____ (Subject)

(Date)

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

APPENDIX J
Legal Guardian Consent Form

Human Subjects Committee

Guardian Consent Letter for Legal Dependents

Dear Legal Guardian:

I am a graduate student under the direction of Professor David Pargman in the Sport and Exercise Psychology Program, the Department of Educational Psychology and Learning Systems, in the College of Education at Florida State University. I am conducting a research study to examine the “Effects of Selected Exercise Modalities upon Feelings and Attitudes of Adults.”

Your dependent's participation will involve taking fitness classes 3 times per week, for 30 minutes per session, for a six week period, as well as filling out paperwork at the end of each week. The exercise sessions will be taught by a trained, certified fitness instructor, and safety and participant enjoyment of the classes will be of the highest priority. Your participation, as well as that of your dependent, in this study is voluntary. If you or your dependent choose not to participate or to withdraw from the study at any time, there will be no penalty. The results of the research study may be published, but your dependent's name will not be used. Complete confidentiality will be maintained.

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

If you have any questions concerning this research study or your dependent's participation in the study, please call me at (850) 980 -5225, or Dr. David Pargman, at (850) 644-8793.

Sincerely,

Kimberlee Bethany

I give consent for my legal dependent _____ to participate in the above study.

Legal Guardian's Name: _____

Guardian's Signature _____ (Date) _____

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

APPENDIX K
Beck Depression Inventory Referral Protocol

Beck Depression Inventory Protocol:

When individuals who are assessed with the BDI are identified: (1) as having a BDI score above the cut-off for severe depression or (2) who indicate suicidal ideation, they will be referred through the following process:

1. The researcher will meet with the individual and inform him/her that there is some concern about his/her results on the Beck Depression Inventory. The nature of the concern (high depression score, and/or indication of suicidal ideation) will be explained. The researcher will suggest that the individual schedule an appointment with his/her primary care physician in order to be screened for participation in the research. The researcher will ask the individual to sign a release form allowing her to contact the primary care physician.

1a) If the individual refuses to sign a release form or allow contact of the primary care physician, he/she will not be allowed to participate in the research study. Because of confidentiality issues, the researcher will not be able to contact the physician without a release from the individual to do so. However, the researcher will provide the individual with the names, phone numbers, and addresses of mental health service providers in the Tallahassee area and suggest that the individual contact one of these providers. Additionally, contact information for Apalachee Mental Health Services will be provided (in case the individual is without health insurance), as well as for the Telephone Counseling Referral Service / Emergency Hotline (in case the individual experiences a mental health emergency).

1b) If the individual agrees to sign a release form and allows the primary care physician to be contacted, the researcher will contact the physician, provide the results of the BDI, suggest that a depression screening be conducted and recommend that referral to a mental health professional be made as appropriate. If the individual wishes to participate in the study, approval for participation must be given by written permission from the primary care physician. In such a case, the researcher will monitor the individual throughout the duration of the intervention, and the individual will only be able to remain a participant in the intervention if he/she is following the doctor's orders concerning medication and appointments.

2. If an individual who has a legal guardian has been identified as having problematic BDI scores, then both the individual and the legal guardian will be consulted per the protocol established in 1.

Release form:

I, _____, give Kimberlee Bethany permission to contact Dr. _____, my primary care physician and Dr. _____ a local psychologist and to release to them any pertinent health or psychological information.

APPENDIX L

Figures for Introversion-Extraversion and Treatment

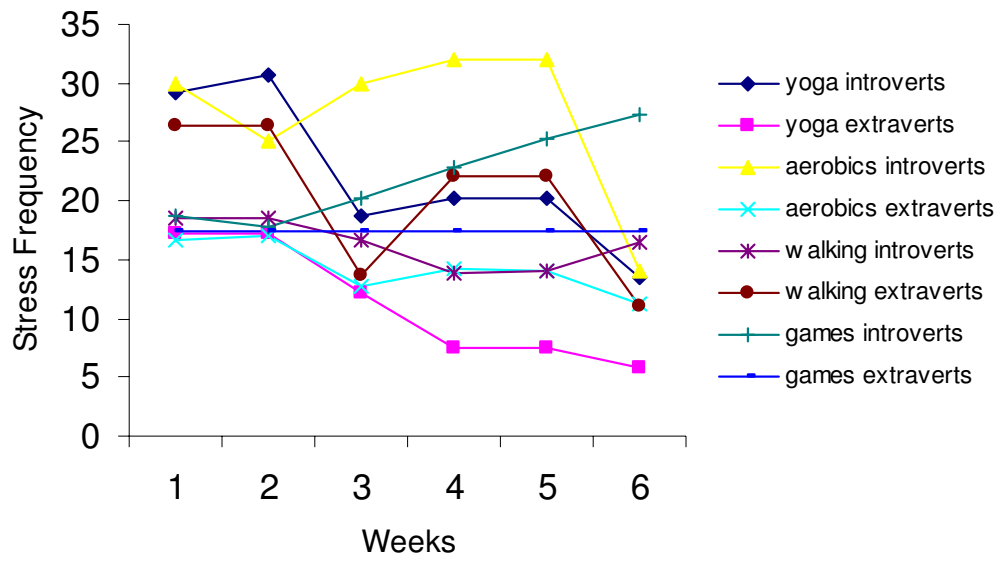


Figure 11: Stress frequency throughout the 6 weeks for each of the 4 studied groups, incorporating extraverts and introverts.

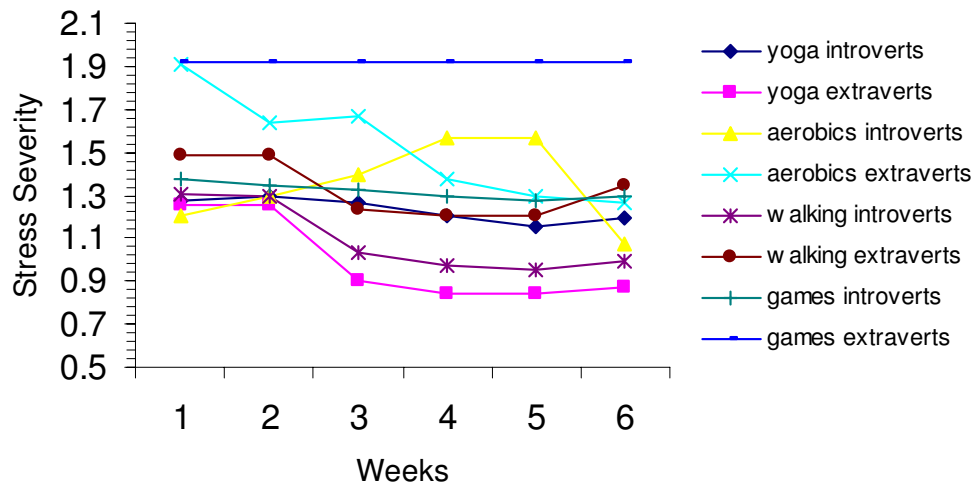


Figure 12: Stress severity throughout the 6 weeks for each of the 4 studied groups, incorporating extraverts and introverts.

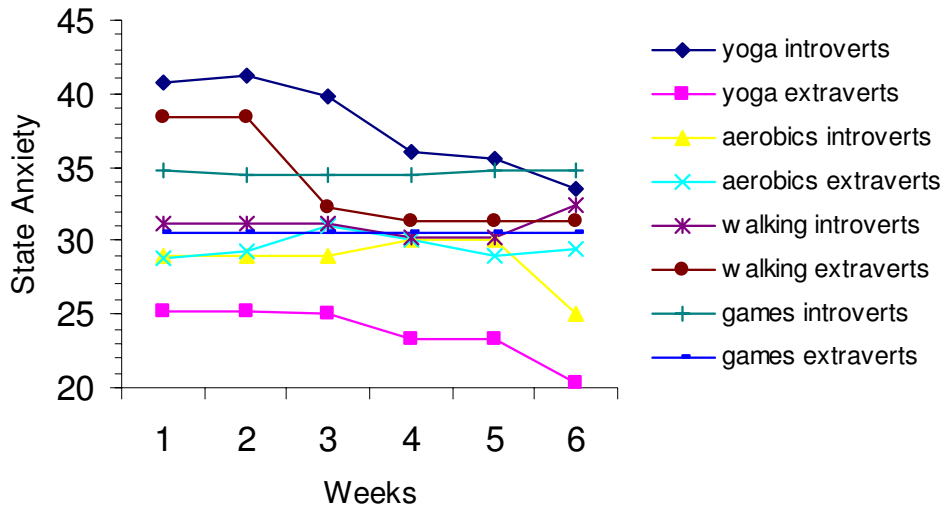


Figure 13: State anxiety throughout the 6 weeks for each of the 4 studied groups, incorporating extraverts and introverts.

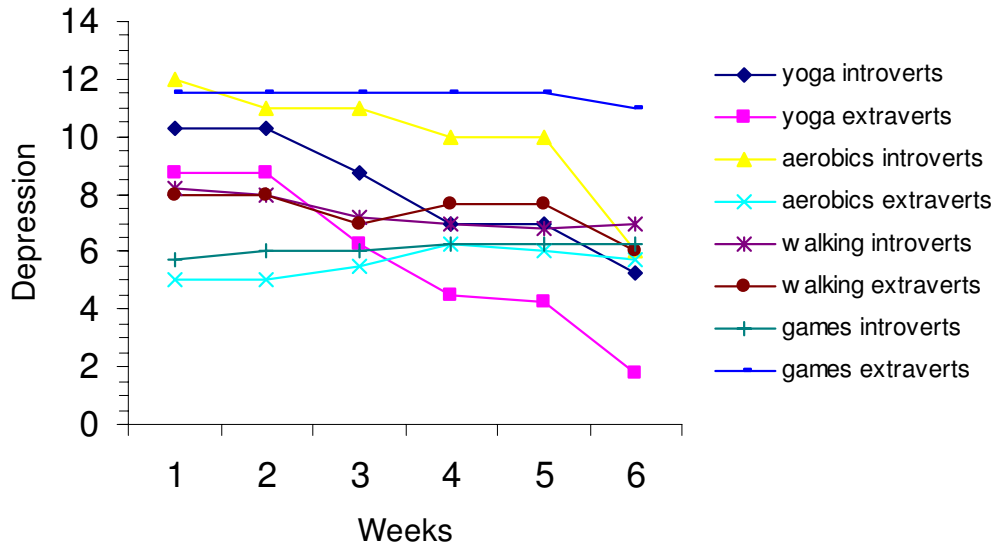


Figure 14: Depression throughout the 6 weeks for each of the 4 studied groups, incorporating extraverts and introverts.

APPENDIX M

Figures for Motivation to Adhere to the Program

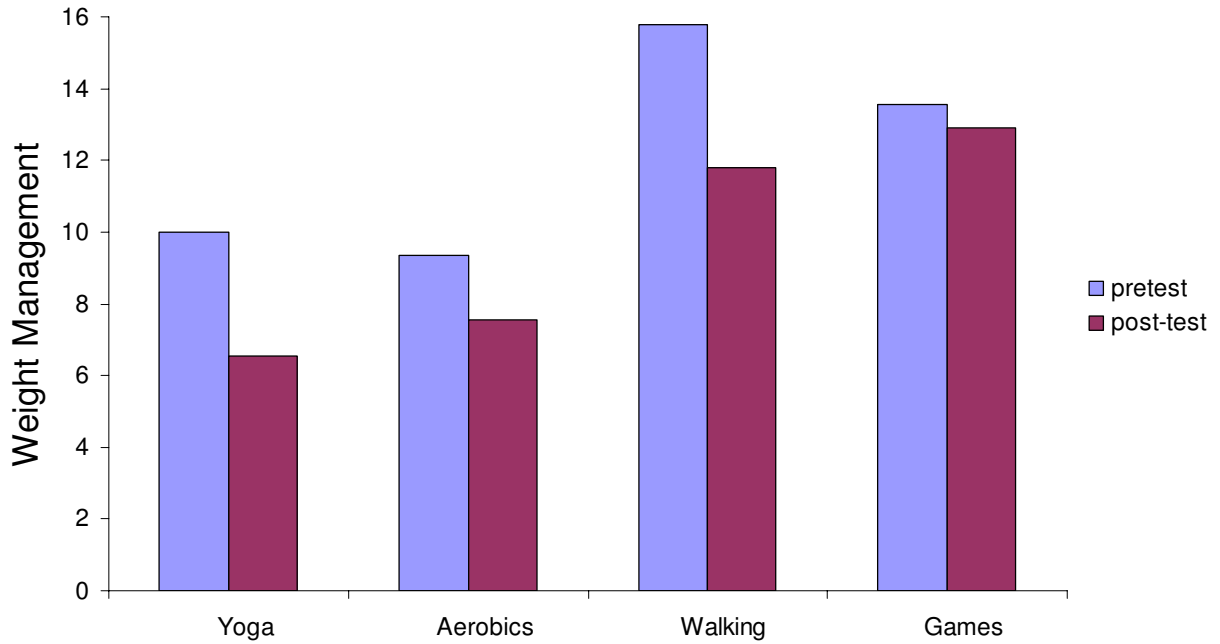


Figure 15: Bar graph representing the pre and post-test mean weight management motivation for the 4 groups.

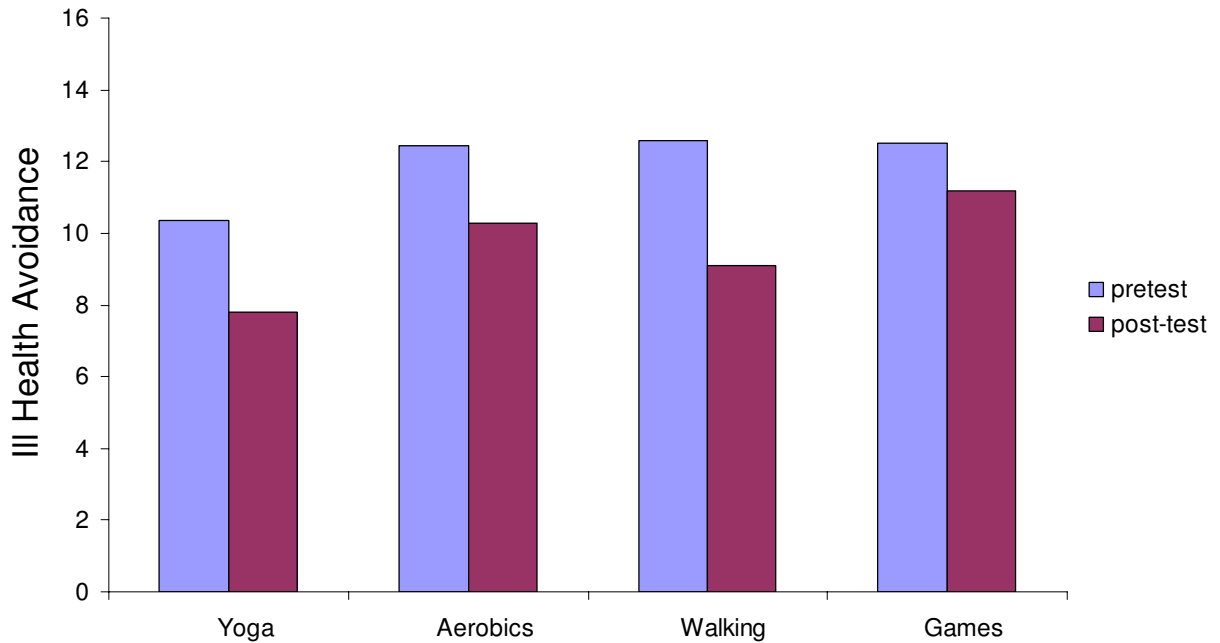


Figure 16: Bar graph representing the pre and post-test mean ill health avoidance motivation for the 4 groups.

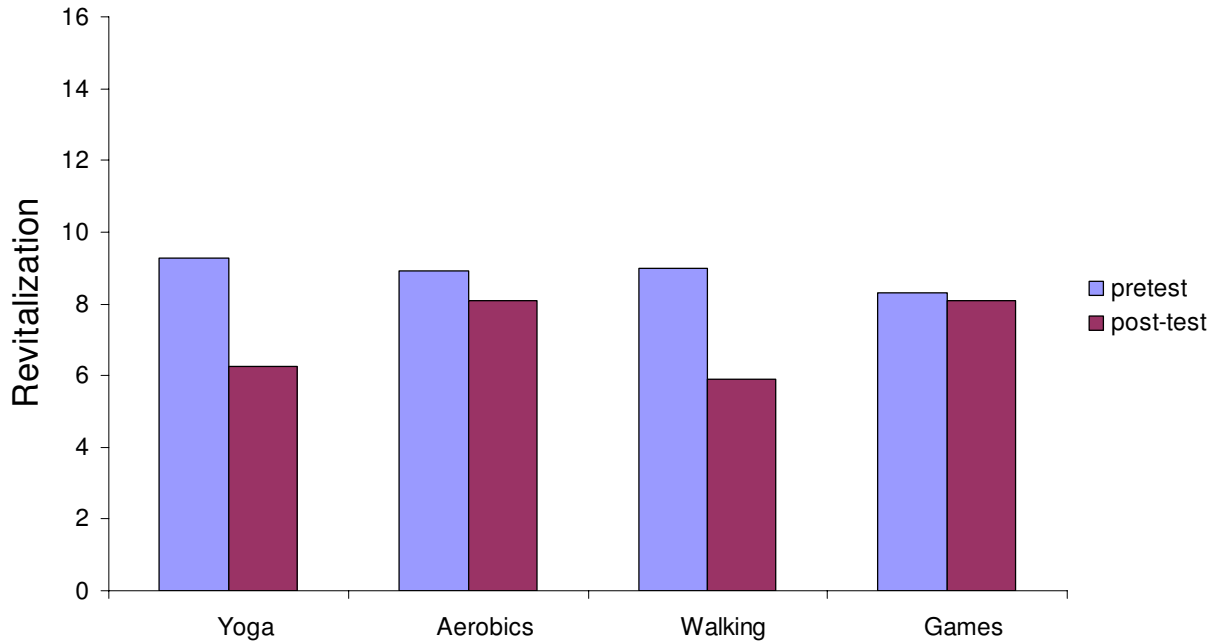


Figure 17: Bar graph representing the pre and post-test mean revitalization motivation for the 4 groups.

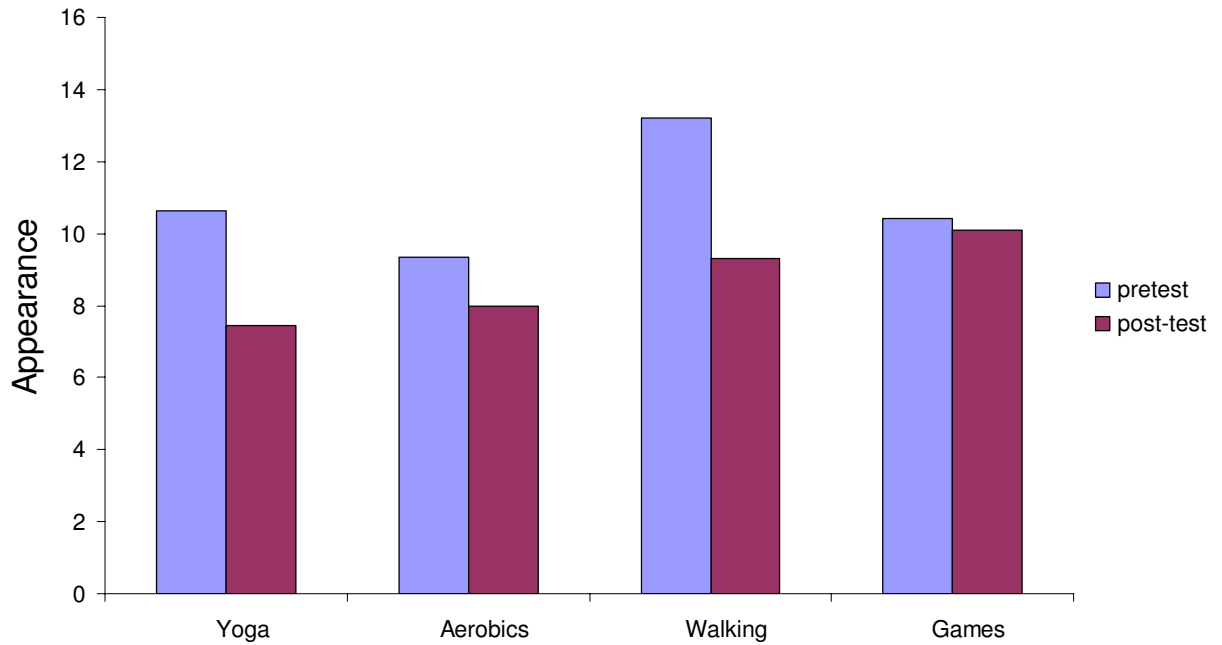


Figure 18: Bar graph representing the pre and post-test mean appearance motivation for the 4 groups.

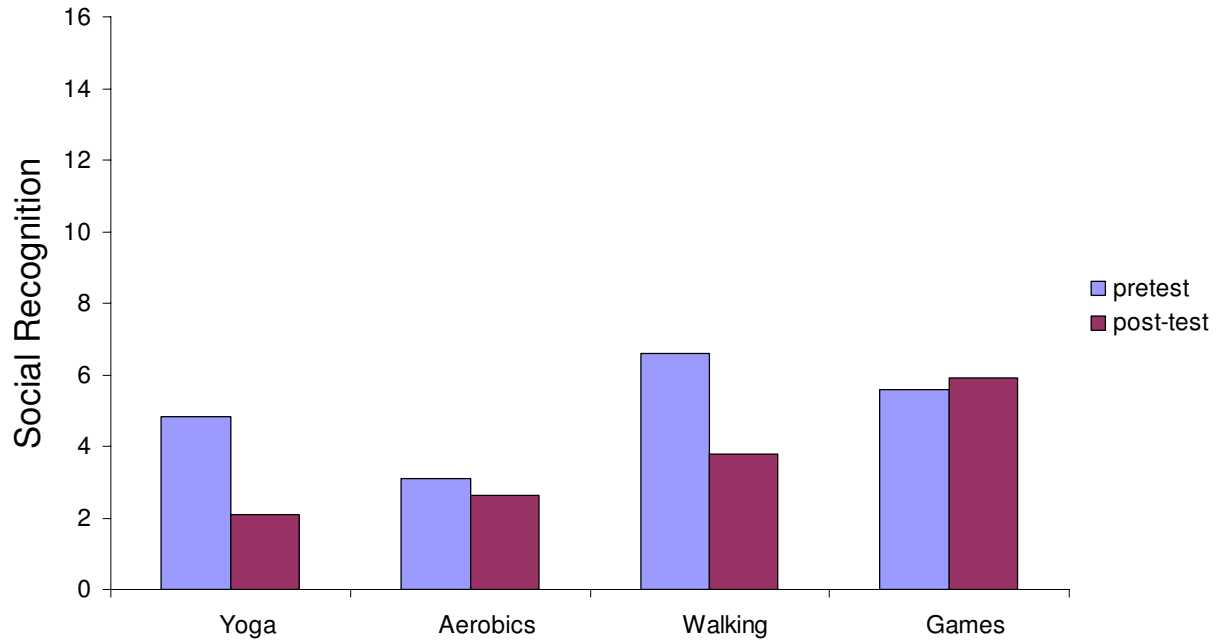


Figure 19: Bar graph representing the pre and post-test mean social recognition motivation for the 4 groups.

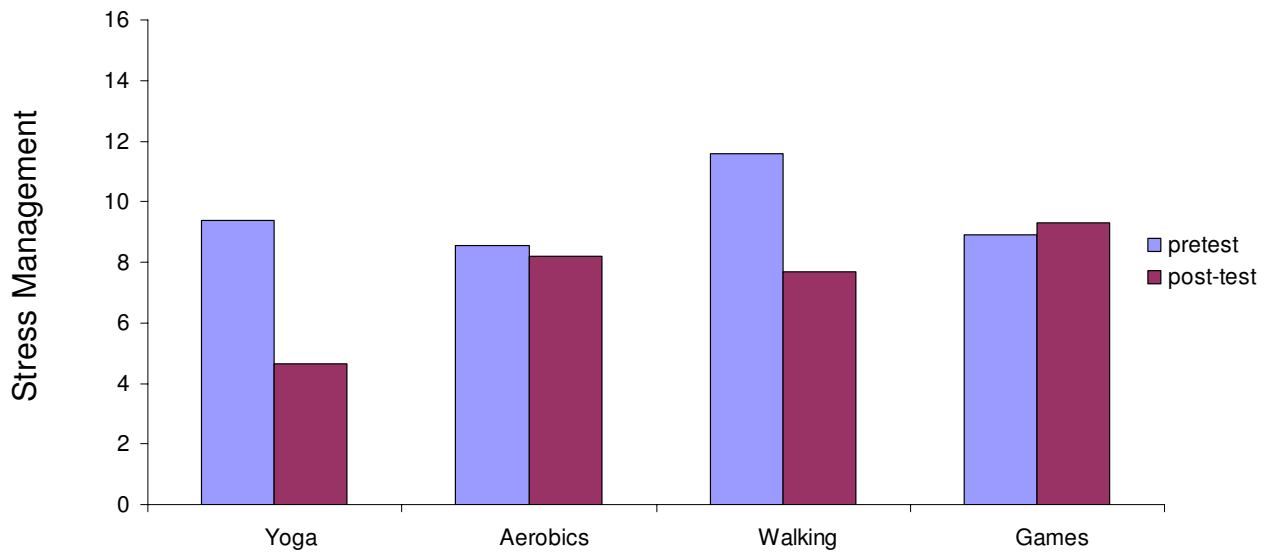


Figure 20: Bar graph representing the pre and post-test mean stress management motivation for the 4 groups.

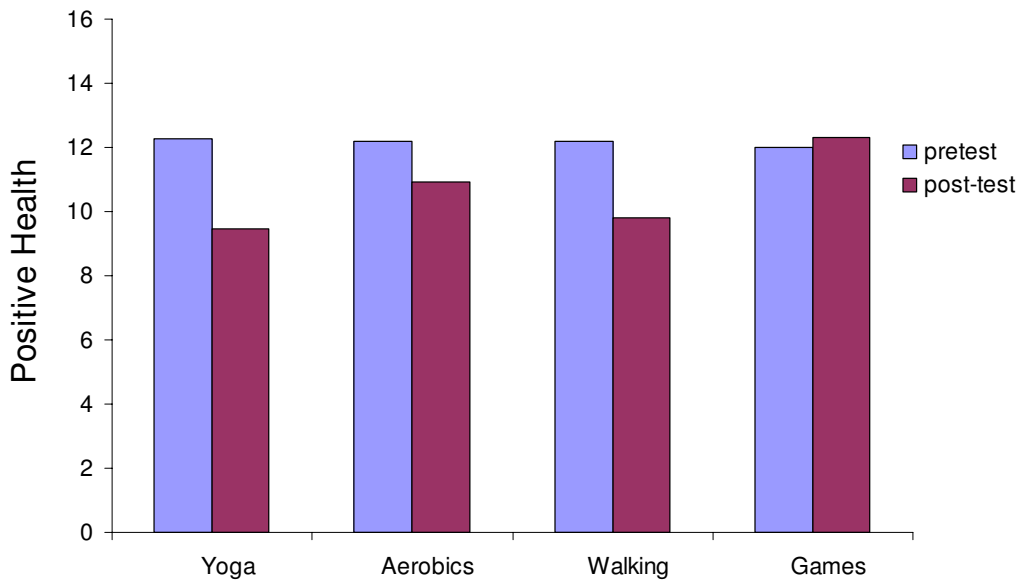


Figure 21: Bar graph representing the pre and post-test mean positive health motivation for the 4 groups.

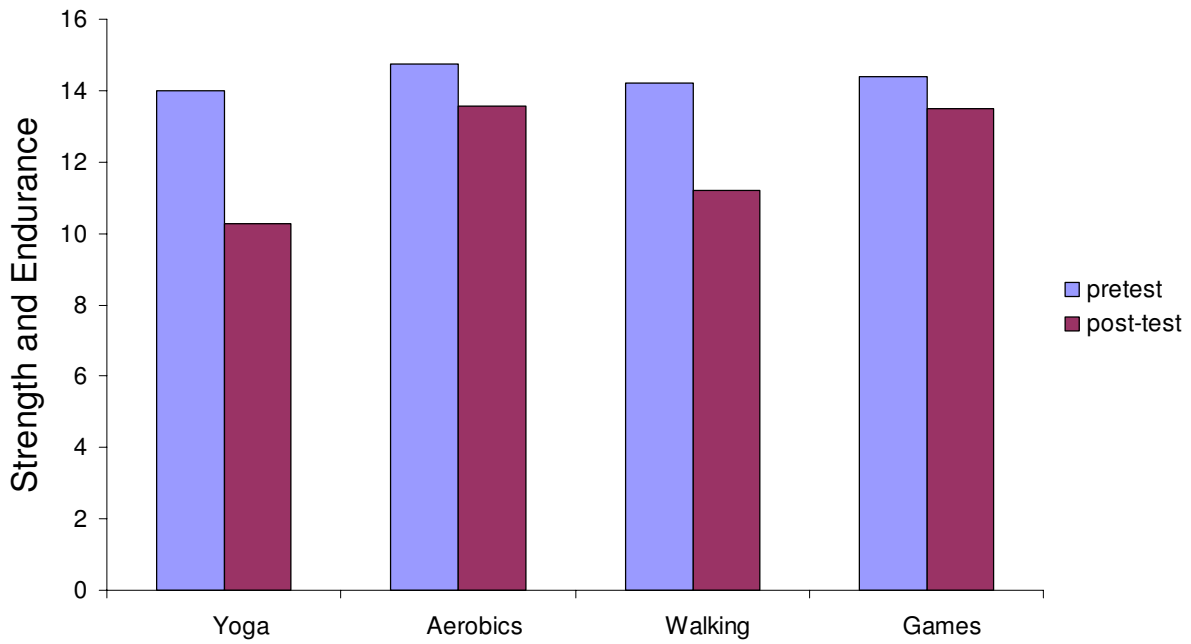


Figure 22: Bar graph representing the pre and post-test mean strength and endurance motivation for the 4 groups.

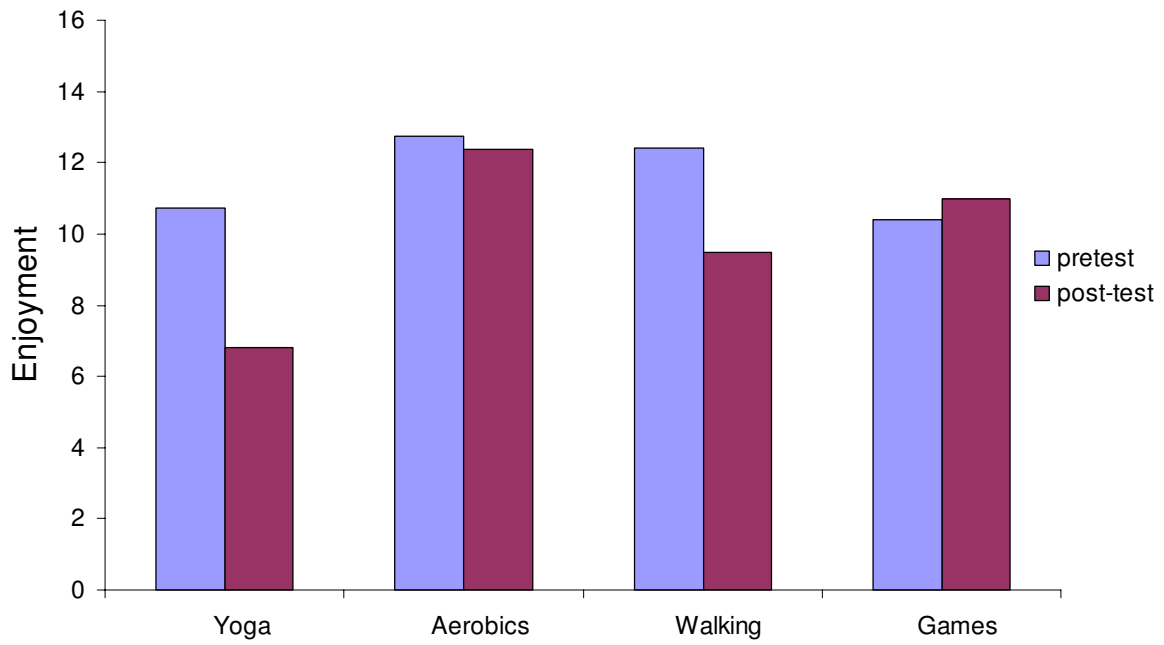


Figure 23: Bar graph representing the pre and post-test mean enjoyment motivation for the 4 groups.

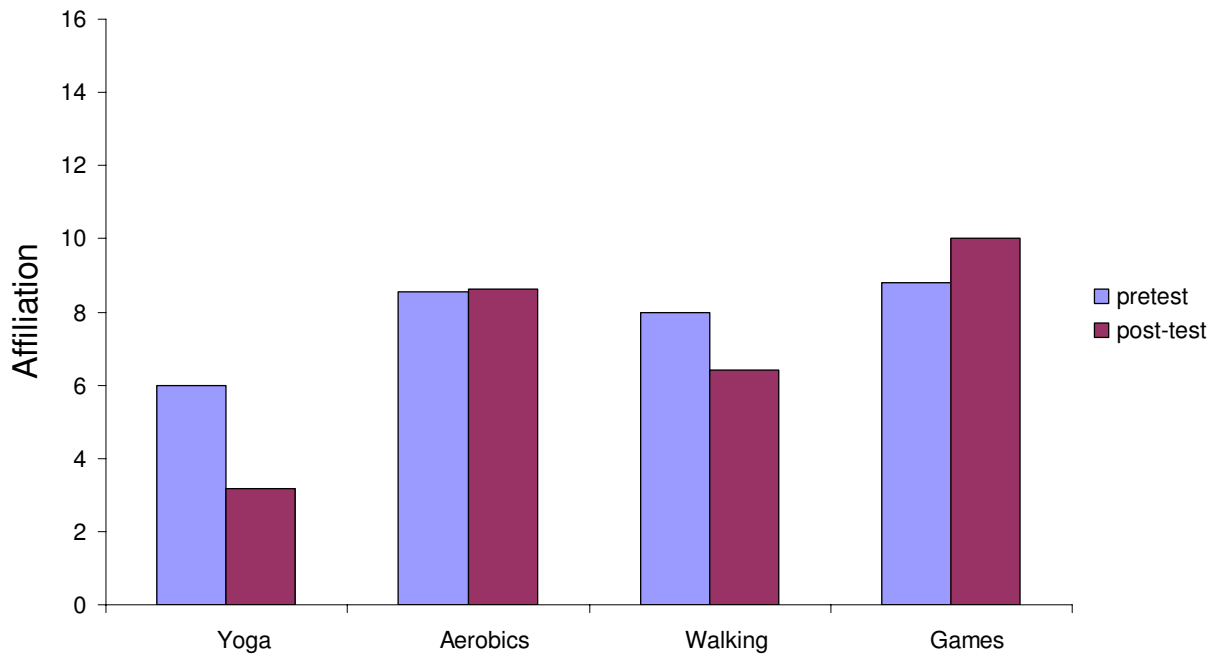


Figure 24: Bar graph representing the pre and post-test mean affiliation motivation for the 4 groups.

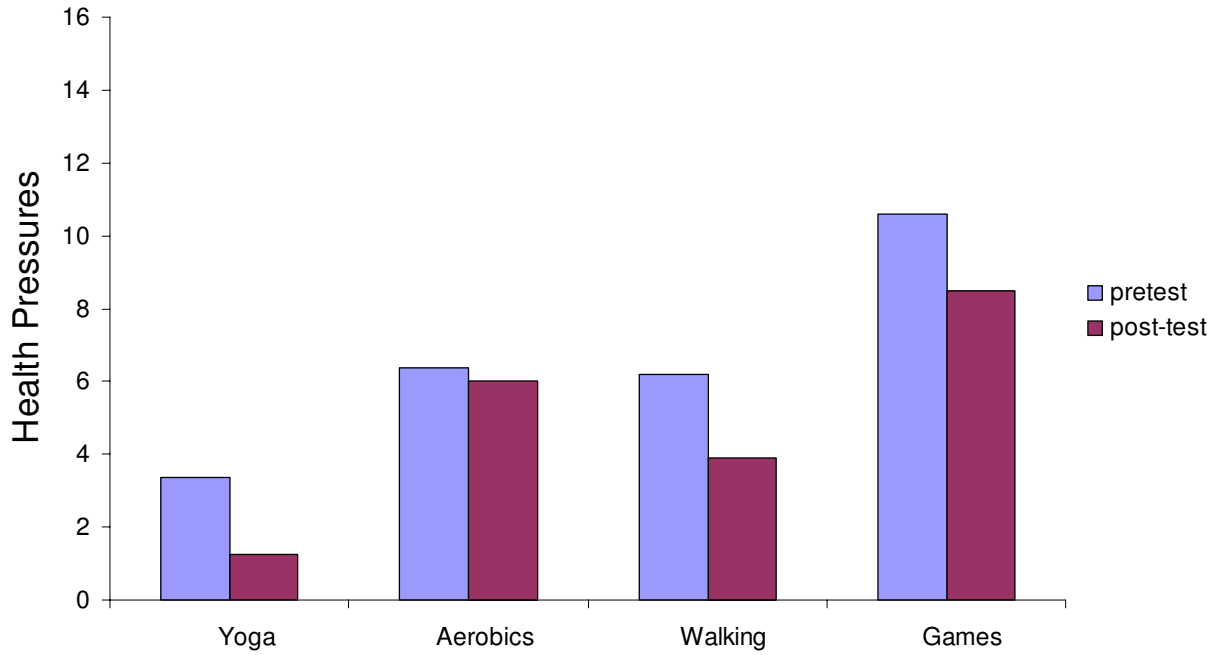


Figure 25: Bar graph representing the pre and post-test mean health pressures motivation for the 4 groups.

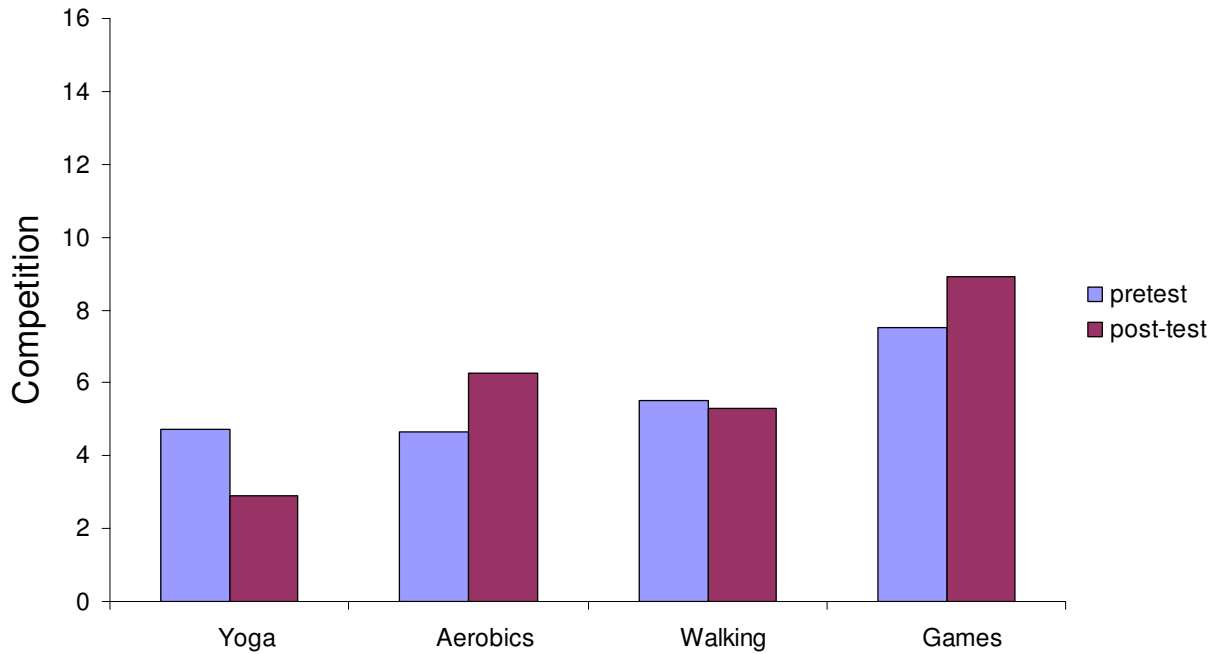


Figure 26: Bar graph representing the pre and post-test mean competition motivation for the 4 groups.

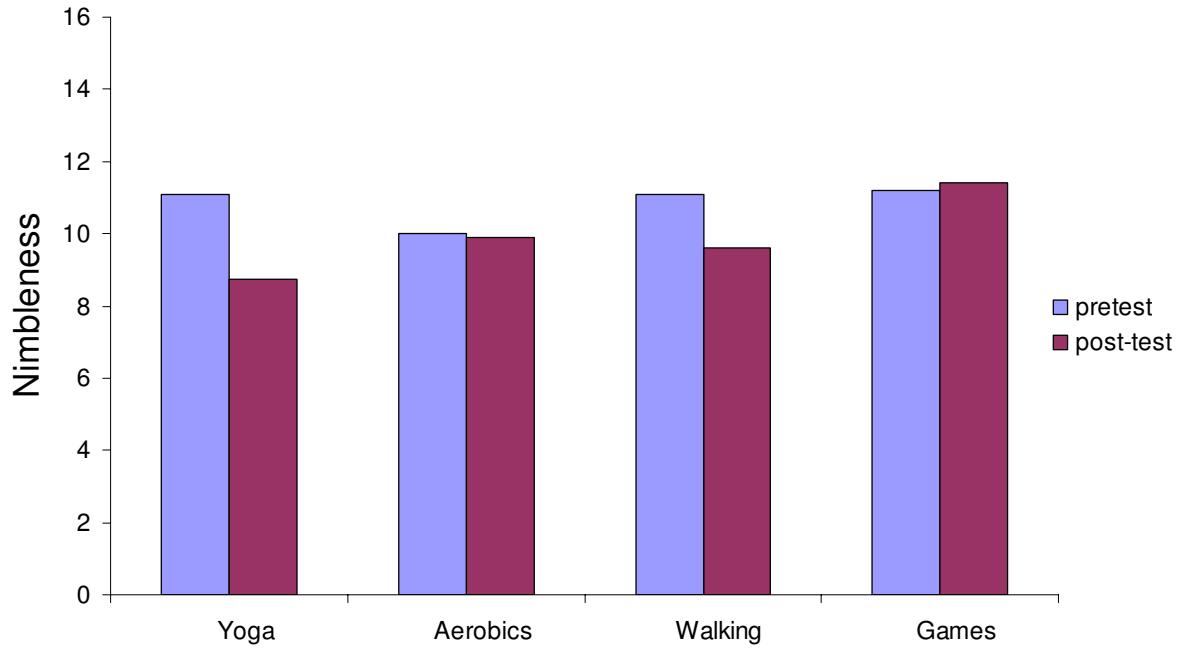


Figure 27: Bar graph representing the pre and post-test mean nimbleness motivation for the 4 groups.

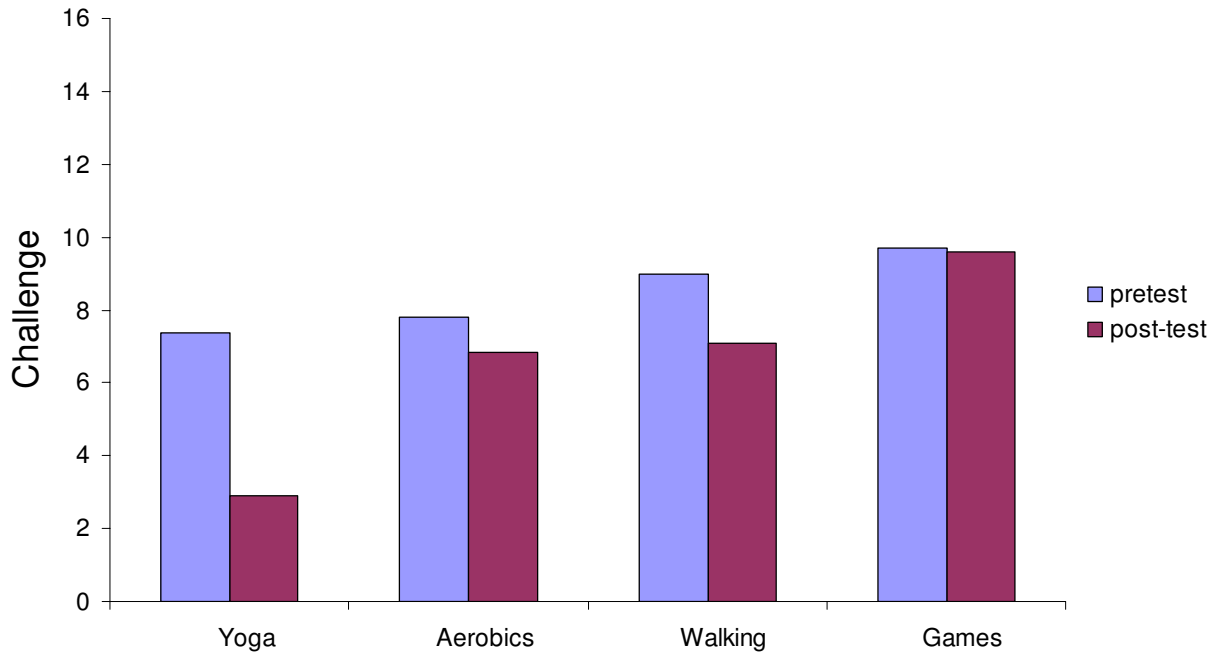


Figure 28: Bar graph representing the pre and post-test mean challenge motivation for the 4 groups.

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BIOGRAPHICAL SKETCH

Kimberlee Bethany began her academic career as a National Merit Scholar and a member of the Texas All-State Academic Team in 1995. She earned her Bachelor of Arts degree in psychology from Thomas Edison State College in 1998. She entered Florida State University's Sport and Exercise Psychology Program in the fall of 2003 and was awarded an FSU University Fellowship for the 2003 – 2004 school year. Kimberlee has served as a graduate research assistant for David Pargman (2003 – 2005), performing numerous duties including providing editorial assistance on scholarly books and book chapters. She is a graduate teaching assistant in the Department of Educational Psychology and Learning Systems, and currently serves as the editorial assistant for the *Journal of Sport and Exercise Psychology* under editor Robert Eklund. Kimberlee presented original research ("Exercise as a Moderator of Stress in Senior Citizens" with D. Pargman) at the 2004 conference for the Association of the Advancement of Applied Sport Psychology. She will continue toward her doctorate in Sport and Exercise Psychology at FSU.

Kimberlee has been a yoga practitioner since 1989, when she began practicing Hatha Yoga with her mother. She has been teaching yoga since 1997. She is a Registered Yoga Teacher through Yoga Alliance, and previously served as the editor of the Yoga Alliance newsletter, *Yoga Matters*. She is certified as a Hatha Yoga instructor at the Yoga Alliance 200-hour level through Yoga West in Katy, Texas; in Power Vinyasa Yoga by Baron Baptiste; and in Ashtanga Yoga by David Swenson. As well, she has been teacher-trained in yoga for children and has completed a 10-day Vipassana meditation training (which included 10 days of complete silence). Kimberlee has expanded her fitness knowledge and experience beyond yoga, and has received certifications as a Group Fitness Instructor and Tai Chi / Qi Gong Instructor through the International Fitness Professionals Association, and as a Personal Trainer and Kickboxing Instructor through the Aerobics and Fitness Association of America. She has taught yoga and fitness classes and workshops in a wide variety of venues, including yoga studios, gyms and fitness centers, private and public schools at the primary and secondary level, community education programs, churches, senior citizen facilities, and the corporate sector. She served as an adjunct faculty member at Florida Southern College in Lakeland (Florida), teaching yoga in the physical education department, and has taught special yoga workshops for Traviss Technical Institute's Massage Therapy program (Lakeland, Florida) and Core Institute of Massage Therapy

(Tallahassee, Florida). For the past two years since she entered FSU, Kimberlee has taught a yoga and meditation class for FSU employees through the FSU Office of Training and Development Wellness Program. Kimberlee has produced two yoga practice CDs (*Chair Yoga with Standing Poses* and *Pelvic Yoga*) which are available at select yoga studios and through her website (www.kimberleebethany.org). She was published by *Yoga 4 Everybody Magazine* in 2004. Her original manuscript, *Pelvic Yoga*, is currently in the publication process and will be available in 2006.

Before entering FSU in 2003, she worked as a newspaper reporter for three daily papers, *The Killeen (Texas) Daily Herald*, *The Black Hills (South Dakota) Pioneer*, and *The Winter Haven (Florida) News Chief*. She is a Screen Actors Guild-eligible actress who spent many years working in the entertainment industry.