Evaluation of the LaughActive Program: A Pilot Study

EVALUATION OF THE LAUGHACTIVE PROGRAM: A PILOT STUDY

by

CELESTE GREENE

Under the Direction of Jennifer Craft Morgan, PhD

ABSTRACT

Despite health benefits of physical activity (PA) and risks of physical inactivity, many older adults do not accumulate sufficient levels of PA to achieve associated health benefits. Lack of PA enjoyment may be a barrier to PA participation. This pilot study posited that by combining endurance-enhancing laughter yoga exercises with a moderate-intensity strength, balance, and flexibility PA program, *LaughActive* would increase health and self-efficacy for PA among older adults residing in 4 assisted living facilities (ALFs). The 12-week wait list control study used pre- and 6-week post-intervention comparisons among and between groups (n =27) who participated in twice-weekly *LaughActive* classes. Significant improvements ($p < .05$ - .10) were observed in mental health (SF-36v2®), aerobic endurance (SFT), and self-efficacy (OEE). Further well-designed research is needed to demonstrate the effectiveness of laughter-enhanced PA programs in achieving health and self-efficacy for PA outcomes among older adult populations.

INDEX WORDS: Older adults, Seniors, Exercise, Physical activity, Laughter, Laughter yoga

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CELESTE GREENE

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by

CELESTE GREENE

Committee Chair: Jennifer Craft Morgan

Committee: LaVona Traywick

Chivon Mingo

Electronic Version Approved:

Office of Graduate Studies

College of Arts and Sciences

Georgia State University

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DEDICATION

Dedicated to my grandmas for inspiring my passion for Gerontology and supporting my vision, and to all of the grandmas and grandpas who have touched my heart along the way.

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ACE	American Council on Exercise
ACSM	American College of Sports Medicine
ADL	Activity of Daily Living
AED	Automated External Defibrillator
AHA	American Heart Association
ALF	Assisted Living Facility
BMI	Body Mass Index
BP	Bodily Pain
CDC	Centers for Disease Control and Prevention
CITI	Collaborative Institutional Training Initiative
CPR	Cardiopulmonary Resuscitation
DCH	Department of Community Health
GDS	Geriatric Depression Scale
GH	General Health
HbA1c	Glycated Hemoglobin
HFR	Healthcare Facility Regulation
HIT	High-Intensity Interval Training
HRQOL	Health-Related Quality of Life
ILF	Independent Living Facility
LTC	Long-Term Care
MCS	Mental Component Summary
MH	Mental Health

MOS	Medical Outcomes Survey
NBS	Norm-based Score
OEE	Outcome Expectations for Exercise Scale
PA	Physical Activity
PACES	Short Physical Activity Enjoyment Scale
PCH	Personal Care Home
PCS	Physical Component Summary
PF	Physical Functioning
PI	Principal Investigator
RCI	Response Consistency Index
RE	Role-Emotional
RP	Role-Physical
RPE	Rating of Perceived Exertion
SCT	Social Cognitive Theory
SEE	Self-Efficacy for Exercise Scale
SES	Socio-economic Status
SF	Social Functioning
SFT	Senior Fitness Test
SWLS	Satisfaction with Life Scale
USDHHS	U.S. Department of Health and Human Services
VT	Vitality

1 INTRODUCTION

Regular physical activity (PA) is needed throughout the life course. Sufficient PA in older adult populations is associated with lower all-cause mortality and reduced risk of a number of chronic conditions, including coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, osteoporosis, colon cancer, breast cancer, anxiety, and depression (Nelson, Rejeski, Blair, Duncan, & Judge, 2007). Regular PA reduces the impact of age-related declines in aerobic endurance and the degenerative loss of muscle mass, quality, and strength, which prevents or mitigates functional limitations (Vogel et al., 2009). These benefits are crucial in the maintenance of older adults' ability to perform activities of daily living (ADLs). Modest evidence supports the association of PA with enhanced sleep quality and health-related quality of life (HRQOL), while strong evidence supports the association between PA and higher levels of functional health, reduced risk of falls and lower incidence of hip fracture, and improved cognitive function (Nelson et al., 2007; U.S. Department of Health and Human Services [USDHHS], 2008).

The current PA guidelines recommend that exercise programs for older adults consist of exercises to improve strength, endurance, balance, and flexibility (Nelson et al., 2007). All of these components work together in a well-rounded program to provide the maximum health benefits of PA for older adults. Strength activities involve moving or lifting the body or an object that creates resistance at a level that requires physical effort (Cress et al., 2005). Strength training helps builds muscle mass and bone density, as well as prevents age-related losses of muscle and bone mass. In addition to the enhanced ability to perform ADLs, benefits of strength training include reduced risk of chronic conditions such as diabetes, heart disease, osteoporosis, and arthritis, as well as reduced depression, improved sleep, and overall sense of well-being

(USDHHS, 2008). Endurance activities increase the heart rate and breathing for a continuous period of at least ten minutes, and usually involve moving the body's major muscle groups (Cress et al., 2005). In addition to improved cardiorespiratory health and stamina needed to perform ADLs, benefits of endurance training include lowered risk of cardiovascular disease, heart disease, stroke, and diabetes (USDHHS, 2008). Balance activities facilitate the ability to remain stable while body both stationary and in motion (Cress et al., 2005). Balance activities help to reduce risk of falls and fall-related injuries, which are often a cause of disability or loss of independence in older adult populations (Nelson et al., 2007). Flexibility activities increase range of motion around the joints and facilitate freedom of movement (Cress et al., 2005). Improved flexibility helps to prevent injuries and may enhance postural stability and balance, and, as in the other types of PA, helps to maintain older adults' ability to perform ADLs (Garber et al., 2011; Nelson et al., 2007).

1.1 Statement of the Problem

Conversely, inactivity is among the most significant factors contributing to age-related impaired functioning and disability (Buchner & Wagner, 1992). Despite the physiological and psychological health benefits of PA and the risks of physical inactivity, many older adults are not physically active and therefore do not accumulate sufficient levels of PA to obtain the associated health benefits. According to a 2010 National Health Interview Survey, 73% of adults aged 65-74, and 82% of adults aged 75 and over failed to meet the level of regular leisure time PA recommended by *Healthy People 2010* (Centers for Disease Control and Prevention [CDC], 2011).

Insufficient PA among older adults is now emphasized as major public health issue (Prohaska et al., 2006). While industry leaders such as the American College of Sports Medicine

(ACSM) have been issuing PA guidelines for a number of years, in 2008, the need to promote PA among older adults was elevated when the Federal government issued PA recommendations for the first time. The 2008 Physical Activity Guidelines recommend that all adults participate in 30 minutes of PA at least five days per week to counter the negative effects of inactivity and achieve desirable health outcomes (USDHHS, 2008). Acquiring sufficient levels of PA according to these guidelines requires that adults maintain motivation to adhere to regular PA, which presents a particular challenge for the older adult population (Brawley, Rejeski, & King, 2003).

The risks of physical inactivity are even more significant when one considers the magnitude of the rapidly increasing aging population, and the implications of this forthcoming demographic shift in terms of the costly expenditures associated with increased health care utilization and/or long-term care placement of this larger older adult population. The number of adults age 65 and over is expected to double from 35 million to nearly 72 million by 2030, representing almost 20% of the total U.S. population (Federal Interagency Forum on Aging-Related Statistics, 2010). Given the role of PA in reducing the risk of chronic diseases and mitigating the impact of age-related declines in physical functioning, disease prevention and health promotion activities may hold the greatest potential as a low-cost solution for curtailing the rising expenditures that inevitably will be associated with the increased health care utilization and long-term care placement of a growing older adult population (O'Shaughnessy, 2008).

However, for programs to be effective in achieving the benefits associated with PA, they must achieve appropriate participant adoption and long-term adherence. Temporary PA program participation is not enough to impart lasting physiological and psychological benefits for participants, nor is it enough to sustain programs at the organizational level (Prohaska et al.,

2006). Focus group research concerning organizational adoption and maintenance of the *Fit and Strong!* evidence-based intervention demonstrated that the degree of client program participation is a critical consideration when organizations examine whether or not to continue maintaining a program (DerAnanian, Desai, Smith-Ray, Seymour, & Hughes, 2012). Respondents consistently ranked participant enrollment and attendance as more important than other key factors associated with long-term program maintenance, including improvement in participant outcomes, cost, participant and instructor feedback, and instructor availability (DerAnanian et al., 2012). Therefore, ongoing client participation is foremost to long-term program success in terms of achieving the intended program results and for the continued provision of programming. However, lack of interest and/or motivation and negative associations with PA may be a barrier to PA participation among older adults. Conversely, enjoyable exercise programming may serve as a facilitator to PA participation in this population (Phillips & Flesner, 2013).

1.2 Purpose of the Study

The overall goal of this research was to improve exercise participation and adherence among older adults by putting the *fun* in *fitness*. The purpose of this 12-week wait list control study was to evaluate an innovative laughter-enhanced PA program that has the goal of increasing overall health and self-efficacy for PA among older adults residing in assisted living facilities (ALFs). *LaughActive* is a 45-minute moderate-intensity group exercise program that intersperses unique endurance-enhancing laughter exercises within a dedicated seated strength, balance, and flexibility program. The intervention is designed to increase exercise enjoyment through the laughter-based programming. The *LaughActive* trainer facilitation techniques and participant enjoyment of the laughter-based programing aim to maximize facilitators and positive outcome expectations, and reduce barriers and negative outcome expectations of PA behaviors.

This study proposed that increased self-efficacy for PA would lead to increased PA adherence using *LaughActive*, and that the increase in PA adherence using *LaughActive* would in turn enhance self-efficacy for PA in general. The intended outcome was to achieve implementation of a laughter-enhanced exercise program that would increase health and self-efficacy outcomes among older adults.

2 THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

Evidenced barriers and facilitators to PA adoption and adherence among older adults may occur at multiple interrelated levels, ranging from the individual, programmatic, and environmental (Prohaska et al., 2006). While the importance of all three levels in contributing to PA participation and adherence cannot be ignored, this program evaluation calls for greater examination of the role of programmatic factors in influencing PA enjoyment, an individual-level domain.

2.1 Theoretical Framework

Enjoyable exercise programming may serve as a mediator to PA in older adults (Phillips & Flesner, 2013). Mullen and colleagues claimed, "Enjoyment is both a predictor and outcome of physical activity participation" (2011, p. 1). Participants that anticipate enjoyment as a part of PA can improve their commitment to participating in PA, as well as continued adherence to exercise activities, due to anticipated positive emotions associated with the activities (Mullen et al., 2011). It seems plausible that if participants that anticipate enjoyment as a part of PA can improve their commitment and continued adherence with exercise activities, then a program that specifically targets exercise enjoyment through eliciting positive emotions would motivate participants to participate in the program both initially and on a continuing basis.

In order to increase PA participation among older adults initially and to encourage long-term adherence, there is value in examining the potential role of PA enjoyment within an overarching theory of change. Social Cognitive Theory ([SCT] Bandura, 1986, 1997, 2004) is one of the most widely used theories of change in understanding the methods to increase PA behavior among older adults (White, Wojcicki, & McAuley, 2012). SCT posits that certain behavioral and cognitive factors act as determinants (i.e., facilitators or impediments to change)

in the process of change, and enjoyment of PA has been identified as one of several potential (albeit under-evaluated) mediators of behavior change (Lewis, Marcus, Pate, & Dunn, 2002).

The *LaughActive* intervention was designed to target variables for change associated with SCT, including: (1) self-efficacy, or program participants' confidence in the ability to change exercise behavior; (2) outcome expectations, or perceived benefits of exercise behavior; and (3) sociostructural factors, or barriers and facilitators of exercise behavior (Bandura, 2004). Bandura (1997) asserted that positive self-efficacy expectations can be increased by positive affective states such as joy associated with or experienced during the behavior. Others have claimed that since self-efficacy influences outcome expectations, affective states such as joy associated with or experienced during exercise likely strengthen outcome expectations as well (Jette et al., 1998; Resnick & Jenkins, 2000; Resnick et al., 2008). In this study, we posited that a program that directly elicits positive emotions among participants through the integration of laughter would be perceived as enjoyable to participants. We further posited that the enhanced joyful affective states experienced during and associated with this enjoyable PA program would positively impact self-efficacy expectations related to perceived barriers and facilitators to exercise, as well as perceived outcome expectations for exercise. The modified SCT for PA participation theoretical framework that guided the development of this intervention is presented in Figure 2.1. Bandura proposed, "Beliefs in self-efficacy affect health behavior both directly and by their impact on goals, outcome expectations, and perceived facilitators and impediments" (2004, p. 145). Bandura (2004) established that high initial self-efficacy beliefs would positively influence PA behaviors through these pathways. Moreover, we theorized that self-efficacy for PA would be positively impacted by improving outcome expectations for PA, and increasing perceived

facilitators and reducing perceived barriers to PA; thus, we present a modified version of the established model with high self-efficacy as both a predictor and an outcome of behavior.

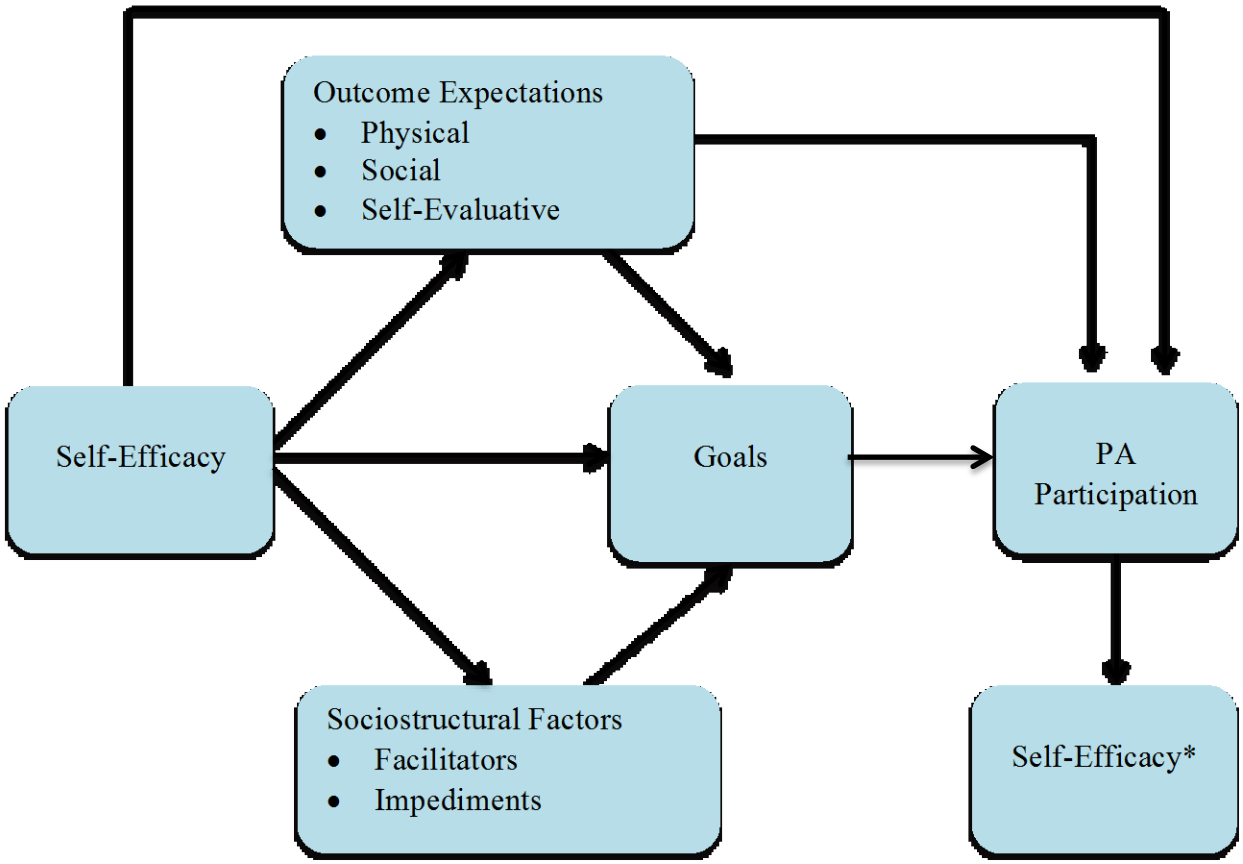

Figure 2.1 Paths of influence for PA participation in Social Cognitive Theory
Note. *Addition to Bandura's model

2.1.1 Laughter Yoga and its Role in PA Programs

Laughter yoga is an innovative health concept in which practically anyone can laugh heartily and achieve the physical and psychological health benefits of laughter without relying on jokes, humor, or comedy. The concept is based on scientific knowledge that the body cannot distinguish between real and self-simulated, or faked laughter — whether one is laughing at something funny, or laughing from having fun, both generate health benefits. During a laughter

yoga session, participants initiate laughter as exercise in a group setting, and through making eye contact and enacting a sense of playfulness, self-simulated laughter often quickly becomes genuine and contagious. Laughter yoga is not postural yoga and requires limited physical ability, and no special exercise clothing or equipment. All that is needed is a willingness to laugh. The practice is called laughter yoga because playful laughter exercises are combined with diaphragmatic yogic breathing (Pranayama). Dr. Madan Kataria, a physician, and his wife, Madhuri Kataria, a yoga teacher, established the practice in 1995, and it is now practiced in over 80 countries worldwide (Kataria, 2011).

Self-simulated laughter elicited through laughter yoga techniques may be an ideal means for older adults with functional impairments to access the health benefits of laughter. Humor may lead to laughter, but it is elicited through a mental stimulus and therefore requires a wide degree of mental functioning including attention, working memory, flexible thinking, extraction of word meaning, and a positive mood state in order to perceive and appreciate humor (Takeda et al., 2010). However, the laughter in laughter yoga is self-simulated as bodily exercise, so older adults do not need to rely on cognitive skills to "get the joke," or a positive mood state to reap the health and wellness benefits of laughter. This concept is especially relevant to older adults with late stage dementias, whose diminished mental capacity may inhibit the ability to understand humor, as well as those who find that there is simply less to laugh about in old age (Takeda et al., 2010). Furthermore, laughter is universal. Nearly everyone enjoys laughing and laughter is almost always positive, whereas humor can sometimes be misjudged and elicit negative emotional responses, especially among those who are cognitively impaired. Moreover, since the laughter elicited through laughter yoga techniques is not reliant on humor, it is often much more long lasting than the short chuckles elicited through the use of comedy. Additionally,

since laughter yoga can be facilitated while seated and is suitable exercise for a wide range of physical abilities, it is an ideal cardiovascular exercise program for sedentary individuals who cannot, or will not, participate in more traditional forms of exercise.

2.2 Literature Review

Laughter is often anecdotally referred to as the *best medicine*. While the potential of simulated laughter through the practice of laughter yoga as an intervention technique is fairly new and relatively under-researched, the health benefits of laughter as elicited through humor have been studied since the late 1960's (Kataria, 2011). To provide an adequate background leading up to this pilot study, we first delineate the scientifically validated physiological and psychological benefits of laughter elicited through the use of humor.

2.2.1 Psychological and Physiological Health Benefits of Laughter

Hearty laughter has profound short and long-term effects on the mind and body. Physiologically, laughter positively impacts the central nervous, muscular, respiratory, circulatory, endocrine, immune, and cardiovascular systems (Fry, 1986, 1992). The physical act of laughter is comparable to cardiovascular exercise and shares many common physiological benefits associated with exercise (Fry, 1994). A review of the humor-based scientific literature confirmed the following physiological benefits of laughter: (1) exercises and relaxes muscles; (2) improves respiration; (3) stimulates circulation; (4) decreases stress hormones; (5) increases immune system defense; (6) elevates pain threshold and tolerance; and (7) enhances mental functioning (Mora-Ripoll, 2011).

These physiological benefits have important implications for older adults. Since laughter exercises facial, chest, abdominal, gastrointestinal, pulmonary, cardiac, and skeletal muscles, laughter yoga has the potential to make PA more accessible to those who are sedentary due to

physical limitations or dislike of traditional exercise programming (Paskind, 1932; Cousins, 1979; Wagner, 2014). Furthermore, the relaxation of tense muscles following hearty laughter can cease the spasm-pain cycle associated with conditions common among older adults, such as neuralgias and rheumatism (Cushner & Friedman, 1989; Fry, 1986, 1992). The physical act of laughter is a combination of deep inhalation and full exhalation, which inspires excellent ventilation (Fry & Rader, 1977). This diaphragmatic activity disrupts the normal cyclic breathing pattern, exercises the lungs and chest muscles, and accelerates the exchange of residual air (Fry & Rader, 1977). Because laughter improves respiration and provides an initial boost to heart rate and blood pressure, followed by a return to pre-laughter levels after the laughter subsides, it disrupts the normal cyclic breathing pattern and brings more oxygen to major internal organs (Berk, 2001). Berk stated, "Laughter disrupts the normal cyclic breathing pattern, increases ventilation, clears mucous plugs, and accelerates the exchange of residual air, which enhances blood oxygen levels" (2001, p. 329). Since this activity may reduce the occurrence of bronchial infection and pneumonia, these findings benefit older adults who commonly suffer from chronic respiratory infections (Fry, 1994; Berk, 2001). Additionally, the stimulation in the immune system's ability to fight viral and bacterial infections may prove beneficial for older adults who generally experience reduced immune system functioning, and are especially beneficial for institutionalized older adults who are more susceptible to infection due to environmental conditions (Berk, 2001). Furthermore, laughter's ability to elevate pain tolerance levels (Nevo, Keinan, & Teshimovsky-Arditi, 1993) may particularly benefit the numerous older adults who suffer from chronic conditions.

The physical benefits of laughter are complemented by the scientifically validated psychological effects of laughter, which are summarized as follows: (1) reduces stress, anxiety,

tension, and counteracts depressive symptoms; (2) elevates mood, self-esteem, hope, energy, and vigor; (3) enhances memory, creative thinking, and problem-solving; (4) improves interpersonal interaction and relationships and increases feelings of bonding; (5) increases friendliness, helpfulness and builds group identity, solidarity, and cohesiveness; (6) promotes general psychological well-being; (7) improves quality of life and patient care; and (8) intensifies joy and is contagious (Mora-Ripoll, 2011). Psychological well-being is important for the prevention and management of a number of chronic diseases frequently reported among the older adult population (Warburton, Nicol, & Bredin, 2006). These benefits have important implications for older adults, particularly the numerous institutionalized older adults suffering from depression, anxiety, and feelings of isolation (Berk, 2001). These psychological and interpersonal benefits have great potential in mediating the challenges of living in institutional environments. Anecdotally, assisted living residents often lament the loss of old friends, as well as personal possessions such as their home and car, along with their feelings of autonomy as they navigate the change from living independently in the community to residing in institutional settings.

2.2.2 Review of Relevant Literature

Despite the scientifically validated physiological and psychological benefits of laughter, and the health benefits that the physical act of laughter shares in common with cardiovascular exercise, very few studies have examined the efficacy of this unique form of exercise in older adult populations. Shahidi and colleagues (2011) compared laughter yoga to group exercise in a sample of community-dwelling older adults. As a rationale for their work, the researchers claimed that geriatric depression is a major public health concern due to its high prevalence, and also the potential harmful side effects of pharmacological treatment options for older adults who may be more susceptible to increased adverse drug side effects and reactions because of multiple

co-morbid medical conditions and altered drug metabolism (Shahidi et al., 2011). Thus, the researchers sought to examine the efficacy of laughter yoga in reducing depression and improving life satisfaction as a potential alternative treatment modality for geriatric depression.

The authors used what they called a randomized controlled trial to compare laughter yoga (n=23) to exercise therapy (n= 23), and both to a control group (n=24) in a sample of depressed community-dwelling Iranian women ranging from 60-80 years of age (Shahidi et al., 2011). The laughter yoga intervention consisted of 10 sessions facilitated in a group setting. The program duration and session duration were not stated. The exercise therapy intervention also consisted of 10 sessions of aerobic activity facilitated in a group setting. Again, the program duration was not stated; however, each exercise session was 30 minutes in duration. Data was collected at pre-intervention and post-intervention for depression (GDS) and life satisfaction (SWLS). A comparison of pre-intervention and post-intervention measurement scores demonstrated statistically significant efficacy of both laughter yoga ($p < .001$) and exercise ($p < .01$) versus the control group in reducing depression. There were no significant differences between laughter yoga and exercise therapy in reducing depression, meaning that both modalities were equally effective in reducing geriatric depression. Moreover, the laughter yoga group showed statistically significant improvement ($p < .001$) versus both the exercise therapy and control groups in improving life satisfaction scores.

While this study showed promise in its demonstration of equal effectiveness of laughter yoga and exercise in reducing depression, and superior efficacy of laughter yoga in improving life satisfaction, the results should be interpreted with caution. It is possible that the incorporation of techniques that are not necessarily laughter-based into the intervention may have confounded the study results. For instance, the class instructor began each laughter yoga

session with a group discussion regarding pleasant topics such as national and religious ceremonies, the power of positive thinking and activity in daily life, etc. This deviation from a typical laughter yoga session is a study limitation, in that the deviation makes it difficult to determine if the efficacy of laughter yoga observed in this study is a result of the laughter itself or the positive discussion at the beginning of each session.

Of particular relevance to our research study is the work of Hirosaki and colleagues (2013), who evaluated the efficacy of a unique PA program that combined laughter with traditional exercise. Hirosaki and colleagues (2013) claimed that lack of participant interest is a primary deterrent of exercise program adherence, and since exercise adherence is especially low in clinical settings, a possible solution may be to develop an exercise program that includes an additional behavioral intervention that may be enjoyable to participants. Thus, the researchers theorized that the addition of humor-based laughter to a traditional exercise program would be perceived as more enjoyable to participants, and therefore, would increase exercise program adherence. The researchers claimed to have selected laughter as the additional behavioral intervention for two primary reasons. First, since the pleasant sensations associated with exercise have been shown to increase exercise adherence, the authors posited that the pleasant associations with laughter would add enjoyment to the exercise program and increase program adherence. Secondly, laughter itself is associated with improved physiological and psychological functioning.

To test their hypotheses, Hirosaki and colleagues (2013) sought to examine the effects of weekly combined laughter and exercise program on physiological and psychological health outcomes among 27 Japanese community-dwelling older adults aged 60 and older. The authors used what they called a partial crossover randomized controlled trial study design, in which

individuals were assigned to an immediate treatment group (n=13) or a delayed treatment group (n=14). The sample participated in a 120-minute session one time per week for a period of 10 consecutive weeks. Each session comprised a 10-minute lecture regarding relevant health topics, 50 minutes of viewing live or videotaped comedy programs, and 60 minutes of light exercise, performed primarily while seated. The authors measured various clinical outcomes via venous blood samples (e.g., Glycated hemoglobin [HbA1c]), as well as body composition, depressive symptoms (GDS-30), and self-rated health (i.e., "How would you rate your current health status?" 1 = very poor, 2 = poor, 3 = good, 4 = very good) at baseline, and at 3 and 6 months post-baseline. Study results indicated statistically significant positive effects on HbA1c (p = .001), bone mineral density (p < .001), and self-rated health (p = .012). In addition, the program adherence rate was 100%.

The current study sought to build on the work of Hirosaki and colleagues (2013), in that this study also posited that the addition of a laughter-based behavioral modification to a traditional exercise program would increase exercise program enjoyment, adherence, and health outcomes among a sample of older adults. However, the current study evaluated a program that incorporated self-simulated laughter elicited as bodily exercise through laughter yoga techniques, as opposed to laughter derived from humor (Hirosaki et al., 2013). As previously discussed, laughter, and in particular, simulated laughter interventions may be an ideal means for older adults to access physiological and psychological health benefits associated with cardiovascular exercise. Simulated laughter is easily accessible for older adults because, unlike humor, laughter is universal and simulated laughter does not require extensive cognitive functioning or an initial positive mood state in order to laugh. Not only is simulated laughter an accessible means for older adults to obtain the health benefits of laughter, incorporating laughter into a traditional PA

program could enable the program to be more approachable for sedentary older adults in particular, and more enjoyable and appealing for older adults in general. To our best knowledge, this research was the first to evaluate the efficacy of a PA intervention that combines self-simulated laughter exercises with a dedicated strength, balance, and flexibility-enhancing exercise program for older adults.

2.3 Research Aims

The purpose of this research was to evaluate an innovative laughter-enhanced PA program intended to increase overall health and self-efficacy for PA among older adults residing in ALFs. The specific research aims and corresponding hypotheses that guided this research are as follows:

Aim 1: Increase overall health among older adults residing in ALFs.

1. The *LaughActive* intervention will improve subjective health outcomes, or heath-related quality of life (HRQOL) measures of older adults residing ALFs.
2. The *LaughActive* intervention will improve objective health outcomes, or physical performance measures of older adults residing ALFs.

Aim 2: Increase self-efficacy for PA, or the confidence to engage in physical activity, among older adults residing in ALFs.

1. The *LaughActive* intervention will be positively associated with aspects of improved self-efficacy for PA among older adults residing in ALFs, including: (a) physical, social, and self-evaluative outcome expectations for exercise; (b) increased perceived facilitators and reduced perceived barriers to exercise; and (c) exercise enjoyment.

3 METHODS

3.1 Study Design

The 12-week study used a wait list control design with baseline and 6-week post-intervention comparisons among and between intervention groups to show within- and-between group change over time. A wait list control design is employed as such so that the study sample is split between an active treatment (intervention) group and a wait list control (comparison) group that receives the intervention after the active treatment group. The control group serves as the untreated comparison group while the active treatment group is receiving the intervention, yet when control participants later receive the intervention, they can be considered intervention participants (Elliot & Brown, 2002). This wait list control study was conducted at four ALFs throughout the Atlanta region. Researchers collected data from the intervention group at two points in time: Time 1 (pre-intervention baseline) and Time 2 (6-week intervention conclusion). Researchers collected data from the wait list control group at three points in time: Time 1 (pre-intervention baseline, Time 2 (6-week intervention baseline), and at Time 3 (6-week intervention conclusion). The logic model that guided this study is presented in Figure 3.1. The study protocol and consent forms were approved by the Georgia State University Institutional Review Board.

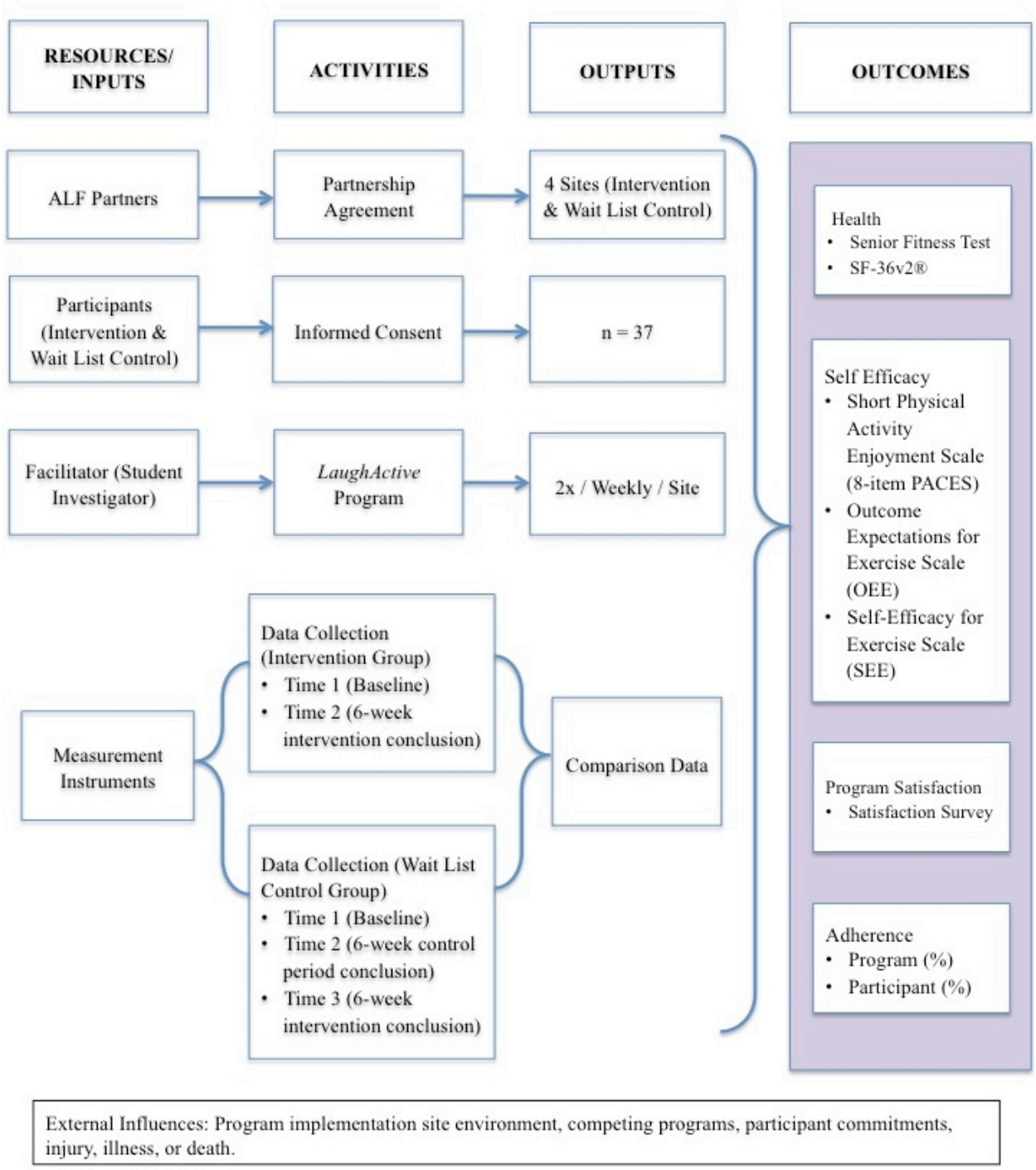

Figure 3.1 *LaughActive* program evaluation logic model

3.2 Recruitment Strategy

The study used a convenience sample of four comparable ALFs in terms of environmental variables (i.e., facility type, average monthly cost of residency, services offered, number of apartments, and number and types of PA activities offered in the facilities). From the sample of eligible ALFs, the investigators sought to recruit enough resident participants to account for drop-out rates, yet still achieve statistical power needed to detect in- and-between group significance in measurement outcomes. A power analysis indicated that a sample size of 21 was required to meet .80 statistical power requirements for the paired sample *t*-tests post-intervention. A large older adult population-based study demonstrated that the mean Physical Component Summary (PCS) value for the MOS SF-36 Health Survey was 44.16 (Gandek, Sinclair, Kosinski, & Ware, 2004). For this study, we used a conservative estimate of mean change post-intervention of one half standard deviation, or 49.16. As this was an exploratory study, the alpha value was .10.

3.2.1 Assisted Living Facility Recruitment

The facility sample recruitment was conducted to ensure that ALFs were as evenly matched as possible in terms of the aforementioned environmental variables. We first determined the total population of Fulton County Personal Care Homes (PCHs) licensed by Healthcare Facility Regulation (HFR), a division of the Department of Community Health (DCH) who is responsible for health care planning, licensing, certification, and oversight of various health care facilities and services in Georgia (http://dch.georgia.gov/healthcare-facility-regulation-0). Next we used available web resources and personal communications with facility personnel to extract all ALFs that were similar in environmental variables, thus creating the recruitment list. ALFs with fewer than 45 apartments, or who only serve residents with greater than moderate levels of

cognitive impairment were excluded from further recruitment efforts. We placed phone calls to all eligible ALFs and obtained the email addresses for the Executive Director and Activity Director. We then emailed recruitment letters outlining the study aims and procedures to the Executive Director and Activity Director of each ALF, and followed up one week later with a telephone call. We scheduled facility recruitment meetings with ALFs who responded to the email and/or follow-up phone call. During the recruitment meetings, we met with key activity department personnel who would help to implement the intervention. We reviewed the study procedures to ensure that the activity staff was willing and able to perform the intervention duties, and also to ensure staff and facility commitment. If both parties agreed that the intervention was feasible at the ALF, we obtained a signed Letter of Support for that facility. Once one ALF was recruited, we made efforts to recruit additional ALFs that were as evenly matched as possible in terms of the aforementioned the environmental variables. Once the facility sample of four facilities had been secured, the faculty advisor randomly drew facility names from a hat to determine the intervention and control groups. The facility sample was split evenly so that two facilities comprised the intervention group and two facilities comprised the control group. Table 3.1 presents key environmental characteristics of the facility sample.

Table 3.1 *LaughActive* sample, 4 Assisted Living Facilities, Georgia, 2014

Name	Facility Type	Zip Code	Average Cost of Residency (mo.)	ALF Apartments	Exercise Classes (day)
A	• ALF • Memory Care	30004	$3,855-$4,555	68	2
B	• ILF • Supportive Living (ALF) • Memory Care	30106	$3,350-$4,885	75	2
C	• ILF • Supportive Living (ALF) • Memory Care	30324	$3,350 – $4,120	60	2
D	• ILF • Supportive Living (ALF) • Memory Care	30084	$3,675-$4,895	46	2

3.2.2 Participant Recruitment

We scheduled 45-minute *LaughActive* resident demonstration sessions at the four selected sites. We hand delivered flyers announcing the date and time of the resident demonstration sessions. The Activity Director selected residents with no more than moderate levels of cognitive impairment and placed the resident demonstration session flyers into eligible residents' mailboxes. The *LaughActive* resident demonstration sessions were held in place of a regularly scheduled morning exercise classes. Session participants received a brief overview of the *LaughActive* program and forthcoming research study, followed by an interactive *LaughActive* demonstration. At the conclusion of the demonstration, interested study participants were given recruitment session flyers informing them of the upcoming participant recruitment session, and were invited to ask questions about the *LaughActive* program and study participation.

Participant recruitment sessions were conducted within two weeks following the resident demonstration sessions. Activity personnel placed recruitment session flyers in eligible potential study participants' mailboxes several days prior to the resident recruitment sessions. The participant recruitment sessions were conducted by the student investigator, the faculty advisor, and up to six additional Georgia State University Gerontology Institute graduate research assistants who had previously completed CITI training and additional training in implementing the measurement procedures.

Each participant recruitment session began with the student investigator introducing the study and providing a brief overview of the study procedures and informed consent document. At the conclusion of the overview, residents who were not interested or ineligible to participate in the intervention were invited to excuse themselves from the recruitment session at this time. The research team then met individually with potential participants, answered questions, and screened all potential participants to ensure their eligibility. Those who were interested in participating, but who did not meet eligibility criteria were excluded from the program at this time. Approximately six potential participants were not eligible for further consideration, as the research team determined that they were unable to perform the preliminary screening procedures due to cognitive impairment or memory issues. The research team then reviewed the informed consent document in more detail before obtaining signatures on printed copies of the informed consent document. Once informed consent was obtained, the research team executed the American Heart Association (AHA)/ACSM Health/Fitness Facility Preparticipation Screening Questionnaire to determine participants' risk-stratification for experiencing a cardiovascular event while engaging in moderate-intensity exercise programming (ACSM, 2013). Based on participants' responses to this interview-assisted questionnaire, participants were classified as

low, moderate, or high risk. According to the screening protocol, participants with one or more symptoms of, or who had been diagnosed with cardiovascular, pulmonary, and/or metabolic disease were considered high risk and were advised to obtain physician's clearance before beginning the *LaughActive* exercise program (Balady et al., 1998). Regardless of participants' risk status for experiencing a cardiovascular event while engaging in moderate-intensity exercise, all study participants were given a copy of a medical release form in order to consult with their physicians before participating in the *LaughActive* intervention.

3.2.3 Procedures to Protect Participant Anonymity & Confidentiality

Every effort was taken to safeguard participant privacy and confidentiality. Data collection was facilitated in a multi-purpose room that typically is used for the purpose of facilitating group exercise classes. Up to six members of the research team interviewed respondents in stations that were set up alternately for the observational fitness test and the individual researcher-assisted paper and pencil questionnaire. Participants were reminded that the study data would be confidential; however, in this setting there would be some risk of other respondents overhearing questionnaire responses. Respondents were given an overview of the questionnaire and were asked if they would like their interview conducted in the multipurpose room or in a more private setting. The observational fitness test is most efficiently performed in a group format with stations set up circuit style. As respondents were enrolling in a study involving a group exercise intervention, participants were agreeable to performing the fitness test in a group format. Facility staff served as advocates for potential participants and were present in the room during the consenting process.

The research team, under the direction of the faculty advisor, continuously monitored data safety. The data that was collected in this study was collected for research purposes only.

No participant names or identifying information appeared on the study questionnaire or fitness test scorecards. Participants were assigned a unique study ID so that their data could be tracked over the course of the study. Paper data were stored in locked drawers in a locked office and electronic data were stored on password-protected servers. Participant names and contact information were stored in a locked and password-protected location separate from the evaluation data.

3.3 Data Collection

All study participants in the intervention and control groups were pretested at Time 1 prior to program commencement. All participants who were willing and able to perform follow-up measurements were post-tested at their group's respective program conclusion. The student investigator, the faculty advisor, and team of six Georgia State University Gerontology Institute graduate research assistants collected all measurements. Data were collected using paper and pencil interview-assisted questionnaires and an observational fitness test.

Socio-demographic and physical status measurements were taken at Time 1 only. Outcome measures were assessed at Time 1 for both groups, and again at Time 2 within the intervention group, and again at both Time 2 and Time 3 within the control group. Participants completed an additional questionnaire to assess *LaughActive* program satisfaction at Time 2 within the intervention group and Time 3 within the control group. Since the student investigator facilitated the *LaughActive* sessions, the student investigator did not administer the questionnaire to assess program satisfaction. Instead, other research team members who were not involved in facilitating the *LaughActive* classes conducted interviews to assess program satisfaction.

3.3.1 Measurements

Data on the following measures were collected for the study at baseline only.

Exercise Risk Stratification. The participants' risk stratification for engaging in moderate-intensity exercise was determined using the AHA/ACSM Health/Fitness Facility Preparticipation Screening Questionnaire (ACSM, 2013). The questionnaire is presented in Appendix B.

Socio-demographic variables. Age, gender, race, education level, marital status, and physical activity participation frequency and type were obtained using an in-person interview-assisted questionnaire (Appendix D).

Basic physical status variables. Height (in), body weight (lbs), and body mass index (BMI) were assessed. Height and weight were assessed using a standard measuring tape and scale, respectively. BMI (kg/m^2) was then determined using a BMI calculator.

3.3.2 Health Variables

Health variables were assessed at Time 1, Time 2, and Time 3.

Subjective health or Health-Related Quality of Life (HRQOL). Subjective health status was assessed using the SF-36v2® Health Survey standard form (4-week recall), a widely used, comprehensive, and carefully validated measure of HRQOL (Ware et al., 2007). The SF-36v2® contains measures eight domains of health, including Physical Functioning ([PF] 10 items); Role-Physical or role participation with physical health problems ([RP] 4 items); Bodily Pain ([BP] 2 items); General Health [GH] 5 items); Vitality ([VT] 4 items); Social Functioning ([SF] 2 items); Role-Emotional or role participation with emotional health problems ([RE] 3 items); and Mental Health ([MH] 5 items). The SF-36v2® generates two types of summary scores for physical and mental health. All eight health domains contribute to the summary scores; however, certain scales have greater physical or mental factor content in contributing to these scores. The

Physical Component Summary (PCS) score primarily comprises PF, RP, BP and GH scores. The Mental Component Summary (MCS) score primarily comprises MH, SF, RE, and VT scores. The domain scales that have the greatest impact on the summary scores are listed in order of the greatest to least impact for each scale. Five of the scales (PF, RP, BP, SF, and RE) define good health status as the absence of health problems. For these scales, reporting no limitations or disabilities results in the highest score. The remaining three scales (GH, VT, and MH) measure a wider range of positive and negative health states. For these scales, a mid-range score is obtained when no limitations or disabilities are reported. A high score is obtained when respondents report positive states and evaluate their health favorably. All domains, including the component scores, use norm-based scoring (NBS). In NBS, each scale is scored using the same mean (50) and the same standard deviation (10 points) found in the 1998 U.S. general population. Thus, each NBS point is one-tenth of a standard deviation. The recommendation for interpreting group-level data using NBS is that scores within 0.3 standard deviation, or 3 NBS points, of the mean are considered within the average or normal range for the U.S. general population. This means that scores falling outside the NBS range of 47 to 53 (i.e. more than 0.3 standard deviation below or above the mean norm-based score of 50) would not be considered average, or normal scores (Ware et al., 2007).

Objective health. Objective physical performance was measured using the Senior Fitness Test ([SFT] Rikli & Jones, 1999). The SFT is the most comprehensive and reliable test for assessing physical fitness in older adults, and it does not require extensive space, equipment, or technical expertise to administer (Rikli & Jones, 2012). The SFT assesses lower and upper body strength, aerobic endurance, lower and upper body flexibility, and agility/dynamic balance. Respectively, test items that measure these functional fitness domains include: Chair Stand

(repetitions/30s); Arm Curl (repetitions of 5 lb weight for women and 8 lb weight for men/30s); 6-Minute Walk (yds/6 min) or 2-Minute Step (steps/2 min); Chair Sit-and-Reach (in); Back Scratch (in); and 8-Ft Up-and-Go (s). Due to space limitations in the various ALFs, the research team assessed aerobic endurance using the 2-Minute Step Test in place of the 6-Minute Walk Test. The possible test score ranges for males and females ages 60-94 are as follows: Chair Stand (0-23); Arm Curl (5-27); 2-Minute Step (24-135); Chair Sit-and-Reach (-10.7-+8.7); Back Scratch (-15.1-+5.0); 8-Foot Up-and-Go (14.6-3.0).

3.3.3 Self-Efficacy Variables

The following self-efficacy measurements were assessed at Time 1, Time 2 and Time 3.

Perceived physical, social, and self-evaluative outcome expectations for exercise. Outcome expectations for exercise were assessed using the Outcome Expectations for Exercise (OEE) scale (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). The OEE was specifically developed to assess older adults' perceived consequences of exercise behavior. The scale consists of nine statements regarding the benefits of exercising with high reliability (α = .89). For each statement, participants indicate the degree to which they agree with each statement (e.g., "Exercise makes my muscles stronger") on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree). The numerical ratings for each response are tallied and then divided by the number of responses in order to arrive at the score. Higher scores are indicative of stronger levels of outcome expectations for exercise.

Perceived facilitators and barriers to exercise. The Self-Efficacy for Exercise (SEE) scale measured perceived facilitators and barriers to exercise (Resnick & Jenkins, 2000). The SEE is a 9-item measure designed to measure subjects' perceived confidence in their ability to exercise three times per week for 20 minutes each time despite the presence of commonly

identified barriers to participation among older adults, such as pain or fatigue. For each item, participants indicate their confidence to execute exercise behavior on a 10-point scale ranging from 0 (Not Confident) to 10 (Very Confident). The score is obtained by summing the numerical ratings for each response and then divided by the number of responses. Higher scores are indicative of stronger levels of self-efficacy expectations for exercise. This measure has also been shown to have high reliability ($\alpha = .92$).

PA enjoyment. Participants' feelings of enjoyment in response to PA were assessed using the Short Physical Activity Enjoyment Scale ([8-Item PACES] Mullen et al., 2011). The original 18-item PACES scale (Kendzierski & DeCarlo, 1991) is the most commonly used scale to assess PA enjoyment, but it was developed for a college-age population. Mullen and colleagues (2011) systematically examined the feasibility of two models of the PACES scale (i.e., 18-item and 8-item versions) used in the literature. Neither version was found to be a good fit for assessing enjoyment among older adults. Therefore, an alternative, theoretically based version of the scale was developed for this purpose. Mullen and colleagues (2011) established construct validity and high reliability ($\omega = .93, .93$) for this 8-item version of the PACES. Respondents are asked to rate "how you feel at the moment about the physical activity you have been doing" using a 7-point bipolar rating scale. Two items are reverse scored. Higher PACES scores reflect greater levels of enjoyment.

3.3.4 Adherence & Satisfaction Variables

Program Adherence/Participant Adherence. Program adherence (i.e., were the program components delivered as prescribed?) was measured by strategies recommended versus actually delivered by the intervention. Participant adherence (i.e., how many *LaughActive* sessions did participants attend?) was measured by the percentage of participant program attendance. These

measurements were tracked via a roll sheet in which the exercise instructor noted participant attendance for each session. Participation was tallied according to percentage of each class attended (i.e., 100% for full class, 75% if participant arrived after the warm-up, 50% for half of class, and 25% if participant arrived for stretching only). Participant adherence was calculated by summing the total number of classes attended and dividing by 12 total sessions.

Program Satisfaction. *LaughActive* program satisfaction was assessed using a questionnaire that asked for feedback specific to the *LaughActive* program. The Satisfaction Questionnaire included both open and close-ended questions about the *LaughActive* program. The questionnaire is presented in Appendix F. In order to reduce participants' response bias, members of the research team who were not involved in facilitating the *LaughActive* sessions assessed program satisfaction and engagement.

3.4 Data Analysis Procedures

Independent samples *t*-tests were used to determine baseline differences between the intervention and control groups. Paired sample *t*-tests (two tailed) were used to measure change between pre- and post-test results on participants and controls. Individuals with missing data on outcomes were excluded pairwise; no imputation was done. IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., 2012) was used to calculate the variations in all pairs of determined study variables. The values are expressed as mean (standard deviation) and number (%). Since this was an exploratory study, differences were considered statistically significant at an alpha level of $p < .10$.

The SF-36v2® Health Survey was scored using the QualityMetric Health Outcomes™ Scoring Software 2.0. The software uses algorithms to convert 0-100 scores to the norm-based score (NBS) metric. This allows scores to be interpreted in relation to the 1998 U.S. general

population norms. Norm-based scores for all health domains and component summary scores were then exported into SPSS for within- and-between group analyses. The SFT was scored using the Senior Fitness Test Scoring Software 2.0. Participant data for each time point was then exported into SPSS for within- and-between group analyses.

3.5 Intervention

Both groups engaged in one 6-week *LaughActive* intervention. The *LaughActive* sessions were facilitated twice weekly within each facility in place of the morning exercise class. *LaughActive* is a 45-minute moderate-intensity exercise program for older adults that combines endurance-enhancing laughter exercises with a dedicated strength, balance, and flexibility exercise program. Playful laughter yoga exercises and breathing techniques were interspersed within the exercise program as "laughter and breathing breaks." These laughter breaks functioned to increase exercise enjoyment, enhance feelings of joyfulness and well-being, and extend the traditional exercise class format to include social connection among participants. Unlike a traditional exercise class, this unique exercise class enabled participants to laugh intentionally with one another and connect on a joyful level.

The strength, balance, and flexibility components of the intervention coincided with the ACSM/AHA PA recommendations for older adults (Nelson et al., 2007). In developing the two exercise routines that were used for each 6-week wave of the intervention, these older adult-specific guidelines were followed in terms of the session format, the selection of exercises for the program, the progression of the exercises within the class sessions themselves, and the progressive advancement of exercise difficulty from the first to second routine (weeks 1-3 and weeks 4-6, respectively). In accordance with industry guidelines, each exercise session included 5-10 minutes of warm-up exercises followed by 35 minutes of intensive repetitive exercises,

before concluding with 5 minutes of cool down exercises and stretching (Fahlman, McNevin, Boardley, Morgan, & Topp, 2011).

3.5.1 Endurance Training

Although *LaughActive* is not a dedicated endurance program, it does have elements of aerobic benefit. As previously discussed, the physical act of laughter is comparable to mild cardiovascular exercise and shares many common physiological benefits associated with exercise (Fry, 1994). The laughter exercises used in *LaughActive* may be equivalent to the short high-intensity aerobic bursts that occur in interval training, in which the exercise intensity is varied within a single bout of exercise (Garber et al., 2011). The interval training model consists of a series of maximal effort sprints with a period of active lower-intensity active recovery between each series (Metcalfe, Babraj, Fawkner, & Vollaard, 2012). Interval durations have been evaluated that range from 15 seconds to several minutes (Arnardóttir, Boman, Larsson, Hedenström, & Emtner, 2007). Numerous studies have demonstrated similar efficacy of interval training and traditional continuous duration endurance training in a number of cardiorespiratory fitness and cardiometabolic biomarkers in healthy subjects (Ciolac et al., 2010; Croft et al., 2009; Gormley et al., 2008; Helgerud et al., 2007; Musa, Adeniran, Dikko, & Sayers, 2009; Talanian et al., 2010; Whyte & Laughlin, 2010), and in subjects with metabolic, cardiac, or pulmonary disease (Beauchamp et al., 2010; Earnest, Blair, & Church, 2010; Guimarães et al., 2010; Rognmo, Hetland, Helgerud, Hoff, & Slørdahl, 2004; Warburton et al., 2005; Wisløff et al., 2007). Berk (2001) claimed, “For older adults who refuse to exercise or simply [cannot], laughter provides a limited proxy for exercise that is within everyone’s reach” (p. 332). The diaphragmatic movement of the laughter itself, combined with the physicality of the playful laughter exercises, was intended to improve cardiorespiratory and muscular endurance. The

laughter exercises incorporated rhythmic movement of the major muscle groups in a playful manner while laughing. For instance, laughter exercises might entail participants pretending to run across hot sand while laughing, jumping rope while laughing, or cleaning out limiting thoughts with "mental floss" by imagining a giant string of floss passing in and out through the ears as participants flex and extend the arms out to the side, all while laughing. The *LaughActiv*e sessions included, on average, 8-10 laughter exercises lasting 30-60 seconds each.

Since even moderate-intensity exercise can be strenuous for some older adults, the laughter exercises were additionally intended to function as a welcome reprieve after completing a series of the strength, balance, or flexibility exercises. Since laughter strengthens and relaxes muscles, the laughter exercises usually involved physicality in the major muscle groups that were just used, or those that would be used in the preceding strength, balance, and flexibility exercises. A laughter exercise was typically incorporated into the workout routine after every 2-4 strength, balance, and flexibility exercises.

3.5.2 Strength Training

In order to increase muscle strength, PA guidelines recommend that all adults engage in 8-10 strengthening exercises that target all muscle groups on at least two or more nonconsecutive days per week (Haskell et al., 2007). To enhance strength, strengthening exercises should be performed in one to three sets of 8-12 repetitions each to the point of volitional fatigue, and the level of resistance should increase as one develops strength. Performing only one set of exercises is effective in enhancing muscle strength (USDHHS, 2008). PA recommendation statements specific to older adults encourage 10-15 repetitions for each resistance exercise at a moderate- to high-intensity to improve strength (Nelson et al., 2007). Per these guidelines, The *LaughActive* intervention used free weights for upper body strengthening exercises and resistive body weight

for lower body strengthening exercises. Sessions included one set of 8-10 exercises with 10-15 repetitions for each exercise. So that the intervention continued to remain moderate-intensity for each participant as gains were made in muscle strength, resistance was gradually progressed over the course of the intervention, ranging from 1 lb to 3 lb free weights and progressive body weight exercises, as tolerated by individual participants. Strength exercises targeted the muscles of the shoulders, chest, back, biceps, triceps, forearms, wrists, abdominals, inner and outer thighs, hips, glutes, quadriceps, hamstrings, and the supporting tissues of the ankles.

3.5.3 Balance Training

While the intervention was designed to include standing static and dynamic balance exercises, due to functional limitations of study participants and the associated risk of falls, balance exercises were completed while seated. Balance exercises focused on strengthening key muscles involved in balance, such as the abdominals, quadriceps, hamstrings, calves, and the supporting tissues of the ankles.

3.5.4 Flexibility Training

Static and dynamic stretching techniques were incorporated into the cool down segment of the *LaughActive* program. Per industry recommendations, static stretches were held for 10-30s. and were repeated 3-4 times for each stretch (Nelson et al., 2007). Muscles that were stretched included the neck, shoulders, chest, back, hamstrings, calves, shins, and the supporting tissues of the ankles.

3.5.5 Intensity

The *LaughActive* intervention was designed to be moderate-intensity in accordance with industry guidelines. These guidelines establish that most health benefits occur with at least 150

minutes a week of moderate-intensity physical activity. Furthermore, the guidelines state that for most individuals, including older adults, the benefits of moderate-intensity physical activity far outweigh the risks associated with inactivity (USDHHS, 2008). Moderate-intensity exercise is generally considered safe for older adults with one or more chronic conditions. This level of exercise raises the heart rate and commences sweating, but the exerciser should not experience difficultly in carrying on a conversation during exercise. Moderate-intensity exercise should be well within an exerciser's capacity to comfortably sustain the exercise for 45 minutes (American Council on Exercise [ACE], 2011). Since older adults are commonly prescribed beta-adrenergic blocking agents medications (commonly referred to as beta blockers), which blunt the heart-rate response and will not give an accurate indication of exercise intensity using heart rate monitoring devices, experts recommend that intensity should be monitored in older adult populations using the Talk Test and the Borg Rating of Perceived Exertion (RPE) scale (ACE, 2010); Borg, 1970). Participants were introduced to these intensity-monitoring techniques before the first *LaughActive* session commenced, and were reminded of the use of these intensity-monitoring methods at the commencement of each exercise session.

The Talk Test takes into account an exerciser's ability to breathe and talk during exercise to ensure that the activities being performed are at an appropriate intensity level (Persinger, Foster, Gibson, Fater, & Porcari, 2004). Participants were notified that there would be times in class in which the instructor would ask them questions. Participants were encouraged to speak out during class and answer the instructor using a full sentence. Those who are able to answer using a full sentence without stopping or gasping for air are exercising at an appropriate intensity (ACE, 2010). Using the Borg Rating of Perceived Exertion scale, participants were asked to assign a rating to feelings of exercise exertion. Participants were asked to gauge and self-monitor

their intensities by feelings that corresponded to the words “just noticeable,” “light,” “somewhat hard,” “hard,” and “maximal.” Participants were reminded that when feelings corresponded to somewhere between “light” and “somewhat hard,” they were exercising at the appropriate intensity. Subjective feelings of exertion in this range correspond to a numeric value of 12-14 on the RPE, which is the equivalent to moderate-intensity exercise (ACE, 2011). Additionally, at the end of each exercise session, participants were asked to rate the intensity of the session according to these terms.

3.5.6 Frequency & Duration

Industry guidelines recommend that moderate-intensity cardiorespiratory (endurance) exercise intervention programs for healthy individuals consist of 30-60 minute sessions (ACSM, 2011). Moderate-intensity endurance exercise sessions should be performed on at least five days per week. Resistance, flexibility, and balance exercise should be performed at least two to three days per week (Garber et al., 2011). The *LaughActive* 45-minute moderate intensity exercise program was facilitated two times per week in each facility. Sessions were not held on consecutive days, which allowed muscles to recover from strength training exercises between sessions (Garber et al., 2011). The literature has not identified for what duration exercise interventions should occur to achieve ideal results among older adults residing in long-term care (LTC) facilities experiencing various states of decline (Baum, Jarjoura, Polen, Faur, & Rutecki, 2003). However, research indicates that the optimal intervention duration may be 12 weeks (Yeom, Keller, & Fleury, 2009). Although research indicates that the optimal intervention duration may be 12 weeks, due to time constraints, the *LaughActive* intervention was facilitated in each ALF over a period of six weeks.

3.5.7 Fidelity

The student investigator facilitated all *LaughActive* exercise sessions. The student investigator possesses several fitness certifications and is qualified to facilitate safe and effective exercise sessions. These certifications include: Group Fitness Instructor (American Council on Exercise); Laughter Yoga Teacher (Laughter Yoga International); and CPR/AED/First Aid (American Heart Association). The two exercise routines that comprised this intervention were developed in partnership with Dr. LaVona Traywick, an associate professor of Gerontology at the University of Arkansas, and a certified Personal Trainer and Group Fitness Instructor (National Exercise Trainers Association). The intervention was supported by written protocol for each routine, and each session was facilitated according to its protocol with minimal variation from the written protocol between groups.

4 FINDINGS

From the four Atlanta-area ALF sites that were recruited for the study, a total of 37 participants were recruited (intervention 18; control 19). A total of 35 participants were initially recruited at the Time 1 baseline recruitment sessions. Two sites participated in the intervention from Time 1 to Time 2. The other two sites, during this Time 1 to Time 2 period, provided the controls. From Time 2 to Time 3, the latter two sites contributed participants (per the wait list control design). The majority of these participants from the original control sites had been controls. Two participants, who had not been controls, were added at Time 2. Of the 37 participants who completed baseline measurements, 31 completed all Time 2 measurements (intervention 15; control 16). A total of 14 control group participants completed both Time 2 and Time 3 measurements in their entirety. Reasons for loss to follow-up were involuntary withdrawal from the study due to 0% class participation (intervention 2; control 1), fall or medical condition since baseline assessment prohibiting exercise participation and observational fitness test evaluation (intervention 1; control 1), movement from the ALF due to medical or personal reasons (intervention 0; control 2), and refusal to complete follow-up measurements (intervention 0; control 1). No participants withdrew from the study for reasons directly related to the *LaughActive* program.

Of the 29 study participants who completed their respective baseline and end point measurements, two participants were excluded from the final analyses. Reasons for exclusion include class participation of fewer than 50% of the program sessions (n=1) and high inconsistencies in responses (n=1), as determined by the SF-36v2® Health Survey Response Consistency Index (RCI) data quality indicator. The RCI is designed to check consistency of responses between the 15 pairs of items. When responses are found to be consistent for the

paired items, the RCI score for that pair would be zero. A pair of inconsistent responses is denoted by a score of one. The final RCI score for a respondent is found by totaling the scores for the 15-item consistency checks. The RCI score that indicates complete consistency is zero and the score that indicates the least consistency is 15 (Ware et al., 2011). To protect the integrity of the findings, participants with an RCI score greater than three were excluded from data analyses.

We examined within- and between-group change over time for these 27 participants. Since the wait list control design allowed for all participants to be part of the intervention at one point in time, all 27 participants served as the intervention group for the within-group change analyses.

4.1 Sample Characteristics

Descriptive characteristics of the sample are presented in Table 4.1. Descriptive characteristics are presented for all study participants who were recruited at baseline, and those who completed the intervention and were included in the final analysis. The mean age of the participants who were recruited at baseline (n=37) was 80.62 years (SD=8.05). The BMI of these participants (n=29) was 27.78 (SD=5.13). Note that we were unable to assess BMI for wheelchair-bound participants. Of the study participants who were included in the final data analyses (n=27), the mean age was 81.55 years (SD=7.48) and the mean BMI (n=25) was 27.40 (SD=4.93). The majority of these study participants were Caucasian (88.9%), female (81.5%), were not married or living with a partner (84.6%), and were college educated (74.1%). The majority of study participants exercised at least 5 days per week (55.5%). Independent samples *t*-tests indicated that there were no significant differences in socio-demographic variables between the intervention and control groups at baseline.

Table 4.1 Socio-demographic characteristics of *LaughActive* participants

	Recruited (N=37) n (%)	**Completed (n=27) n (%)**
Age (years)		
60-70	4 (10.8)	3 (11.1)
71-80	9 (24.3)	3 (11.1)
81-90	22 (59.4)	19 (70.3)
91-100	2 (5.4)	2 (7.4)
Gender		
Male	7 (18.9)	5 (18.5)
Female	30 (81.1)	22 (81.5)
Race		
White (Not Hispanic)	31 (83.8)	24 (88.9)
Black/African American (Not Hispanic)	6 (16.2)	3 (11.1)
Education		
Some High School/High School Graduate	8 (22.2)	7 (25.9)
Some College/College Graduate	19 (51.4)	16 (59.3)
Graduate Education	10 (26.4)	4 (14.8)
Partnership Status		
Married/Living with partner	5 (13.9)	4 (15.4)
Other	32 (86.1)	23 (84.6)
Exercise Class Participation		
Do not participate	4 (10.8)	2 (7.4)
1 day per week	7 (18.9)	5 (18.5)
2 days per week	3 (8.1)	2 (7.4)
3 days per week	1 (2.7)	1 (3.7)
4 days per week	3 (8.1)	2 (7.4)
5 days per week	5 (13.5)	3 (11.1)
More than 5 days per week	14 (37.8)	12 (44.4)

Note. Data are presented as number (percent).

4.2 Subjective Health Outcomes

Within-group improvements from baseline to end point were observed in several SF-36v2® domains, including RP (Role-Physical), BP (Bodily Pain), GH (General Health), VT (Vitality), SF (Social Functioning), MH (Mental Health), and the overall MCS (Mental Component Summary) score (Table 4.2). However, statistically significant within-group effects were only observed for the MH health domain (p = .056; Table 4.2). Findings in relation to the normative mean scores for similarly aged older adults are presented in Figure 4.1.

Table 4.2 Within-group change of outcomes from baseline to end point for *LaughActive* participants

Outcomes	Baseline *M (SD)*	End Point *M (SD)*	*p*-value
Subjective Health (n=27)			
SF-36v2®			
PCS	46.76 (9.09)	47.05 (8.05)	.844
PF	42.72 (10.07)	42.58 (10.52)	.942
RP	47.67 (9.51)	48.75 (8.62)	.529
BP	52.51 (9.62)	53.15 (9.02)	.692
GH	53.36 (8.80)	54.27 (8.21)	.386
MCS	56.12 (8.32)	57.59 (6.86)	.262
VT	56.11 (9.95)	57.87 (10.46)	.332
SF	51.95 (9.00)	52.32 (8.45)	.864
RE	50.88 (8.15)	50.88 (7.25)	1.000
MH	54.35 (8.91)	56.68 (5.68)	.056*
Objective Health			
SFT			
Chair Stand (n=23)	6.78 (3.04)	7.04 (3.03)	.756
Arm Curl (n=27)	10.40 (4.05)	9.92 (3.48)	.589
2-Minute Step (n=25)	55.66 (21.34)	64.33 (23.66)	.036**
Chair Sit-and-Reach§ (n=26)	-3.42 (3.61)	-4.26 (3.97)	.114
Back Scratch§ (n=25)	-6.80 (5.41)	-6.51 (5.01)	.687
8-Foot Up-and-Go¶ (n=25)	13.53 (6.48)	15.10 (7.38)	.026**
Self-Efficacy (n=27)			
OEE	4.09 (.60)	4.35 (2.34)	.006**
SEE	6.43 (2.34)	6.85 (2.12)	.404
PACES	20.18 (9.81)	17.44 (8.84)	.227

Note. Data are presented as *M (SD)*. *$p < .10$; **$p < .05$ indicates significance of group difference from baseline (paired sample *t*-test, 2-tailed). §Scores further from 0 in the negative direction indicate worse outcomes. ¶Higher scores indicate worse outcomes.

PCS indicates Physical Component Summary; PF, Physical Functioning; RP, Role-Physical; BP, Bodily Pain; GH, General Health; MCS, Mental Component Summary; VT, Vitality; SF, Social Functioning; RE, Role-Emotional; MH, Mental Health; SFT, Senior Fitness Test; OEE, Outcome Expectations for Exercise Scale; SEE, Self-Efficacy for Exercise Scale; PACES, Physical Activity Enjoyment Scale.

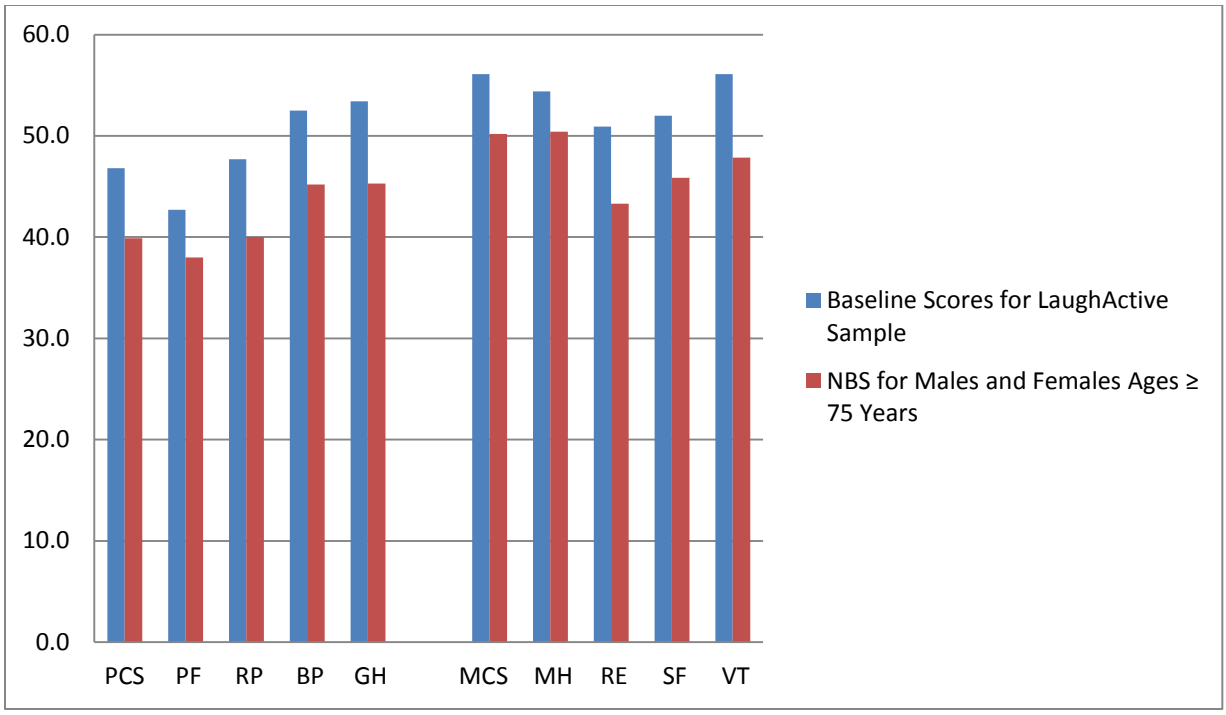

Figure 4.1 Quality of life domains of SF-36v2® Health Survey Standard Form at baseline and end point for *LaughActive* participants (n=27) in comparison to 1998 SF-36v2® age norms for males and females ages 75+

Note. Data are presented as means.

PCS indicates Physical Component Summary; PF, Physical Functioning; RP, Role-Physical; BP, Bodily Pain; GH, General Health; MCS, Mental Component Summary; VT, Vitality; SF, Social Functioning; RE, Role-Emotional; MH, Mental Health.

4.3 Objective Health Outcomes

Complete (baseline and end point) SFT data were available for 23-27 participants, depending on the test. Due to participants' inability to perform certain tests because of health or functional restrictions, there was variation in the number of participants who completed each test. In fact, the only test that all participants were able to perform at both measurement periods was the Arm Curl Test (upper body strength). The results of the within-group change paired sample *t*-tests are presented in Table 4.2. Statistically significant within-group improvements ($p = .036$) were observed in aerobic endurance (2-Minute Step Test). Statistically significant within-group declines ($p = .026$) were observed in agility and dynamic balance (8-Foot Up-and-Go

Test). Minimal within-group improvement was observed in lower body strength (Chair Stand Test) and upper-body flexibility (Back Scratch Test), but these findings did not reach significance.

Many of the fitness tests were too difficult for this study population to perform, resulting in the need for modifications to the standard test protocols when performing the tests. The number of participants (n = 27) who performed each test using modifications to the standard test protocols are as follows: Chair Stand = 11 (no attempt = 4); Arm Curl = 21; 2-Minute Step = 21 (no attempt = 2); Chair Sit-and-Reach = 20 (no attempt = 1); Back Scratch = 1 (no attempt = 2); 8-Foot Up-and-Go = 14 (no attempt = 2). These modifications meant that participants would normally be scored zero if they used any modifications at all. We took a different approach to examining change because of these floor effects. We examined scores without discounting those who used modifications, and instead recorded participants' numerical score. This scoring approach proved difficult in our analyses because whether or not participants' used modifications changed over time. Some participants performed the tests with modifications at baseline, but then did not use modifications in the follow-up testing period. Since participants were typically able to obtain a better score using modifications, the follow-up scores appear to decline, when in actuality, the follow-up scores represent an improvement since they performed the tests according to the protocols. Given these complications, we present the results of the paired sample *t*-tests (Table 4.2) and also the frequency of improvement/decline from baseline to end point (Table 4.3). When calculating the results that are displayed in the frequency table, we assigned a status of improvement if participants performed a test initially with modifications and then later performed the test without modifications, irrespective of participants' poorer numerical scores. We assigned a status of decline if participants performed a test initially without

modifications, and then later performed the test with modifications, irrespective of participants' better numerical scores. All control participants who completed baseline and Time 2 measurements for the comparison period (n = 16) are included in the control period baseline to end point analyses. As with the paired *t*-test analyses, participants with missing data on a test were excluded pairwise for that test. The results of this hand-scoring technique demonstrate that the intervention group maintained or improved their scores from baseline to end point in all measures, while the comparison group only maintained or improved their scores in the Chair Stand, Chair Sit-and-Reach, and 8-Foot Up-and-Go Tests during the control period. Sensitivity analysis examining the use of modifications compared to no modifications and hand scored improvement or decline over time did not change overall study findings.

Table 4.3 Frequency of SFT improvement and decline from baseline to end point for *LaughActive* participants

	Intervention Period Baseline to End Point			**Control Period Baseline to End Point**		
Outcomes	**n**	**Declined**	**No Change or Improved**	**n**	**Declined**	**No Change or Improved**
Chair Stand	23	6 (26.1%)	17 (73.9%)	14	6 (42.9%)	8 (57.1%)
Arm Curl	27	13 (48.1%)	14 (51.8%)	16	9 (56.3%)	7 (43.7%)
2-Minute Step	25	11 (44%)	14 (56%)	15	9 (60%)	6 (40%)
Chair Sit-and-Reach	26	10 (37%)	17 (63%)	16	5 (31.3%)	11 (68.7%)
Back Scratch	25	8 (32%)	17 (68%)	14	9 (64.3%)	5 (35.7%)
8-Foot Up-and-Go	25	11 (44%)	14 (56%)	15	4 (26.7%)	11 (73.3%)

Note. Data are presented as number (percent).

While the frequency table conveys participant improvement and decline due to variance between the use of modifications from baseline to end point, follow-up scores that could be considered improvement for some participants are not portrayed in the data, and thus, participant improvement may actually be underrepresented in our reporting.

4.4 Self-Efficacy Outcomes

Within-group improvements from baseline to end point were observed in self-efficacy (Table 4.2). Statistically significant improvements ($p = .006$) were observed in outcome expectations for exercise (OEE) and minimal improvements were observed in self-efficacy for exercise (SEE), but these findings did not reach significance. PACES scores declined, but declines in exercise enjoyment were not significant.

4.5 Control Group Outcomes

In general, the participants within the control facilities were in better health at Time 1. Independent samples *t*-tests indicated statistically significant differences ($p < .05$) at baseline between the intervention and control participants in aerobic endurance (2-Minute Step Test), the overall MCS (Mental Component Summary), and the RP (Role-Physical) and MH (Mental Health) domain scores that contributed to the overall MCS score. However, since we employed a wait list control study design, all sites were intervention sites at one point in time. We examined between-group change from Time 1 to Time 2 and observed statistically significant declines among the control group in agility/dynamic balance ($p = .053$) and PA enjoyment ($p = .20$). We observed one surprising finding, in that the MCS score significantly improved ($p = .026$) for control group participants during this control period, although none of the domains that comprise the MCS score showed significant improvement from baseline to follow-up.

4.6 Adherence & Satisfaction Outcomes

The intervention was supported by written protocol for each session, and each session was facilitated according to its protocol with minimal variation from the written protocol between groups. No adverse events were reported. The mean number of classes attended was 9.85 (SD =

2.09; range = 4-12). The majority of participants (22 or 81.4%) who were included in the final analyses attended at least 75% of the *LaughActive* program.

LaughActive Satisfaction Questionnaire results are presented in Table 4.4. All participants who completed end point measurements (n=30) are included in the presentation of results. Unanimously, participants were satisfied with the program and enjoyed being in class. Respondents indicated that they found the laughter aspect of the programming to be an enjoyable addition to a traditional exercise program (96.7%). Moreover, 96.7% of respondents stated that the laughter aspect of the *LaughActive* program helped to make exercise more accessible for them, and 86.6% found that the program enhanced their motivation to participate in other exercise classes or activities. All participants stated that they felt better overall, and 93.4% found more joy in their lives as a result of the *LaughActive* program. Furthermore, 90% of respondents not only wanted to continue the program, but wanted to continue the program two times per week. However, only 50% of respondents wanted to continue the program as frequently as three times per week. Several themes emerged from our analysis of participants' responses to the open-ended questions (results not displayed). These open responses included appreciation of the following aspects of the *LaughActive* intervention: interaction with peers, mood benefits, enjoyment/fun, laughter, the program as different, and the instructor's equating the *LaughActive* program exercises with activities of daily living.

Table 4.4 *LaughActive* satisfaction questionnaire findings at end point for *LaughActive* participants[a]

Description		
Outcome variables (4 pt. scale, where strongly agree=4)	***M (SD)***	**% Agree or Strongly Agree**
I am satisfied with the *LaughActive* program	3.53 (.507)	100
As a result of the *LaughActive* program, I feel better overall	3.40 (.498)	100
As a result of the *LaughActive* program, I find more joy in my life	3.20 (.551)	93.4
The *LaughActive* program was appropriate for my physical fitness level	3.43 (.568)	96.7
I found the laughter aspect of the *LaughActive* program to be an enjoyable addition to a traditional exercise program	3.43 (.568)	96.7
The laughter aspect of the *LaughActive* program helped to make exercise more accessible for me	3.23 (.626)	90
The *LaughActive* program enhanced my interaction with my classmates during the exercise classes	3.30 (.702)	86.6
The *LaughActive* program enhanced my interactions with others outside of class	3.03 (.768)	83.3
The *LaughActive* program enhanced my motivation to participate in other exercise classes or activities	3.17 (.747)	86.6
I would like to continue participating in the *LaughActive* program	3.37 (.669)	90
I would like to continue participating in the *LaughActive* program two times per week	3.27 (.640)	90
I would like to continue participating in the *LaughActive* program three times per week	2.67 (.758)	50
I would recommend the *LaughActive* program to a friend	3.43 (.568)	96.7
Outcome variables (3 pt. scale, where often=3)	***M (SD)***	**% Sometimes or Often**
I felt comfortable approaching my instructor with questions or comments	2.70 (.535)	96.6
I liked the instructor's teaching approach	2.90 (.305)	100
I was satisfied with the way my instructor taught the classes	2.93 (.254)	100
I enjoyed being in class	2.93 (.254)	100
I felt that I was a valued and respected member of the class	2.87 (.346)	100

Note. [a]n=30. Data are presented as *M (SD)* and percentages.

5 DISCUSSION AND CONCLUSION

The efficacy of a 6-week laughter-based PA program on health and self-efficacy for PA was evaluated in ALF residents. We observed statistically significant improvements in mental health, aerobic endurance, and outcome expectations for exercise in the intervention participants.

5.1 Subjective Health

The *LaughActive* intervention aimed to improve subjective health status, or HRQOL. Aim 1 was partially supported, in that statistically significant within-group improvements (p = .056) were observed in mental health and modest improvements were observed in other SF-36v2® health domains. The five-item MH (Mental Health) domain measures the four major mental health dimensions of anxiety, depression, behavioral/emotional control, and psychological well-being. Higher scores indicate improved mental health states of peace, happiness, and calmness; lower scores indicate feelings of anxiety, depression, and loss of behavioral/emotional control (Ware et al., 2007). These significant improvements in mental health are supported by the Satisfaction Questionnaire findings, in that 100% of respondents stated that they felt better overall, and 93.4% of respondents found more joy in their lives as a result of the program.

Additionally, we observed improvements in the MCS (Mental Component Summary) score, as well as improvements in key health domains that make up the overall summary score, including VT (Vitality) and SF (Social Functioning). Although the findings did not reach significance, these scores may demonstrate a tendency toward participants' increased energy levels, enhanced quantity and quality of social activity, and a reduction in physical and emotional problems interfering with social activities (Ware et al., 2007). Additionally, the *LaughActive* exercise instructor observed anecdotal improvements in vitality throughout the intervention, as

numerous residents often stated during and immediately following classes that the sessions made them feel “invigorated and full of life.” Additionally, we observed trends toward improvements in key health domains that contribute to the overall PCS (Physical Component Summary) score, including RP (Role-Physical), BP (Bodily Pain), and GH (General Health). These increased scores indicate a trend toward fewer problems with activities as a result of physical health, reduced intensity and impact of pain on daily activities, and higher ratings of general health and more favorable expectations of future health (Ware et al., 2007). These improvements were trending upward, but did not reach significance. If power were increased, these measures may have shown statistically significant change.

We did not observe improvements in the PF (Physical Functioning) domain, which reflects levels and kinds of limitations in various daily, moderate, and vigorous physical activities; nor did we observe improvements in the overall PCS score. The PCS measure reflects physical morbidity. A very high PCS score requires an evaluation of current health as excellent, beyond a lack of physical or social problems. PCS scores decrease with limitations or disabilities in the physical spectrum, reflecting of the results of limitations and disabilities in physical health, which decreases the personal evaluation of health. The domains are ordered from the best physical health measure to the least (PF, RP, BP, GH). Thus a low score on the PCS reflects a low score on one or more of these domains (Ware et al., 2007). Given the low PF scores and its high factor loading into the overall PCS score, it is not surprising that we did not observe improvements in the PCS score. This sample was residing in ALFs, which implies that they would have limitations in three or more ADLs. These limitations cannot easily be impacted by a 6-week PA intervention.

Improvements in HRQOL may have been limited by several factors. First, the sample's scores at baseline across all health domains were higher in comparison to the norm-based mean scores for males and females aged 75 and over, indicating that this study sample had levels of subjective mental and physical functioning at baseline that were well above similarly aged older adults. A literature review of the association between physical activity and quality of life in older adults confirmed that the effect of PA on HRQOL is less pronounced in items where an individual is functioning at or above the norm (Rejeski & Mihalko, 2001) The effects of an exercise intervention might have been more pronounced in a sample of community-dwelling older adults or ALF residents with lower baseline perceived HRQOL. It is also important to note that this sample likely had a higher socio-economic status (SES) than the general population of their peers, given that they were residing in ALFs that charged monthly fees ranging from $3,350-$4,895.

Improvements in HRQOL may also have been limited by our use of the SF-36v2® standard (4-week recall) form. We selected the SF-36v2® because it is the most comprehensive and precise all of the SF measurement instruments (Ware et al., 2007). It has more response items, so each health domain is better represented, as there is a wider range of each construct that can be measured. Thus, ceiling and floor effects are less pronounced with this instrument, as opposed to the shorter instruments that comprise the SF family (Ware et al., 2007). However, since this instrument was administered with other instruments, the decision to use this instrument as opposed to a shorter instrument may have contributed to respondent burden. Additionally, in choosing between the SF-36v2® acute form (1-week recall) and the standard form (4-week recall), the standard form was more appropriate for assessing the efficacy of a 6-week intervention. However, it may have been difficult for respondents to accurately recall and assess

their health status over a period of four weeks, and responses instead may have been influenced by how participants were feeling at the time of test administration. Physical and affective states vacillate from week-to-week, day-to-day, and even minute-to-minute. Therefore, participants' inability to reflect upon their assessment of physical and emotional status over the course of four weeks may have limited their ability to accurately assess subjective health ratings comprehensively. This difficultly in responding to test items because of the 4-week recall required was especially apparent among those participants with higher degrees of memory loss or cognitive decline.

5.2 Objective Health

The *LaughActive* program aimed to improve objective health, or fitness performance measures. Aim 1 was minimally supported, in that we observed statistically significant within-group improvements ($p = .036$) in aerobic endurance (2-Minute Step Test). The statistically significant aerobic endurance improvements are especially meaningful given the structure of the *LaughActive* program. The *LaughActive* program could not be considered an endurance program in the traditional sense because the program did not incorporate activities that increase the heart rate and breathing for a continuous period of *at least ten minutes* (Cress et al., 2005). Instead the heart and breathing rate were increased through the 30-60 second aerobic bursts interspersed throughout the session in the form of laughter exercises. The increase in aerobic endurance demonstrates that laughter in this format may improve aerobic endurance.

We observed statistically significant within-group declines ($p = .026$) in agility and dynamic balance (8-Foot Up-and-Go Test). The control group also significantly declined ($p = .053$) in this measure during the control period. When we developed the *LaughActive* intervention and progressive series of *LaughActive* sessions, we intended for the program to

include standing strength and balance exercises. However, after meeting the potential study participants at the *LaughActive* demonstration sessions, we determined that the safest course of action was to facilitate the entire intervention while seated. We made this determination based on the numerous participants with apparent balance and mobility issues. Additionally, the chairs used for exercise classes in three of the four facilities did not seem sturdy enough to adequately hold participants' weight without risk of the chairs tipping forward. Upon discovering the participants' apparent balance and mobility issues at the *LaughActive* resident demonstration sessions, the instructor inquired about the current exercise regimen at the facilities, and learned from activity personnel that the exercise classes at all sites were facilitated entirely while seated. Rather than facilitating standing balance exercises as we had intended, we instead promoted balance through exercises aimed at strengthening key muscles involved in balance, as well as exercises geared toward improving neuromotor coordination.

The lack of additional statistically significant findings in physical performance measures might be related to the instrument selected to measure efficacy of this intervention. While the SFT is suitable for use with dependent older adults who need assistance with basic ADLs, the instrument was designed to assess the physical performance capacity of independent, community-dwelling adults (Rikli & Jones, 2012). Although the instrument uses continuous-scale scores which can accommodate a wide range of physical ability levels, many of the fitness tests were too difficult for this study population to perform, resulting in the need for modifications in performance of the tests.

The frequent use of modifications was problematic for scoring the SFT and, subsequently, measuring change over time. As discussed, a score of zero is assigned if the test is performed with any modifications to the standard test protocol, and when a test is performed

using modifications, the score cannot be compared to the normative data of community-dwelling older adults. Since numerous participants performed tests using modifications to the standard test protocols, we were advised by the scoring software developer to record the numerical score obtained using modifications, rather than assigning a score of zero. While the modified score cannot be compared to the normative data, this method was intended to allow the ability to track change over time in this frailer, non-community dwelling sample. However, between test trials many participants alternated between performing tests with modifications and without modifications to the test protocols. For instance, many participants initially performed tests using modifications, but then were able to perform the follow-up trial(s) without using modifications. We used *t*-tests to examine change in scores, but our analyses could not account for the varied use of modifications at baseline and the follow-up testing period(s). Therefore, in many instances the follow-up scores appear to represent a decline, as participants were often able to obtain a better score with the use of modifications, yet in actuality, what might appear to be a poorer score is actually an improvement because the participant performed the test according to the standard test protocol. Less frequently, we observed the reverse of this scenario. Some participants did not perform the tests with modifications at baseline, but then used modifications in the follow-up testing period(s). Since participants were typically able to obtain a better score using modifications, the follow-up scores appear to improve, when in actuality, the better scores represent a decline.

Given these complications, we also presented the results as frequency of improvement and decline from baseline to end point. The results of this hand scoring technique showed that the intervention group maintained or improved their scores from baseline to end point on all six tests, while the comparison group only maintained or improved their scores on three tests during

the control period. Examining the frequencies of participant improvement/decline in this manner enabled a clearer picture of the meaning behind participants' numerical scores; however, the technique is limited in that we could not examine the statistical significance of improvement/decline.

Even with hand scoring participant improvement/decline, participant improvement may actually be underrepresented in our reporting. We illustrate this point with two participant case studies. Case Study A is a particularly frail 87-year-old female participant in one of the control sites, who the *LaughActive* instructor observed to make progressive gains in overall strength, endurance, and flexibility over the course of the intervention. However, due to the scoring procedures, this participant appears to decline in performance measures from baseline to end point. The Chair Stand Test assesses lower body strength, and proper performance of the test protocol requires that participants come to a full stand out of the chair and return to the seated position with the arms remaining crossed over the chest. Test administrators record the number of chair stands that are performed in 30 seconds. Although the test is a measure of lower body strength, due to the frailty of our sample, it was nearly impossible for many participants to perform the test without assistance from their arms. If we more closely examine the Chair Stand Test scores of Case Study A, we observe that she performed six chair stands at baseline, but used her arms for assistance in rising from the chair (modification). In her second trial (baseline score), she performed one chair stand without modifications. Due to the scoring protocol, while this score is fewer chair stands, the second trial score represents an improvement over baseline since she performed the test without modifications. In her third trial (end point), she performed 14 chair stands, but used her arms for assistance in rising from the chair (modification). Although she made substantial improvements in the number of chair stands from the first to third

trial, since she performed one chair stand during her second trial (baseline) without modifications and used modifications in her third trial (end point), the scoring protocol dictates that this much higher score over her first trial represents a decline.

Case Study B is a 90-year-old female in the intervention group, who the *LaughActive* instructor also observed to make progressive gains in physical performance measures over the course of the intervention. The 2-Minute Step Test is a measure of aerobic endurance. Test administrators first determine participants' appropriate stepping height and then record the number of steps participants can take at their stepping height over the course of two minutes. Proper performance of the test protocol requires that participants step at this height without holding a wall or other object for support. If we more closely examine the 2-Minute Step Test scores of Case Study B, we observe that she performed 44 steps without modifications during her first trial (baseline). During her second trial (end point), she performed 73 steps, but held a wall for support (modification). While her second trial represents a substantial improvement in the number of steps she could perform in two minutes, according to the scoring protocol, since she held a wall for support, the higher score represents a decline. Her holding a wall for support is likely due to declines in balance and/or fear of falling. In further examining her scores on the 8-Foot Up-and-Go Test (a measure of agility and dynamic balance), we clearly observed decline since she performed both trials using an assistive walking device (modification), yet her score declined in the second trial. Since she used modifications in both trials, her second score represents a true decline. Her decline in agility and dynamic balance may provide more insight into her use of modifications during her second trial of the 2-Minute Step Test.

These case studies illustrate the unique nuances of scoring an instrument that was designed to assess the functional performance of community-dwelling older adults within a

sample of institutionalized older adults. These case studies serve to illustrate how the improvement in scores of participants in our sample are underrepresented, both in our reporting of the within-group change paired *t*-tests and also the frequency of improvement or decline when accounting for the use of modifications. Due to these difficulties in scoring the fitness tests and in capturing change over time, it is likely that we may have observed more improvement if we had selected a physical performance instrument that is more appropriate for frailer, institutionalized older adults.

We may have observed more change in a less active population. This population's reported levels of exercise class participation at baseline were very high; the majority of study participants reported exercising at least five days per week (55.5%). Given that these ALFs all had very active participation in their exercise programs, the impact of *LaughActive* on study participants' physical health may have been more maintenance than improvement. With a larger sample size, we could have evaluated the impact of *LaughActive* on those who reported that they engaged regularly in exercise versus those that did not. Since we had very few who were not engaging in PA at these ALFs, that analysis was not an option in this study.

Additionally, SFT follow-up results may have negatively impacted by the time of day in which these follow-up measurements were administered. Baseline measurements were generally administered in the morning during regular exercise class time, yet follow-up measurements were generally administered after lunch. It is possible that study participants were feeling fatigued after spending the morning completing their final *LaughActive* class and follow-up questionnaire, and then eating a large meal. Ideally the baseline and end point measurements would have been administered at the same time across measurement periods. However, due to scheduling logistics of the six trained volunteers required to administer the SFT circuit style, we

were unable to conduct the SFT measurements in the morning across the follow-up evaluation periods. Future interventions should administer baseline and end point measurements at the same time of day. It is also worth noting that due to the high burden of chronic conditions in this study population, there is considerable vacillation from day-to-day in the impact of these chronic conditions on energy, fatigue, and mood.

5.3 Self-Efficacy

The *LaughActive* program aimed to improve self-efficacy for PA by improving outcome expectations for exercise, increasing perceived facilitators and reducing perceived barriers to exercise, and enhancing exercise enjoyment. Aim 2 was partially supported in that statistically significant within-group improvements (p = .006) were observed in outcome expectations related to exercise (OEE) and minimal improvement was observed in self-efficacy for exercise scores (SEE). Outcome expectations play an important role in influencing older adults' exercise adoption and maintenance of exercise behaviors, and in fact may be better predictors of exercise behavior than beliefs regarding the ability to continue exercising despite perceived barriers (Resnick et al., 2008).

LaughActive was intended to serve as a program that would improve outcome expectations for exercise by educating participants on the benefits of exercise and experientially increasing participants' perceptions of the benefits of exercise and the joyful affective states within themselves. The facilitation techniques aimed to educate participants on the benefits of exercise. Throughout the sessions, the instructor narrated the health benefits of engaging in regular exercise (e.g., exercise strengthens our muscles and bones), as well as the benefits of each exercise on functional status (e.g., this exercise helps us to get in and out of a chair more efficiently). The observed statistically significant improvements indicate that the perceived

benefits of exercise were more apparent to the sample after the intervention concluded. Given the statistically significant increase in MH (Mental Health) domain scores and feedback on the Satisfaction Questionnaire, it is clear that participants experienced enhanced joyful affective states during this program, which is turn could have positively impacted outcome expectations (Jette et al., 1998; Resnick & Jenkins, 2000; Resnick et al., 2008). It is possible that the facilitation techniques provided meaningful education so that participants became more aware of the benefits of exercise, and/or that these benefits became more experiential in nature for participants. Several participants noted in the open-ended questions on the Satisfaction Questionnaire that they appreciated knowing how the exercises impacted their activities of daily living.

The program aimed to improve perceived facilitators and reduce perceived barriers to exercise. While we did observe within-group improvements in SEE scores, these improvements did not reach statistical significance. These results could have been limited by several factors. First, the sample reported moderate-to-high baseline self efficacy at 6.43 (range 0-10), and their reported levels of exercise class participation at baseline were very high with the majority of study participants exercising at least five days per week (55.5%). The combination of the moderate-to-high self efficacy scores and the high degree of exercise participation at baseline indicates that this sample already possessed high levels of self-efficacy for exercise, which could have limited improvement in scores. Secondly, for some respondents, their perceived ability to overcome barriers to PA participation was hypothetical in nature. There was a complex sense of whether respondents felt they could overcome a barrier even if they never perceived it as a barrier. We may have observed stronger results with this population by asking open-ended questions about barriers and facilitators, or simply using a checklist for barriers.

The importance of exercise enjoyment and enjoyable exercise programming in this sample of older adults emerged as a key finding from the SEE. We analyzed the frequencies of each SEE item at baseline to ascertain which barriers to PA maintenance were the most salient to all participants at baseline (n=37), as well as to those whose scores were included in the final analyses (n=27). The barrier that was the most salient to both sets of respondents was lack of exercise enjoyment. Using a range of 0-10, where 0 is "Not Confident" and 10 is "Very Confident" to indicate the current level of confidence to engage in exercise 3 times per week for 20 minutes each time, 64.7% of the total sample (n=37) and 64% of the sample included in the final analyses (n=27) marked a 5 or fewer in response to the question, "How confident are you right now that you could exercise 3 times a week for 20 minutes each time if you did not enjoy it?". Pain was the second most frequently cited barrier to exercise participation and adherence; 55.6% of the total sample (n=37) and 53.8% of the sample included in the final analysis (n=27) marked a 5 or fewer in response to the question, "How confident are you right now that you could exercise 3 times a week for 20 minutes each time if you felt pain when exercising?" Results of the Satisfaction Questionnaire similarly show that pain was a salient barrier to PA participation and maintenance among this sample. When asked what kept participants from attending *LaughActive* classes, pain was the second most frequently cited barrier after doctor's appointments. These findings demonstrate that while pain is a significant barrier to exercise participation and ongoing adherence, lack of exercise enjoyment was the most significant barrier to participation and maintenance of ongoing PA behaviors among this sample of ALF residents. These findings further demonstrate that perceived enjoyment of exercise and exercise programming may be a critical factor to participation and ongoing adherence to exercise programming among older adults.

Surprisingly, PACES scores declined from baseline to follow-up, although participants (100%) indicated that were both satisfied with the program and enjoyed being in class on the Satisfaction Questionnaire. Several aspects could have contributed to the seemingly incongruous results between the PACES and the Satisfaction Questionnaire. Numerous respondents seemed to have difficulty in interpreting the PACES scale. We suspect that the respondents had trouble with the PACES in particular because it uses a bipolar rating scale with varied response items for each question, and two items are reverse scored. Given hearing loss, memory issues, and some cognitive decline, the majority of respondents had difficulty understanding questions.

Furthermore, the PACES scale asks respondents to comment on the physical activity that they have been doing, and this is problematic for two reasons. First, the PACES scale is inclusive of all PA, and is not exclusive to *LaughActive* program enjoyment. Since the questions did not specifically target the *LaughActive* program, it is possible that participants' responses were in relation to other exercise programming and not the *LaughActive* program. This may explain the differences in responses observed on the PACES and the Satisfaction Questionnaire, which specifically targeted participants' perceptions of the *LaughActive* program. Secondly, the PACES scale is designed for people already involved in PA; consequently, the scale is limited in its ability to track change over time (when we might expect change) for the study participants who were inactive at baseline (Mullen, 2011). PACES scores significantly declined during the control period ($p = 0.20$), and while the findings declined during the intervention period, the declines were not significant.

5.4 Adherence & Satisfaction

The majority of participants (22 or 81.4%) who were included in the final analyses (n=27) attended at least 75% of the *LaughActive* program. The *LaughActive* participant

adherence rate is consistent with other findings of exercise program attendance in older adult populations ranging from 60% to 90% (Resnick et al., 2008). In fact 48.1% of the sample attended more than 90% of the program, while only 14.8% attended less than 60% of the program.

The Satisfaction Questionnaire asked both open and closed-ended questions regarding residents perceptions of the *LaughActive* program. Several key findings emerged in relation to exercise enjoyment and self-efficacy for exercise. We hypothesized that the addition of laughter to a traditional PA program would enhance exercise enjoyment, and in accordance with our hypothesis, 96.7% of respondents found the laughter aspect of the programming to be an enjoyable addition to a traditional exercise program. We also hypothesized that the laughter aspect of the programming would help to make exercise more accessible for participants, and that accessible and enjoyable PA programming would enhance participants' motivation to participate in other exercise classes or activities. In accordance with our hypothesis, 96.7% of respondents stated that the laughter aspect of the *LaughActive* program helped to make exercise more accessible for them, and 86.6% found that the program enhanced their motivation to participate in other exercise classes or activities. Finally, through the use of laughter exercises that stimulate playful behavior and eye contact while laughing, we sought to create an enjoyable exercise environment in which participants could connect with one another on a joyful level. In support of this aim, 86.6 % of respondents felt that the *LaughActive* program enhanced their interactions classmates during the classes, and 83.3 % of respondents stated that the program enhanced their interactions with others outside of class. In navigating institutional living environments, meaningful engagement with other residents may be key to helping residents to

feel inclined to continue participating in activity programming, and this meaningful engagement in activity programming may extend to helping residents feel a part of an overall community.

Several themes emerged from our analysis of participants' responses to the open-ended questions. These open responses included appreciation of the following aspects of the *LaughActive* intervention: interaction with peers; mood benefits; enjoyment/fun; laughter; the program as different; and the instructor's equating the *LaughActive* program exercises with activities of daily living. Respondents' appreciation of the opportunity to interact with peers was expressed in the following comments: "It built a sense of camaraderie. I think the laughter helped with that. I felt more of a personal connection due to the laughter than I have in other programs," "I liked the friendship that you develop with other people; it makes you more motivated," "I liked the fellowship with other members participating," "Laughing with others makes you laugh." Interaction with others may even help older adults overcome barriers such as pain, as expressed by one participant's comment, "People will try things despite the pain they are feeling if the thing is personable." When asked what they liked about the program, numerous respondents mentioned the benefits to their mood, as exemplified by the following remarks: "It is uplifting," "It made you happy," "It made me feel good," "It made you feel good about yourself," and "I think everybody should participate because it's good for your mood and body." Numerous respondents called the program "fun" and stated that they "enjoyed it." Others, when asked what they liked about the program, stated that they liked that it was "something different." Respondents specifically referenced the laughter aspect of *LaughActive*, as well as their appreciation of the idea of integrating laughter into an exercise program. Examples of these statements include: "I like the concept of laughing as healing and the exercise was good too. I would like to do more laughing in my regular life," "I love to laugh and this gives me more of a

chance to do that," "I don't laugh enough. I appreciated the program," "It's a great idea, combining laughter with the exercise," "Laughing is a good thing for the geriatric population. This needs to be offered at senior centers." Finally, respondents' comments indicated that they appreciated knowing how each exercise would help them perform their ADLs. Examples of participants' comments included, "She explained very well what the exercise was doing to help us in doing our daily routine," and "She helped me to understand what I will be doing better, like standing, walking, carrying groceries, or putting things on a shelf." Participant remarks indicate that the laughter was an enjoyable addition to a traditional exercise program, and that participants derived benefit from the laughter, the interaction with peers, and the educational teaching approach.

5.5 Lessons Learned: Implementation

Implementing interventions in ALFs and other institutional living settings for older adults presents particular challenges. Since the sample comprised participants with varying degrees of memory loss and cognitive decline, many of these participants required staff reminders in order to successfully facilitate class attendance. Additionally, since this program was targeted to elicit exercise class uptake and adherence of sedentary residents who had not previously attended exercise classes regularly, the challenge of eliciting class attendance from these memory and cognitively impaired residents was particularly challenging, as these participants were not already accustomed to attending exercise classes. While the student investigator sought staff commitment to initial and ongoing *LaughActive* session promotion during the recruitment phase, these staff reminders that were key to optimal program attendance among the memory and cognitively impaired participants were not always feasible in practice due to other work commitments of these staff program stakeholders. One facility in particular underwent turnover

in a key staff program stakeholder during the course of the intervention and the staff member who had initially agreed to help facilitate class reminders was no longer employed at that facility. As a result, there was not an assigned staff member to facilitate reminders for a period of several weeks. For successful implementation, this intervention may have benefited from the ongoing commitment of several key staff members and resident participants acting as program ambassadors.

Another challenge to participant recruitment and adherence related to poor scheduling of the demonstration, recruitment, and actual class sessions. As outside collaborators with the partnership ALF sites, we were unaware of the unique nuances of each facility's previous ongoing commitments when scheduling these sessions. For instance, at one facility the initial *LaughActive* resident demonstration session had very low attendance due to mandatory resident Tuberculosis skin testing taking place during the allotted demonstration session time. While there were often more regular *LaughActive* class attendees than those who were participating in the study at several of the ALF sites, the ratio imbalance was particularly evident at this facility. Additionally, at two of the sites, intervention classes were scheduled on days reserved for resident doctor appointments, making it impossible for participants with previously scheduled doctors appointments to attend the *LaughActive* classes on those days. The Satisfaction Questionnaire specifically asked what kept participants from attending *LaughActive* classes. Previously scheduled doctor's appointments were most often cited as the reason for missing class sessions. One resident stated, "I missed 2-3 classes due to dental appointments. We only have transportation on Tuesdays and Thursdays, which were the class days." A better understanding of each facility's unique scheduling nuances prior to implementation is recommended for future successful program implementation.

Implementation of a preliminary onboarding process for both staff and residents as part of the intervention may have improved study outcomes, and is recommended for future research efforts. The onboarding process for future interventions could comprise one staff training session and one initial participant education session. Before the *LaughActive* exercise program commences in each facility, all staff and participants would be properly trained and educated in the respective introductory session. A primary goal of the staff training session would be to educate implementation staff on the program and its benefits. This education would aid staff stakeholders in explaining the program and its benefits to residents and other staff members, and assist staff in allaying participants' concerns. Additionally, the staff training session would outline staff expectations required for successful program implementation and ensure commitment to program expectations from these key staff stakeholders. Training content could be communicated to staff members using an in-person presentation and interactive practice outlining the program and its benefits, as well as addressing participants' concerns. Staff program handouts would outline the key program talking points. Staff and trainer would execute a signed contract to ensure mutual commitment to program expectation and procedures.

Next in the onboarding process would be the initial participant education session. Ideally this session would take place after baseline measurements are collected. The session would be designed to provide an overview of the program, and specifically target determinants for SCT health promotion, including goals, outcome expectations, and facilitators and impediments to behavior change. While this laughter-enhanced PA program aimed to elicit joyful affective states experienced during and associated with PA, and therefore positively impact perceived outcome expectations and facilitators/barriers to PA participation and adherence, better integrating this program into the overall program theory of behavior change could help to ensure that the

pleasant associations with laughter are maximally leveraged to elicit initial PA uptake and ongoing adherence. The participant education session would address the paths of influence in the sociocognitive causal framework for health promotion and provide information relevant to older adults in general, and based on baseline evaluation findings, information relevant to individual participants in particular. General discussion would address outcome expectations for PA that are evidenced to resonate with older adults, as well as known facilitators and impediments to PA participation among older adults. Baseline evaluation findings would be used to target efforts based on individual participant's fitness status and self-efficacy beliefs. For instance, evaluators would interpret fitness test data in order to help each participant understand how their scores relate to functional ability (Rikli & Jones, 2012) and how participants can prevent or reduce functional declines (and consequently improve their own self-efficacy for PA) by taking small steps to regulate their functional status through an accessible, moderate-intensity PA program that includes the addition of playful laughter. This discussion would serve as a meaningful basis for goal setting, a major determinant of health promotion behaviors. As part of the goal setting process, participant's self-efficacy beliefs in terms of individual facilitators and barriers could be used to identify strategies to maximize facilitators and to overcome participant's inevitable obstacles to PA participation. The evaluator would collaborate with each participant to set goals and strategize a personal action plan to meet goals. Participant's fitness status and self-efficacy beliefs would be evaluated on an ongoing basis, and activity plans outlining goals and strategies would be revised according to evaluation results. Participant education session content could be outlined using an in-person presentation, and interactive group and individual discussion. All participants would receive leave-behind materials outlining key points, and a mutually agreeable personal action plan.

In terms of better integrating this program into the overall sociocognitive program theory, the intervention also may have benefited from establishing a resident ambassador to champion the unique nature of the laughter aspect of the program to other residents. The laughter used in the laughter exercises is initially self-simulated as bodily exercise before it transitions into genuine and contagious laughter. In *LaughActive* sessions, participants "laugh for no reason," meaning that the laughter is not reliant on outside stimuli such as jokes or comedy (Kataria, 2011). It is not unusual for young children to laugh playfully and unconditionally without jokes. However, this ability to laugh for no reason diminishes as children progress into adolescence and adulthood, and social conventions dictate a departure from unconditional laughter to laughter that is reliant on jokes, or laughing *at* an outside stimulus. As adults, playful unconditional laughter is generally not perceived as socially acceptable; therefore, this return to playful, unconditional laughter may feel strange or uncomfortable at first, and may even elicit negative or social emotional responses. This assertion was supported by a respondent's comment on the Satisfaction Questionnaire. She stated, "Forced laughter is uncomfortable for me. I like to laugh and I laugh a lot and I know it's good for me but I don't like to force myself to laugh." Additionally, older adults in particular may avoid laughing for no reason due to the negative consequences associated with being perceived as having dementia. Bandura (2004) recognized that individuals may change their behavior in response to the perceived judgment from others in the context of social interactions, and he included these perceptions of social approval or disapproval of a behavior as a key component of outcome expectations in SCT. Due to the impact of the social reactions of behavior change in regulating outcome expectations of behavior in general, and the unique nature of this intervention in particular, a program ambassador could help to enhance social outcome expectations related to the program. The facilities where this

intervention took place all had resident ambassadors who wore name badges and were primarily responsible for welcoming new residents. When implementing future interventions, the role of the resident ambassador could be expanded to include conveying the program benefits and social acceptability of "laughter for no reason" to other residents.

5.6 Lessons Learned: Methodology

We chose to implement a wait list control study design because it allowed for a comparison group, larger sample size, and further presented an ethical advantage over a traditional control study. The overall goal of this exploratory pilot study was to demonstrate preliminary evidence of the program's efficacy in order to inspire future research needed to establish *LaughActive* as an evidence-based intervention. Therefore it was important for this research to employ an experimental design and evaluate the program's efficacy using a control condition for study comparison. Secondly, we anticipated some difficulty in participant recruitment and retention. Since both groups inevitably functioned as the intervention group at one point in time regardless of the initial group assignment, this design allowed for a larger sample size for our within-group change analyses. Finally, the design presents an ethical advantage because it permits a non-intervention evaluation period, while at the same time allowing for the control group to later receive the intervention benefits during their intervention period.

Despite the methodological strengths of the wait list control study design, this design presented implementation challenges. The control period of monitoring was described to participants as a necessary baseline so that the researchers could be more certain that any observed improvements during the control group's intervention period could indeed be attributed to participation in the *LaughActive* intervention. Despite this explanation, the researchers had

difficulty in obtaining Time 2 follow-up measurements from control group participants. We attributed this difficulty to control group participants' lack of understanding of the purpose of the waiting period in the wait list control study design. Two of the control group participants refused to participate in Time 2 follow-up measurements, as they (correctly) felt that they had already performed the measurements, yet had not received the intervention, and now they were being asked to perform the measurements again. Furthermore, based on past experience of not receiving the intervention after the Time 1 testing period, these control group participants may have felt unsure that they were going to receive the intervention after the second testing period. There was high attrition in the control group, as several participants were lost to follow-up during the 6-week non-intervention evaluation period, as they had suffered falls and other serious illnesses during that timeframe.

While we sought to randomize the groups by drawing intervention and control facility names from a hat, the intervention and control groups were different in ways that we could not have anticipated. In general, the control group was healthier at baseline, as demonstrated by the statistically significant ($p < 0.05$) results of the independent samples *t*-tests in several outcomes measures, including aerobic endurance, the MCS (Mental Component Summary) score, and the RP (Role-Physical) and MH (Mental Health) health domains. There were organizational and cultural factors beyond our control, which could have affected each group's receptiveness toward the intervention. We suspect that the since the intervention group began the intervention almost immediately after the recruitment sessions, these facilities may have been less organizationally prepared to promote and champion the program, while at the same time, the control group was anticipating the commencement of the program for six weeks. The control group's statistically significant improvement in the MH (Mental Health) domain at their pre-intervention baseline

may have been a result of this sense of anticipation. However, as outside collaborators, we cannot be certain of the reasons for these baseline differences or the exogenous improvement in the control group mental health outcomes during the comparison period, as we were not involved in the day-to-day facility operations or the intricacies of participants' personal lives and any changes in health status.

While we sought to use measurement instruments that have been carefully validated in older adult populations, more robust study results may have been observed in this study population if the study had employed simpler measurement instruments. As previously discussed, due to varying degrees of hearing loss, memory issues, and some cognitive decline, many study participants had difficulty in interpreting the instrument content (in particular the PACES, SEE, and the 4-week recall needed for SF-36v2®). Respondents likely had difficulty with the PACES because it uses a bipolar rating scale with varied response items for each question, and two items are reverse scored. Although the SEE also uses a bipolar rating scale, the response items are consistent throughout the instrument, and most participants did not seem to have trouble with the format of this scale. The issue with the SEE was instead related to the instrument content, in that participants' perceived ability to overcome barriers to PA participation was hypothetical in nature. There was a complex sense of whether respondents felt they could overcome a barrier even if they never perceived it as a barrier. Although the participants' moderate-to-high self-efficacy scores at baseline may explain why some of the barriers on the SEE were not perceived as barriers to our respondents, we may have observed stronger results in this sample by asking open-ended questions about barriers and facilitators, or simply using a checklist for barriers. Additionally, despite the strengths of the SFT, it is designed for use with community-dwelling adults, and likely was not the most appropriate assessment of

objective functional health for our sample of older adults residing in institutional living environments.

5.7 Strengths & Limitations

There were several notable strengths of this exploratory study. This program evaluation was the first to evaluate the efficacy of a novel PA program for older adults that employed the use of self-simulated playful laughter exercises. The study evaluated the efficacy of the *LaughActive* program using a comparison condition, which aided the ability to discriminate program outcomes from outcomes related to other factors, and therefore, strengthened the validity and credibility of the findings. Furthermore, we randomized the groups by drawing facility names from a hat to determine the intervention and control groups. The four facilities were spread throughout Atlanta metro area, so there was a cross-section of geographic areas and, to our knowledge, no spillover effects. Several factors contributed to high fidelity. One instructor facilitated all *LaughActive* sessions, and the same research team took measurements across all measurement periods. The exercise sessions were supported by a written protocol and there was minimal variation in the protocol between groups. Data were collected by graduate student volunteers who were in no way connected to the efficacy of the intervention. Lastly, we chose not to incentivize participants to attend classes, and therefore, we can be fairly certain that the participants attended classes due to the perceived benefit of the classes themselves and not an extrinsic reward.

Despite the study's strengths, there were several limitations. The findings of the study are limited by small sample size and selectivity. We were only able to include 27 participants in our final data analyses, and while the sample size met the requirements of our power calculation (21), it was relatively small, given the number of study outcomes. When interpreting the study

results, it is helpful to account for the fact that our power calculation was based on the PCS score of the SF-36v2®; however, since there were multiple outcomes, this may partly explain the lack of findings. We used a convenience sample, which may suffer from biases resulting from overrepresentation or underrepresentation of particular groups of people. While our sample was largely representative of the average ALF resident in terms of age, gender, race, and education, the sample was fairly homogenous, as the majority of the study participants were Caucasian, female, and well educated. Moreover, it possible that those who agreed to participate in the study may have been healthier, more active, and more educated that the average ALF resident. Our study sample was further biased in that the majority of study participants had moderate-to-high baseline scores on all outcome measures, and was accustomed to engaging in exercise classes on a regular basis. Furthermore, the ALF sites selected for this intervention all had established exercise programs with twice daily exercise classes six days per week. Therefore these findings cannot be generalized to a more heterogeneous sample of older adults, or to other ALFs without established exercise programs. In fact, the findings may have been more pronounced if the sample were comprised of less healthy and less active residents residing in ALFs with less robust existing exercise programs.

As demonstrated by the high response inconsistencies observed in the SF-36v2® RCI scores, it is clear that several study participants had difficulty in interpreting the questions that are part of this measurement instrument. Furthermore, the research team observed response difficulty on other measurement instruments that did not contain a built-in objective means of evaluating response consistency.

Additionally, the study may have been limited by the intervention duration. Although research indicates that the optimal intervention duration may be 12 weeks, due to time

constraints, the *LaughActive* intervention was facilitated in each ALF over a period of 6 weeks (Yeom et al., 2009). It is possible that the intervention may have proven more effective if the intervention were 12 weeks in duration.

Finally, this intervention was designed to improve participant adherence to PA programming. Due to the complexities in collaborating with ALF sites as an external researcher, adherence comparisons of the *LaughActive* program to other exercise programs taking place in these facilities were limited, as we were not able to obtain objective comparison data on participants' regular exercise class attendance outside of the program. The *LaughActive* instructor took attendance at each *LaughActive* class, but it was not an established practice for the activity personnel in the ALF partner sites to take participant attendance in their regularly scheduled exercise classes. Future interventions might encourage the activity personnel to take attendance in the exercise classes that they facilitate so that there will be some basis for adherence comparisons.

5.8 Future Research Recommendations

To the best of our knowledge, this research represents one of only a few studies to evaluate the potential of self-simulated laughter in improving health outcomes among older adults, and the first evaluation of a dedicated PA program that incorporated self-simulated laughter. While this was an exploratory pilot study, the results are promising and could be the beginning of much more exhaustive research to evaluate the potential of self-simulated laughter as a viable technique for enhancing health and self-efficacy for PA outcomes among older adults.

Further well-designed research is needed to demonstrate the efficacy of self-simulated laughter as part of PA programming in achieving health and self-efficacy for PA outcomes among older adult populations. Immediate future research efforts should seek to make the

aforementioned practical and methodological improvements, and evaluate the *LaughActive* intervention in larger and more diverse samples of older adults. Suggested practical improvements include further integration of the intervention within the SCT framework through the staff training session, resident education session, and resident ambassador program; scheduling resident demonstration, recruitment, and class sessions so that these activities do not conflict with transportation days, or mandatory resident activities; as well implementing roll taking procedures in facility exercise classes so that there is a basis for *LaughActive* program adherence comparison data. We also suggest that future research efforts make methodological improvements, including selecting simple measurement instruments that are validated and appropriate for use with future study populations and administering baseline and end point measurements at the same time of day.

Further research is needed to evaluate various program lengths, number of sessions, and session durations in order to determine the ideal program length, number of sessions, and session duration needed to achieve the health and self-efficacy benefits of the *LaughActive* program. Once these issues are resolved, the research should move forward to include a large experimental or quasi-experimental study that demonstrates the clinically meaningful impact of the *LaughActive* program. Due to the aforementioned strengths of the *LaughActive* program, and the ease with which this program can be incorporated into community-based, as well as institutional living and medical settings, *LaughActive* has the potential be a viable evidence-based intervention suitable for a wide range of populations; however, the program requires more rigorous research in order to further validate the health and self-efficacy outcomes of the program.

5.9 Conclusions

Inactivity among older adults is a serious public health issue that will only be compounded by rising expenditures that inevitably will be associated with the increased health care utilization and long-term care placement of a growing older adult population. PA interventions have vast potential for helping older adults maintain functional independence and preventing or delaying nursing home placement. Even modest gains in functional fitness can have a significant impact on older adults' ability to maintain independence (Warburton et al., 2006). It is imperative to increase older adults' exercise participation and adherence to ensure that older adults receive the physiological and psychological benefits of exercise, which will not only reduce costly healthcare expenditures due to inactivity, but will also improve older adults' quality of life. PA programs that are approachable and enjoyable to older adult participants have the potential to incite a largely sedentary population to become more physically active. Innovative PA programs that increase PA enjoyment may influence initial program participation and ongoing engagement, thus positively impacting program adoption and ongoing adherence. This wait list control study demonstrated that lack of exercise enjoyment was a significant barrier to PA participation and ongoing adherence in a sample of assisted-living residents. Participants found *LaughActive* to be an enjoyable program and derived benefits from their participation. Participation rates were similar to more traditional exercise programs. Our results demonstrated that a laughter-enhanced PA program improved mental health, aerobic endurance, and outcome expectations for exercise.

REFERENCES

2008 Physical Activity Guidelines for Americans: Be Active, Healthy, and Happy! (2008). Washington, D.C.: U.S. Department of Health and Human Services; Government Printing Office. ODPHP Publication No. U0036

American Council on Exercise (2010). *Exercise for Older Adults: ACE's Guide for Fitness Professionals*. San Diego: American Council on Exercise.

American Council on Exercise (2011). *ACE Group Fitness Instructor Manual: A Guide for Fitness Professionals* (3rd ed.). San Diego: American Council on Exercise.

American College of Sports Medicine (2013). *ACSM's Guidelines for Exercise Testing and Prescription* (9th ed.). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.

Arnardóttir, R. H., Boman, G., Larsson, K., Hedenström, H., & Emtner, M. (2007). Interval training compared with continuous training in patients with COPD. *Respiratory Medicine*, *101*(6), 1196–1204. doi:10.1016/j.rmed.2006.11.004

Balady, G. J., Chaitman, B., Driscoll, D., Foster, C., Froelicher, E., Gordon, N., … Bazzarre, T. (1998). Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities. *Circulation*, *97*(22), 2283–2293. doi:10.1161/01.CIR.97.22.2283

Bandura, A. (1986). The Explanatory and Predictive Scope of Self-Efficacy Theory. *Journal of Social and Clinical Psychology*, *4*(3), 359–373. doi:10.1521/jscp.1986.4.3.359

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control* (1st edition.). New York: Worth Publishers.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior:*

The Official Publication of the Society for Public Health Education, *31*(2), 143–164. doi:10.1177/1090198104263660

Baum, E. E., Jarjoura, D., Polen, A. E., Faur, D., & Rutecki, G. (2003). Effectiveness of a group exercise program in a long-term care facility: a randomized pilot trial. *Journal Of The American Medical Directors Association*, *4*(2), 74–80.

Beauchamp, M. K., Nonoyama, M., Goldstein, R. S., Hill, K., Dolmage, T. E., Mathur, S., & Brooks, D. (2010). Interval versus continuous training in individuals with chronic obstructive pulmonary disease--a systematic review. *Thorax*, *65*(2), 157–164. doi:10.1136/thx.2009.123000

Berk, R. A., (2001). The active ingredients in humor: Psychophysiological benefits and risks for older adults. *Educational Gerontology, 27,* 323-339. doi: 0360-12277/01

Borg, G. (1970). Perceived exertion as an indicator of somatic stress. *Scandinavian Journal of Rehabilitation Medicine, 2,* 92-98.

Brawley, L. R., Rejeski, W. J., & King, A. C. (2003). Promoting physical activity for older adults: The challenges for changing behavior. *American Journal of Preventive Medicine*, *25*(3, Supplement 2), 172–183. doi:10.1016/S0749-3797(03)00182-X

Buchner, D.M., & Wagner, E.H. (1992). Preventing frail health. *Clinics in geriatric medicine*, *8*(1), 1–17.

Centers for Disease Control and Prevention. (2011). *Physical activity for everyone: Physical activity and health.* Retrieved May 5, 2013 from, http:///www.cdc.gov/physicalactivity/everyone/health/index.html

Ciolac, E. G., Bocchi, E. A., Bortolotto, L. A., Carvalho, V. O., Greve, J. M., & Guimarães, G. V. (2010). Effects of high-intensity aerobic interval training vs. moderate exercise on

hemodynamic, metabolic and neuro-humoral abnormalities of young normotensive women at high familial risk for hypertension. *Hypertension Research: Official Journal of the Japanese Society of Hypertension*, *33*(8), 836–843. doi:10.1038/hr.2010.72

Cousins, N. (1979). Anatomy of an illness as perceived by the patient. New York: W. W. Norton.

Cress, M. E., Buchner, D. M., Prohaska, T., Rimmer, J., Brown, M., Macera, C., … Chodzko-Zajko, W. (2005). Best practices for physical activity programs and behavior counseling in older adult populations. *Journal of Aging & Physical Activity*, *13*(1), 61-74.

Croft, L., Bartlett, J. D., MacLaren, D. P. M., Reilly, T., Evans, L., Mattey, D. L., … Morton, J. P. (2009). High-intensity interval training attenuates the exercise-induced increase in plasma IL-6 in response to acute exercise. *Applied Physiology, Nutrition, and Metabolism = Physiologie Appliquée, Nutrition Et Métabolisme*, *34*(6), 1098–1107. doi:10.1139/H09-117

Cushner, F. D., & Friedman, R. J. (1989). Humor and the physician. *Southern Medical Journal, 82*, 51–52.

DerAnanian, C. A., Desai, P., Smith-Ray, R., Seymour, R.B., & Hughes, S. L. (2012) Perceived versus actual factors associated with adoption and maintenance of an evidence-based physical activity program. *Translational Behavioral Medicine, 2*(2), 209-217. doi: 10.1007/s13142-012-0131-x

Earnest, C. P., Blair, S. N., & Church, T. S. (2010). Age attenuated response to aerobic conditioning in postmenopausal women. *European Journal of Applied Physiology*, *110*(1), 75–82. doi:10.1007/s00421-010-1472-0

Elliott, S.A. & Brown, S. (2002). What are we doing to waiting list controls? *Behav Res Ther.*

40(9), 1047–52.

Fahlman, M. M., McNevin, N., Boardley, D., Morgan, A., & Topp, R. (2011). Effects of Resistance Training on Functional Ability in Elderly Individuals. *American Journal of Health Promotion*, *25*(4), 237–243.

Federal Interagency Forum on Aging-Related Statistics. (2010). *Older Americans 2010: Key indicators of well-being.* Washington, DC: U.S. Government Printing Office. Retrieved May 5, 2013, from http://www.aoa.gov/agingstatsdotnet/main_site/data/2010_documents/docs/oa_2010.pdf

Fry, W. F., Jr. (1986). Humor, physiology, and the aging process. In L. Nahemow, K. A. McCluskey-Fawcettt, & P. E. McGhee (Eds.), Humor and aging (pp. 81–98). Orlando, FL: Academic.

Fry, W. F., Jr. (1992). The physiological effects of humor, mirth, and laughter. *Journal of the American Medical Association*, *267*(4), 1857–1858.

Fry, W. F., Jr. (1994). The biology of humor. *HUMOR: International Journal of Humor Research*, *7*(2), 111–126.

Fry, W. F., & Rader, C. (1977). The respiratory components of mirthful laughter. *Journal of Biological Psychology*, *19*(2), 39-50.

Gandek, B., Sinclair, S. J., Kosinski, M., & Ware, J. E. (2004). Psychometric evaluation of the SF-36 health survey in Medicare managed care. *Health Care Financing Review*, *25*(4), 5–25.

Garber, C. E., Blissmer, B., Deschenes, M. R., Franklin, B. A., Lamonte, M. J., Lee, I.-M., … Swain, D. P. (2011). Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy

Adults: Guidance for Prescribing Exercise. *Medicine & Science in Sports & Exercise*, *43*(7), 1334–1359. doi:10.1249/MSS.0b013e318213fefb

Gormley, S. E., Swain, D. P., High, R., Spina, R. J., Dowling, E. A., Kotipalli, U. S., & Gandrakota, R. (2008). Effect of intensity of aerobic training on VO2max. *Medicine and Science in Sports and Exercise*, *40*(7), 1336–1343. doi:10.1249/MSS.0b013e31816c4839

Guimarães, G. V., Ciolac, E. G., Carvalho, V. O., D'Avila, V. M., Bortolotto, L. A., & Bocchi, E. A. (2010). Effects of continuous vs. interval exercise training on blood pressure and arterial stiffness in treated hypertension. *Hypertension Research: Official Journal of the Japanese Society of Hypertension*, *33*(6), 627–632. doi:10.1038/hr.2010.42

Haskell, W., Lee, I.-M., Pate, R., Powell, K., Blair, S., Franklin, B., … Bauman, A. (2007). Physical Activity and Public Health: Updated Recommendation for Adults From the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*, 1081–1093.

Helgerud, J., Høydal, K., Wang, E., Karlsen, T., Berg, P., Bjerkaas, M., … Hoff, J. (2007). Aerobic high-intensity intervals improve VO2max more than moderate training. *Medicine and Science in Sports and Exercise*, *39*(4), 665–671. doi:10.1249/mss.0b013e3180304570

Hirosaki, M., Ohira, T., Kajiura, M., Kiyama, M., Kitamura, A., Sato, S., & Iso, H. (2013). Effects of a laughter and exercise program on physiological and psychological health among community-dwelling elderly in Japan: Randomized controlled trial. *Geriatrics & Gerontology International*, *13*(1), 152–160.

IBM Corp. (2012). IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

Jette, A. M., Rooks, D., Lachman, M., Lin, T. H., Levenson, C., Heislein, D., … Harris, B. A. (1998). Home-based resistance training: predictors of participation and adherence. *The Gerontologist*, *38*(4), 412–421.

Kataria, M. (2011). *Laugh for no reason (4th Ed).* Mumbai: Madhuri International

Kendzierski, D., & DeCarlo, K. J. (1991). Physical Activity Enjoyment Scale: Two validation studies. *Journal of Sport & Exercise Psychology*, *13*(1), 50-64.

Lewis, B. A., Marcus, B. H., Pate, R. R., & Dunn, A. L. (2002). Psychosocial mediators of physical activity behavior among adults and children. *American Journal of Preventive Medicine*, *23*(2), 26–35.

Metcalfe, R. S., Babraj, J. A., Fawkner, S. G., & Vollaard, N. B. J. (2012). Towards the minimal amount of exercise for improving metabolic health: beneficial effects of reduced-exertion high-intensity interval training. *European Journal of Applied Physiology*, *112*(7), 2767–2775. doi:10.1007/s00421-011-2254-z

Mora-Ripoll, R. (2011). Potential health benefits of simulated laughter: A narrative review of the literature and recommendations for future research. *Complementary Therapies in Medicine*, *19*(3), 170-177.

Mullen, S. P., Olson, E. A., Phillips, S. M., Szabo, A. N., Wójcicki, T. R., Mailey, E. L., … McAuley, E. (2011). Measuring enjoyment of physical activity in older adults: invariance of the physical activity enjoyment scale (paces) across groups and time. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 103. doi:10.1186/1479-5868-8-103

Musa, D. I., Adeniran, S. A., Dikko, A. U., & Sayers, S. P. (2009). The effect of a high-intensity interval training program on high-density lipoprotein cholesterol in young men. *Journal*

of Strength and Conditioning Research / National Strength & Conditioning Association, *23*(2), 587–592. doi:10.1519/JSC.0b013e318198fd28

Nelson, M., Rejeski, W., Blair, S., Duncan, P., Judge, J., King, A., … Castaneda-Sceppa, C. (2007). Physical Activity and Public Health in Older Adults: Recommendation From the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*, 1094–1105.

Nevo, O., Keinan, G., & Teshimovsky-Arditi, M. (1993). Humor and pain tolerance. *HUMOR: International Journal of Humor Research*, *6*(1), 71–88.

O'Shaughnessy, C. V. (2008). The aging services network: Broad mandate and increasing responsibilities. *Public Policy & Aging Report, 18*(3).

Paskind, H. A. (1932). Effects of laughter on muscle tone. *Archives of Neurological Psychiatry*, *28*, 623–628.

Persinger, R., Foster, C., Gibson, M., Fater, D.C. & Porcari. J.P. (2004). Consistency of the talk test for exercise prescription. *Medicine & Science in Sports & Exercise*, *36*(9), 1632-6.

Phillips, L. J., & Flesner, M. (2013). Perspectives and Experiences Related to Physical Activity of Elders in Long-Term-Care Settings. *Journal of Aging and Physical Activity*, *21*(1), 33–50.

Prohaska, T., Belansky, E., Belza, B., Buchner, D., Marshall, V., McTigue, K., ... & Wilcox, S. (2006). Physical activity, public health, and aging: critical issues and research priorities. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *61*(5), S267-S273.

Rejeski, W. J., & Mihalko, S. L. (2001). Physical Activity and Quality of Life in Older Adults.

The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, *56*(suppl 2), 23–35. doi:10.1093/gerona/56.suppl_2.23

Resnick, B., & Jenkins, L. S. (2000). Testing the reliability and validity of the Self-Efficacy for Exercise scale. *Nursing Research*, *49*(3), 154–159.

Resnick, B., Luisi, D., & Vogel, A. (2008). Testing the Senior Exercise Self-efficacy Project (SESEP) for Use with Urban Dwelling Minority Older Adults. *Public Health Nursing*, *25*(3), 221–234. doi:10.1111/j.1525-1446.2008.00699.x

Resnick, B., Zimmerman, S. I., Orwig, D., Furstenberg, A. L., & Magaziner, J. (2000). Outcome expectations for exercise scale: utility and psychometrics. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *55*(6), S352–356.

Rikli, R. E., & Jones, C. J. (1999). Development and validation of a functional fitness test for community-residing older adults. *Journal of aging and physical activity*, *7*, 129-161.

Rikli, R. E., & Jones, C. J. (2013). *Senior fitness test manual* (2nd ed.). Champaign, IL: Human Kinetics.

Rognmo, Ø., Hetland, E., Helgerud, J., Hoff, J., & Slørdahl, S. A. (2004). High intensity aerobic interval exercise is superior to moderate intensity exercise for increasing aerobic capacity in patients with coronary artery disease. *European Journal of Cardiovascular Prevention and Rehabilitation: Official Journal of the European Society of Cardiology, Working Groups on Epidemiology & Prevention and Cardiac Rehabilitation and Exercise Physiology*, *11*(3), 216–222.

Shahidi, M., Mojtahed, A., Modabbernia, A., Mojtahed, M., Shafiabady, A., Delavar, A., & Honari, H. (2011). Laughter yoga versus group exercise program in elderly depressed

women: a randomized controlled trial. *International Journal of Geriatric Psychiatry, 26*(3), 322-327. doi: 10.1002/gps.2545

Takeda, M., Hashimoto, R., Kudo, T., Okochi, M., Tagami, S., Morihara, T., … Tanaka, T. (2010). Laughter and humor as complementary and alternative medicines for dementia patients. *BMC Complementary and Alternative Medicine, 10*(1), 28. doi:10.1186/1472-6882-10-28

Talanian, J. L., Holloway, G. P., Snook, L. A., Heigenhauser, G. J. F., Bonen, A., & Spriet, L. L. (2010). Exercise training increases sarcolemmal and mitochondrial fatty acid transport proteins in human skeletal muscle. *American Journal of Physiology. Endocrinology and Metabolism, 299*(2), E180–188. doi:10.1152/ajpendo.00073.2010

Vogel, T., Brechat, P. H., Leprêtre, P. M., Kaltenbach, G., Berthel, M., & Lonsdorfer, J. (2009). Health benefits of physical activity in older patients: a review. *International Journal of Clinical Practice, 63*(2), 303-320.

Warburton, D. E., McKenzie, D. C., Haykowsky, M. J., Taylor, A., Shoemaker, P., Ignaszewski, A. P., & Chan, S. Y. (2005). Effectiveness of high-intensity interval training for the rehabilitation of patients with coronary artery disease. *The American Journal of Cardiology, 95*(9), 1080–1084. doi:10.1016/j.amjcard.2004.12.063

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian medical association journal, 174*(6), 801-809.

Ware, J.E., Jr., Kosinski, M., Bjorner, J.B., Turner-Bowker, D.M., Gandek, B., & Maruish, M.E. (2007). *User's manual for the SF-36v2™ Health Survey* (2nd ed.). Lincoln, RI: QualityMetric Incorporated.

White, S. M., Wojcicki, T. R., & McAuley, E. (2012). Social Cognitive Influences on Physical Activity Behavior in Middle-Aged and Older Adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *67B*(1), 18–26. doi:10.1093/geronb/gbr064

Whitney, S. L., Poole, J. L., & Cass, S. P. (1998). A review of balance instruments for older adults. *The American Journal Of Occupational Therapy: Official Publication Of The American Occupational Therapy Association*, *52*(8), 666–671.

Whyte, J. J., & Laughlin, M. H. (2010). The effects of acute and chronic exercise on the vasculature. *Acta Physiologica (Oxford, England)*, *199*(4), 441–450. doi:10.1111/j.1748-1716.2010.02127.x

Wisløff, U., Støylen, A., Loennechen, J. P., Bruvold, M., Rognmo, Ø., Haram, P. M., … Skjaerpe, T. (2007). Superior cardiovascular effect of aerobic interval training versus moderate continuous training in heart failure patients: a randomized study. *Circulation*, *115*(24), 3086–3094. doi:10.1161/CIRCULATIONAHA.106.675041

Yeom, H. A., Keller, C., & Fleury, J. (2009). Interventions for promoting mobility in community-dwelling older adults. *Journal Of The American Academy Of Nurse Practitioners*, *21*(2), 95–100. doi:10.1111/j.1745-7599.2008.00390.x

APPENDICES

Appendix A: LaughActive Eligibility Screening Questionnaire

Name: _____ Subnum _____

Community: _____

Phone number: _____

---

1) Do you speak English? ☐ YES ☐ NO

2) Are you at least 60 years old? ☐ YES ☐ NO

3) Are you able to get around with or without assistance from devices or one caregiver? ☐ YES ☐ NO

****

Date/Time/Outcome (Use coding scheme below)

1)

---

2)

Coding Scheme:

1 = Completed Informed Consent

2 = Ineligible

3 = Refused (Why?) _____

Appendix B: Health/Fitness Facility Preparticipation Screening Questionnaire

FOR OFFICE USE ONLY:

NUMBER: __ __ __ __

DATE: __ __ / __ __ / __ __

LOCATION: __ __

Interviewer: __ __

Help us assess your ability to participate in an exercise program and your health needs by answering these questions. (Check the box for all affirmative statements, unless otherwise noted).

History

Have you ever had:

□ a heart attack
□ heart surgery
□ cardiac catheterization
□ percutaneous transluminal coronary angioplasty (PTCA)
□ pacemaker / implantable cardiac defibrillator / rhythm disturbance
□ heart valve disease
□ heart failure
□ heart transplantation
□ congenital heart disease

Symptoms

□ Do you experience chest discomfort with exertion?
□ Do you experience unreasonable breathlessness?
□ Do you experience dizziness, fainting, or blackouts?
□ Do you take heart medications?

Other health issues

□ Do you have diabetes?
□ Do you have asthma or any other lung disease?
□ Do you have burning or cramping sensation in your lower legs when walking a short distance?
□ Do you have musculoskeletal problems that limit your physical activity?
□ Do you have concerns about the safety of exercise?

(If respondent answered yes to any of these questions, it is strongly recommended that he/she consult his/her physician before participating in this exercise program).

Cardiovascular risk factors

□ Do you smoke, or did you quit smoking within the last 6 months?
□ Is your blood pressure greater than 140/90 mmHg?
□ Do you know your blood pressure? (**check box if BP is unknown**)
□ Do you take blood pressure medication?
□ Is your blood cholesterol level greater than 200 mg/dl?
□ Do you know your cholesterol level? (**check box if cholesterol is unknown**)
□ Do you have a close blood relative who had a heart attack or heart surgery before age 55 (father or brother) or age 65 (mother or sister)?
□ Do you get less than 30 minutes of physical activity on at least 3 days per week?
□ Are you greater than 20 pounds overweight?

Please list any medications that you are taking:

(If respondent has 1 or more tally marks to any of these questions, it is recommended, but not necessary, that he/she consult his/her physician before participating in this exercise program).

Appendix C: Medical Release Form

Date _____

Dear Doctor:

Your patient, _____, wishes to start a group exercise program. The program will involve the following:

LaughActive is a 45-minute moderate-intensity seated strength, endurance, balance, and flexibility exercise program. The program intersperses playful laughter and deep breathing exercises between the strength, balance, endurance, and flexibility exercises. The program will be facilitated two times per week for a total of six to eight weeks.

If your patient has any medical conditions or is taking medications that will affect his or her exercise capacity or heart-rate response to exercise, please indicate the manner of the effect (raises, lowers, or has no effect on exercise capacity or heart-rate response):

Type of medication(s)
_____

Effect(s)
_____

Please identify any recommendations or restrictions that are appropriate for your patient in this exercise program:

Thank you.

Sincerely,

Celeste Greene
ACE Certified Group Fitness Instructor
Email: cgreene12@student.gsu.edu
Phone: 678.596.6979

_____ has my approval to begin an exercise program with the recommendations or restrictions stated above.

Physician's signature _____ Date _____ Phone _____

Appendix D: *LaughActive* Questionnaire

Evaluation of the Laughter-Fit Program: A Pilot Study 2014

Georgia State University, Gerontology Institute

Introduction:

We are conducting a study on the effectiveness of the Laughter-Fit seated group exercise program. We will ask you questions about your health and your perceptions of exercise. Your participation in the interview will advance current knowledge in the area of exercise programming for older adults.

This questionnaire is completely voluntary and confidential. If there is a question that you do not want to answer simply skip and move on to the next question. However, it would be helpful to our research if you complete the entire questionnaire. Please do not hesitate to ask any questions at any time during your participation in this project.

Thank you so much for your participation.

FOR OFFICE USE ONLY:

NUMBER: __ __ __ __

DATE: __ __ / __ __ / __ __

LOCATION: __ __

INTERVIEWER: __ __

In this interview, I am going to ask you specific questions that we need to find out from everyone. We apologize in advance if some questions seem repetitive, appear to not make sense, or seem obvious. However, all questions are included to ensure we get the most accurate information possible. If there are no questions, we will begin.

Section A
[Sociodemographic Characteristics]

Please Start by Telling Me a Little About Yourself:

1. **Could you please tell me your age at your last birthday?** _____

2. **What is your gender?**

   ☐ Male
   ☐ Female

3. **Which do you feel best describes your race/ethnicity?**

   ☐ White (Not Hispanic)
   ☐ Black/African American (Not Hispanic)
   ☐ Hispanic or Latino
   ☐ Asian
   ☐ Native American or Other Pacific Islander
   ☐ Other (Please specify)
   _____

4. What is the highest degree or level of school you have completed?
(Please check only one box)

☐ Grade 1
☐ Grade 2
☐ Grade 3
☐ Grade 4
☐ Grade 5
☐ Grade 6
☐ Grade 7
☐ Grade 8
☐ Grade 9
☐ Grade 10
☐ Grade 11
☐ Grade 12
☐ GED
☐ Vocational training/college after high school
☐ Associate Degree
☐ College graduate
☐ Master's Degree
☐ Doctoral Degree (Ph.D., MD, EdD, JD, etc.)

5. What is your current marital status?

☐ Married
☐ Living with partner
☐ Widowed
☐ Divorced
☐ Separated
☐ Never Married

6. How often do you participate in exercise classes?
(Please check only one box)

☐ I do not participate in exercise classes
☐ 1 day per week
☐ 2 days per week
☐ 3 days per week
☐ 4 days per week
☐ 5 days per week
☐ More than 5 days per week

7. Which types of exercise classes do you currently participate? (for example: aerobic exercise, weight training, stretching, walking program, etc.)

_____

_____

_____

_____

Section B
[SF-36v2®]

The next questions ask for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

For each of the following questions, please select the <u>one</u> response that <u>best</u> describes your answer.

The first questions are about your health now. Please try to answer as accurately as you can.

1. In general, would you say your health is *…*
[READ RESPONSE CHOICES]

Excellent	Very good	Good	Fair	Poor
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. <u>Compared to one year ago</u>, how would you rate your health in general <u>now</u>? Would you say it is … *[READ RESPONSE CHOICES]*

Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse now than one year ago
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Now I'm going to read a list of activities that you might do during a typical day.

As I read each item, please tell me if your <u>health</u> now <u>limits you a lot</u>, <u>limits you a little</u>, or <u>does not limit you at all</u> in these activities.

3. *[READ ACTIVITY] ...* ***["Does your health now limit you a lot, limit you a little, or not limit you at all?"]***

[IF RESPONDENT SAYS THAT S/HE DOES NOT DO THE ACTIVITY: PROBE: "Is that because of your health?"]

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	☐ 1	☐ 2	☐ 3
b Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
c Lifting or carrying groceries	☐ 1	☐ 2	☐ 3
d Climbing several flights of stairs	☐ 1	☐ 2	☐ 3
e Climbing one flight of stairs	☐ 1	☐ 2	☐ 3
f Bending, kneeling, or stooping	☐ 1	☐ 2	☐ 3
g Walking more than a mile	☐ 1	☐ 2	☐ 3
h Walking several hundred yards	☐ 1	☐ 2	☐ 3
i Walking one hundred yards	☐ 1	☐ 2	☐ 3
j Bathing or dressing yourself	☐ 1	☐ 2	☐ 3

The following four questions ask you about your physical health and your daily activities.

4. During the <u>past four weeks</u>, how much of the time have you … *[READ ACTIVITY]* **… <u>as a result of your physical health</u>?** *[READ RESPONSE CHOICES]*

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Cut down on the <u>amount of time</u> you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b <u>Accomplished less</u> than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Were limited in the <u>kind</u> of work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d Had <u>difficulty</u> performing the work or other activities (for example, it took extra effort)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

The following three questions ask about your emotions and your daily activities.

5. During the <u>past four weeks</u> how much of the time have you … ***[READ ACTIVITY]*** … <u>as a result of any emotional problems</u> such as feeling depressed or anxious? ***[READ RESPONSE CHOICES]***

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Cut down on the <u>amount of time</u> you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b <u>Accomplished less</u> than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Did work or other activities <u>less carefully than usual</u>	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

6. During the <u>past four weeks</u>, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups? Has it interfered …
[READ RESPONSE CHOICES]

Not at all	Slightly	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

7. During the <u>past four weeks</u>, how much did <u>pain</u> interfere with your normal work including both work outside the home and housework? Did it interfere … *[READ RESPONSE CHOICES]*

[IF RESPONDENT SAYS THAT S/HE DOES NOT WORK: SUBSTITUTE "DAILY ACTIVITIES" FOR WORK]

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

8. How much <u>bodily</u> pain have you had during the <u>past four weeks</u>? Have you had … *[READ RESPONSE CHOICES]*

None	Very mild	Mild	Moderate	Severe	Very severe
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

The next questions are about how you feel and how things have been with you during the past four weeks.

As I read each statement, please give me the one answer that comes closest to the way you have been feeling; is it all of the time, most of the time, some of the time, a little of the time, or none of the time?

9. How much of the time during the <u>past four weeks</u> … *[READ STATEMENT] … [READ RESPONSE CHOICES]*

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Did you feel full of life?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b Have you been very nervous?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Have you felt so down in the dumps that nothing could cheer you up?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d Have you felt calm and peaceful?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e Did you have a lot of energy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
f Have you felt downhearted and depressed?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
g Did you feel worn out?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
h Have you been happy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
i Did you feel tired?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

10. During the <u>past four weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities like visiting with friends or relatives? Has it interfered … *[READ RESPONSE CHOICES]*

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

These next questions are about your health and health-related matters.

Now, I'm going to read a list of statements. After each one, please tell me if it is <u>definitely true</u>, <u>mostly true</u>, <u>mostly false</u>, or <u>definitely false</u>. If you don't know, just tell me.

11. *[READ STATEMENT]* **… "Would you say that's" …** *[READ RESPONSE CHOICES]*

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a I seem to get sick a little easier than other people	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b I am as healthy as anybody I know	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c I expect my health to get worse	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d My health is excellent	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Section C
[Self Efficacy for Exercise Scale]

The next section will include questions about your confidence to continue an exercise program despite potential barriers that you may experience.

Now I am going to give nine situations that might affect your participation in exercise. For each situation, please answer <u>using a range where 0 is "Not Confident" and 10 is "Very Confident,"</u> to tell me how confident you are right now that you could exercise 3 times a week for 20 minutes each time, in each of these situations.

How confident are you right now that you could exercise 3 times a week for 20 minutes each time:

1. If the weather was bothering you

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

2. If you were bored by the program or activity

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

3. If you felt pain when exercising

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

4. If you had to exercise alone

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

Using our range where <u>0 is "Not Confident" and 10 is "Very Confident,"</u> How confident are you right now that you could exercise 3 times a week for 20 minutes each time:

5. If you did not enjoy it

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

6. If you were too busy with other activities

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

7. If you felt tired

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

8. If you felt stressed

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

****

9. If you felt depressed

Not Confident **Very Confident**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Section D
[Outcome Expectations for Exercise Scale]

The next section will include questions about your perceived benefits of exercising.

Now I'm going to read you nine different statements about the benefits of exercising, (for example, walking, jogging, swimming, biking, stretching, or lifting weights). Using a range from 1 to 5, where 1 means you "Strongly Disagree," and 5 means you "Strongly Agree," please tell me how much you agree or disagree with each statement.

[READ STATEMENT] **… "Would you say that you" …** *[READ RESPONSE CHOICES]*

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Exercise makes me feel better physically	1	2	3	4	5
Exercise makes my mood better in general	1	2	3	4	5
Exercise helps me feel less tired	1	2	3	4	5
Exercise makes my muscles stronger	1	2	3	4	5
Exercise is an activity I enjoy doing	1	2	3	4	5
Exercise gives me a sense of personal accomplishment	1	2	3	4	5
Exercise makes me more alert mentally	1	2	3	4	5
Exercise improves my endurance in performing my daily activities (personal care, cooking, shopping, light cleaning, taking out the garbage)	1	2	3	4	5
Exercise helps to strengthen my bones	1	2	3	4	5

Section E
[Physical Activity Enjoyment Scale]

The next section will include questions about how much you enjoy the physical activity that you have been doing.

Using a range from <u>1 to 7</u>, please rate how you feel *at the moment* about the physical activity you have been doing.

I find it pleasurable **I find it unpleasurable**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's no fun at all **It's a lot of fun**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's very pleasant **It's very unpleasant**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's very invigorating **It's not at all invigorating**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's very gratifying **It's not at all gratifying**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's very exhilarating **It's not at all exhilarating**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's not at all stimulating **It's very stimulating**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

****

It's very refreshing **It's not at all refreshing**

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

Thank you for completing this questionnaire!

Appendix E: Senior Fitness Test Score Card

Scorecard: Senior Fitness Test

Date: _____

Name: _____ M: _____ F: _____ Age: _____ Ht: _____ Wt: _____

Test Item	Trial 1	Trial 2	Comments
1. **Chair stand test** (# in 30 sec)	_____	N/A	_____
2. **Arm curl test** (# in 30 sec)	_____	N/A	_____
3. **2-minute step test** (# of steps or **6-minute walk test** (# of yds)	_____	N/A	_____
4. **Chair sit-and-reach test** (nearest 1/2 in.: +/–)	_____	_____	Right or Left (extended leg)
5. **Back scratch test** (nearest 1/2 in.: +/–)	_____	_____	Right or Left (over shoulder)
6. **8-ft up-and-go test** (nearest 1/10 sec)	_____	_____	_____

Scorecard: Senior Fitness Test

Date: _____

Name: _____ M: _____ F: _____ Age: _____ Ht: _____ Wt: _____

Test Item	Trial 1	Trial 2	Comments
1. **Chair stand test** (# in 30 sec)	_____	N/A	_____
2. **Arm curl test** (# in 30 sec)	_____	N/A	_____
3. **2-minute step test** (# of steps or **6-minute walk test** (# of yds)	_____	N/A	_____
4. **Chair sit-and-reach test** (nearest 1/2 in.: +/–)	_____	_____	Right or Left (extended leg)
5. **Back scratch test** (nearest 1/2 in.: +/–)	_____	_____	Right or Left (over shoulder)
6. **8-ft up-and-go test** (nearest 1/10 sec)	_____	_____	_____

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Appendix F: *LaughActive* Participant Satisfaction Questionnaire

1. Now that you have completed the *LaughActive* program, please tell us to what extent do you agree or disagree with the following statements:

(Please circle the answer):

	Strongly Disagree	Disagree	Agree	Strongly Agree
A. I am satisfied with the *LaughActive* program.	1	2	3	4
B. As a result of the *LaughActive* program, I feel better overall.	1	2	3	4
C. As a result of the *LaughActive* program, I find more joy in my life.	1	2	3	4
D. The *LaughActive* program was appropriate for my physical fitness level.	1	2	3	4
E. I found the laughter aspect of the *LaughActive* program to be an enjoyable addition to a traditional exercise program.	1	2	3	4
F. The laughter aspect of the *LaughActive* program helped to make exercise more accessible for me.	1	2	3	4
G. The *LaughActive* program enhanced my interaction with my classmates during the exercise classes.	1	2	3	4
H. The *LaughActive* program enhanced my interactions with others outside of class.	1	2	3	4
I. The *LaughActive* program enhanced my motivation to participate in other exercise classes or activities.	1	2	3	4
J. I would like to continue participating in the *LaughActive* program.	1	2	3	4
K. I would like to continue participating in the *LaughActive* program <u>two</u> times per week.	1	2	3	4
L. I would like to continue participating in the *LaughActive* program <u>three</u> times per week.	1	2	3	4
M. I would recommend the *LaughActive* program to a friend.	1	2	3	4

2. Please indicate how often the following occurred during the program: (Please circle the answer):

	Never	Sometimes	Often
A. I felt comfortable approaching my instructor with questions, concerns, or comments.	1	2	3
B. I liked the instructor's teaching approach.	1	2	3
C. I was satisfied with the way my instructor taught the classes.	1	2	3
D. I enjoyed being in class.	1	2	3
E. I felt that I was a valued and respected member of the class.	1	2	3

3. We are hoping to understand what prevents older adults like you from attending exercise class. If you missed any classes, can you tell me what kept you from attending? (e.g. health reasons, felt pain while exercising, too busy, too tired, did not enjoy the *LaughActive* program, etc.)

_____

_____

4. What did you like about the *LaughActive* program?

_____

_____

_____

_____

5. **What did you NOT like about the *LaughActive* program?**

_____

_____

_____

_____

6. **How would you improve the *LaughActive* program?**

_____

_____

_____

_____

7. **Do you have any additional comments you would like to share?**

_____

_____

_____

_____

Thank you for completing this program and survey!