PEER-ASSISTED SOCIAL COGNITIVE PHYSICAL ACTIVITY INTERVENTION FOR OLDER ADULTS

By

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By

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There is growing and profound evidence that regular and sustained physical activity has substantial physical and mental health benefits for middle-aged and older adults. In spite of this evidence aging adults represent the most inactive segment of our population. One of the most pressing contemporary public health issues is identifying ways to increase the likelihood that older adults engage in regular physical activity. The purpose of our study was to the evaluate the effectiveness of the Active Adult Mentoring Program (Project AAMP), a 16-week social cognitive physical activity intervention using peer mentors, goal setting, and mental imagery, to enhance social cognitive beliefs and attitudes regarding exercise, to increase physical activity levels, and to increase cardiorespiratory fitness. An experimental design was chosen where participants were randomized to the intervention group or a "health hygiene" control group matched in social contact and peer mentorship.

Participants were 81 previously sedentary adults age 50 and older (M = 63.42, SD = 8.62), primarily female, white, college-educated, and free of disease or disability preventing physical activity participation. Sixty-nine participants completed baseline and posttest assessments (85% retention). Social cognitive outcomes were mixed; the intervention did not increase self-efficacy in either group, yet the intervention group had marginally improved intrinsic motivation

compared to the control. Physical activity, measured by minutes of moderate-to-vigorous physical activity, a metabolic estimate, and pedometer steps, showed positive, curvilinear growth such that activity monotonically increased for the first eight weeks, was sustained for an additional four weeks, and had modest declines in the final four weeks when the intervention was withdrawn. Group assignment did not moderate this time trend. Small improvements in cardiorespiratory fitness were observed in both groups. These findings provide initial support for the use of peer-assisted interventions in the physical activity domain and perhaps more broadly in behavioral and health programs. Future research should continue to explore ways to increase physical activity behavior in older adult populations through the use of peer mentors and a theoretical model that can be easily and inexpensively delivered to a wide range of population subgroups.

CHAPTER 1
INTRODUCTION

There is growing and profound evidence that regular and sustained physical activity (PA) has substantial physical and psychological health benefits for older adults. Individuals age 50 and older who engage in regular PA have improved cardiovascular health, increased metabolism, and slowed declines in bone mineral density (Singh, 2002). Regular exercise can reduce adults' risk of coronary heart disease (Haskell et al., 1992), cancer (Blair et al., 1989), offer protection against non-insulin dependent diabetes (Helmrick, Ragland, Leung, & Paffenbarger, 1991), and reduce hypercholesterolemia (Harris et al., 1991). Studies have also linked exercise with diminished declines of functional capacity due to age, reduced risk factors associated with falls in the elderly (DiPietro, 2001; Liu-Ambrose et al., 2004), while older adults who engage in regular exercise reduce their risk for mortality associated with chronic disease states and premature mortality (Bean, Vora, & Frontera, 2004; Bokovoy & Blair, 1994; Lee & Paffenbarger, 1996; Paffenbarger et al., 1993; Wagner, LaCroix, Buchner, & Larson, 1992). When exercise is initiated later in life there is still a strong impact on health and mortality rates even when accounting for factors such as smoking, family history, weight gain, and hypertension (Blair et al., 1995). Additionally, regular exercise benefits older adults with chronic conditions as varied as cancer, cardiovascular disease, respiratory disease, and dementia (Bath & Morgan, 1998; Kiely, Wolf, Cupples, Beiser, & Kannel, 1994; Lakka et al., 1994; Leveille, Guralnik, Ferrucci, & Langlois, 1999; Morgan & Bath, 1998; Shephard & Balady, 1999).

Regular exercise, whether involving structured or unstructured programs, is also associated with psychological health and well-being for older adults (Arent, Landers, & Etnier, 2000; Brown, 1992; Colcombe et al., 2004; Dunn, Trivedi, & O'Neal, 2001; Fukukawa et al., 2004; McAuley, 1993a; McAuley, Marquez, Jerome, Blissmer, & Katula, 2002; McAuley & Rudolph, 1995; Morgan & Bath, 1998; Pescatello & DiPietro, 1993; Plante & Rodin, 1990; Rejeski & Mihalko, 2001; Spano, 2001). More recent literature has linked fitness outcomes with improved cognitive functioning for older adults (Colcombe et al., 2004; McAuley, Kramer, & Colcombe, 2004). In summary, it is generally believed that exercise is linked to a variety of positive physical health outcomes for older adults (McAuley & Rudolph, 1995).

In spite of evidence that regular PA slows the aging process and that physical health is essential to quality-of-life and the maintenance of functional independence, many older adults remain sedentary. Active involvement in the recommended levels of PA declines considerably with age (CDC, 2005; see Table 1-1) and the percentage of adults who are completely inactive increases throughout the age span with approximately 3/4 of all individuals in the United States over the age of 50 being either inactive or not gaining sufficient activity to derive health benefits (Schiller, Adams, & Coriaty, 2005). In response to these concerns, the American College of Sports Medicine (Cress et al., 2004), the National Institutes of Health (NIH, 1995), and the United States Surgeon General's office have consensus statements and planning documents to promote exercise behaviors for older adults. It is clear that one of the most pressing contemporary research and public health issues should focus on ways to increase the likelihood that older adults engage in leisure time exercise.

In the past two decades there has been a large number of PA interventions developed and implemented with older populations. Van der Bij, Laurant, and Wensing (2002) reported on a systematic review of the literature, identifying 38 randomized controlled trials that targeted adults 65 years or older that included 57 PA interventions. The great majority of these interventions have focused on modifying factors associated with the individual, and in fewer cases the modification of the community and environment (Satariano & McAuley, 2003).

Individual-level strategies include the modification of cognitive, affective, and social influences such as self-efficacy, locus of control, and intention. The majority of these behavior change strategies have been adapted from the general psychology literature and use the following theoretical perspectives: theory of planned behavior (Ajzen, 1991), transtheoretical model (Prochaska & Velicer, 1997), self-efficacy theory (Bandura, 1997), and self-determination theory (Deci & Ryan, 1985). Community and environmental approaches to PA promotion, on the other hand, aim to address meso- and macro-environmental factors such as urban planning and design, public transportation, and policy decisions. These strategies have been influenced largely by social-ecological models of health promotion (King, Stokols, Talen, Brassington, & Killingsworth, 2002; McLeroy, Bibeau, Steckler, & Glanz, 1988).

Satariano and McAuley (2003) have suggested that the community/environmental and individual-level approaches to PA promotion have evolved distinctively and antithetically from each other. In many cases, individual-level theories are not able to fully account for environmental factors and how they directly influence behavior. Community and environmental approaches may neglect the transactional nature of the individual and his/her environment and the volitional nature of health behaviors. Social cognitive theory, traditionally viewed as an individual-level meta-theory, holds at its core a reciprocal, triadic interplay of individual, environmental, and behavioral factors (Bandura, 1986). Indeed, ecological and social cognitive approaches to PA promotion are compatible and can be viewed as complementary (King et al., 2002). For instance, individuals within communities may help to shape each others' views about exercise which may then impact choices made at the individual and/or community level. Satariano and McAuley (2003) point out that "individuals may be sufficiently motivated and confident to inspire and convince others in their neighborhoods and communities by word or deed to engage in physical activity" (p. 188). Such a transtheoretical approach is needed to address the complex nature of PA adoption in older populations where barriers are experienced more variably and commonly than their younger counterparts (CDC, 2005).

Project AAMP, or the Active Adult Mentoring Project, is a pilot research project designed and implemented by a multidisciplinary team of researchers at the University of Florida who sought not only to promote PA in older populations, but also to examine gains in other health-related psychosocial domains (i.e., cognition, sleep) as a function of improved PA behavior and fitness. The purpose of the current study was to evaluate the primary outcomes of Project AAMP (self-efficacy and intrinsic motivation, PA behavior, and fitness). These important outcomes were hypothesized to mediate change in secondary outcomes including sleep, cognition (particularly executive functioning), emotional well-being, and physical functioning.

Project AAMP adopted a social cognitive theoretical framework to enhance self-efficacy beliefs and intrinsic motivation, which are important mediators of PA behavior and well-being (Netz, Wu, Becker & Tenenbaum, 2005). Through a multi-component approach to behavior change (concurrent use of peer mentors, goal setting, and mental imagery), Project AAMP was designed to address behavior change at multiple levels of influence. These levels of influence interact reciprocally to influence behavior (Bandura, 1997). The following levels were addressed:

- **Intrapersonal:** The intervention sought to modify beliefs and attitudes (i.e., self-efficacy, intrinsic motivation) that have theoretical and empirical linkages to PA behavior. Intervention strategies that address this level of influence included the use of goal setting and mental imagery.
- **Interpersonal:** Central to the intervention was the use of physically active older adults as trained same aged peer mentors to deliver the intervention. This delivery took place within

a group-based context designed to foster a supportive environment conducive to sustainable behavior change.

- **Environmental:** Setting and context are recognized as important factors in the evaluation of health behavior interventions (Glasgow, Vogt, & Boles, 1999). The intervention was expressly designed to be highly replicable and ecologically valid at a low cost to participants and utilize a relatively small amount of community resources.

The basic question addressed in our study was whether a multi-component, 16-week PA intervention for sedentary adults aged 50 years and older can effectively enhance social cognitive variables (i.e., self-efficacy, self-determined behavior) which have demonstrated theoretical linkages to PA behavior and fitness outcomes. Therefore, the purposes of the study were as follows:

- **Primary purpose:** To examine the effects of a multi-component 16-week exercise intervention for sedentary adults 50 years of age and older on changes in exercise self-efficacy and intrinsic motivation toward exercise.

- **Secondary purpose:** To evaluate subsequent improvement in PA behavior (i.e.; self-reported PA and pedometer count) and fitness parameters (i.e.; cardiorespiratory fitness).

Table 1-1. United States physical activity prevalence data grouped by age in 2005.

Age group (years)	18-24	25-34	35-44	45-54	55-64	65+
Recommended (%)	59.4	51.7	50.3	45.5	44.7	39.0
Insufficient (%)	21.1	27.9	28.3	28.4	28.7	26.9
No physical activity (%)	19.5	20.4	21.4	23.1	26.6	34.1

Note. Behavioral Risk Factor Surveillance System. The recommended amount of physical activity for older adults is 30 minutes or more of moderate physical activity five or more days per week, or vigorous physical activity for 20 minutes or more three or more days per week (Nelson et al., 2007). Data includes District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands

CHAPTER 2
REVIEW OF LITERATURE

The following review of the literature has been divided into two sections. First, the social cognitive underpinnings of PA behavior will be reviewed and the specific theoretical perspectives utilized within the Project AAMP intervention will be presented. Second, a guiding theoretical framework will be presented and literature relevant to the intervention strategies chosen will be reviewed.

Social Cognitive Underpinnings of Physical Activity Behavior

Social cognitive theory (Bandura, 1986) forms the theoretical foundation for Project AAMP. Social cognitive theory, broadly defined, is concerned with the social psychological links between cognitions, beliefs, attitudes and behavior and is deeply rooted in expectancy-value motivation (cf. Atkinson, 1964). Social cognitive theory contends that behavior is not approached passively; rather, individuals plan, set goals, and make decisions that affect the volition of behavioral involvement. More specifically, self-efficacy theory (Bandura, 1997) and self-determination theory (Deci & Ryan, 1985) were chosen as guiding frameworks for our study because both theories place emphasis on the reciprocal interplay of individual and social-contextual factors in the development of goal directed behavior and psychological well-being (Bandura, 1997; McAuley, Elavsky, Jerome, Konopack, & Marquez, 2005; Ryan & Deci, 2000). Both theories also emphasize the importance of perceived competence or beliefs in one's capabilities as the primary predictor of the adoption and maintenance of PA behavior (Standage & Duda, 2004).

Self-Efficacy Theory

Self-efficacy beliefs can be defined as differentiated and domain specific "self-beliefs" that operate within various and distinct realms of human functioning (Bandura, 1997). Self-efficacy theory is concerned with how individuals effectively organize cognitive, social, emotional, and behavioral sub-skills that underpin successful attempts to initiate and maintain behavior. Self-efficacy expectations are derived from four sources: (a) past performance accomplishments (i.e., PA history), (b) vicarious experiences (i.e., peer modeling); (c) physiological states (i.e., PA-induced positive affect); and (d) verbal persuasion (i.e., physician advice). Information received from past performance accomplishments is hypothesized to be the strongest predictor of self-efficacy beliefs. Therefore, it is through incremental and repeated practice of a health behavior that results in enhanced self-efficacy expectations and subsequent initiation, persistence, and maintenance of the behavior (Baranowski, Perry, & Parcel, 2005).

Self-efficacy in the PA domain includes confidence to perform tasks as well as overcoming barriers that prevent behavior. Information received from past success or failure in performing PA tasks serves to inform future efforts and decisions regarding behavior. McAuley (1992) has developed a measure of barriers self-efficacy (BSE) that has been widely used and validated in older adult samples (McAuley et al., 2005; McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). Items on this measure reflect judgments of one's perceived capabilities to maintain regular PA despite barriers (e.g., "…if I exercise alone;" "…felt pain or discomfort"). BSE has been found to be the most consistent and proximal predictor of PA behavior to date as demonstrated by prospective and correlational studies (Conn, 1998; McAuley, 1992; McAuley et al., 2003; McAuley et al., 2005; Rhodes et al., 1999; Wilcox & Storandt, 1996).

Long-term maintenance of PA and BSE has received less attention and shown weaker and less consistent relationships (Maddison & Prapavessis; 2004; McAuley et al., 2003). McAuley et al. (2003) reported on the effects of a 6-month randomized exercise trial on short-term (6 months) and long-term (18 months) maintenance of PA in a sample of previously sedentary community-dwelling adults aged 60 to 75 years. The researchers found that BSE at baseline was predictive of short-term PA at 6 months ($\beta = .27$) and long-term maintenance at 18 months ($\beta = .25$) in a structural model. These long-term effects of BSE on adherence held even after controlling for PA behavior in the first 6 months of the intervention ($\beta = .52$).

Maddison and Prapavessis (2004) examined the short- and long-term role of BSE on two additional objective measures of PA: (a) attendance of an 18-week aerobic (walking) and stretching supervised cardiac-rehabilitation exercise program; and (b) energy expenditure during the prescribed exercise sessions. The participants included 41 adults (*M* age = 63.65 years) who were recently diagnosed with ischemic heart disease and prescribed exercise. The researchers found in a cross-lag path analysis that BSE at baseline was predictive of attendance across the first 6 weeks of the intervention ($\beta = .44$). BSE was again measured after 13 weeks in the intervention and found to be predictive of attendance in the final six weeks of the intervention ($\beta = .29$), after controlling for attendance and BSE at previous time points. Energy expenditure was not associated with BSE at any of the time points.

The role of self-efficacy in overcoming commonly experienced barriers of older adults remains an important relationship to explore. Bandura (1997) posits that self-efficacy is particularly useful when challenging situations or barriers arise as it determines persistence in which we approach the obstacles. While relationships between BSE at baseline and short-term behavior appear robust, additional questions remain regarding how BSE may impact PA beyond the initiation phase.

Self-Determination Theory

Self-determination theory is broadly focused and seeks to explain human motivation and psychological well-being within social contexts. Motivation is viewed along a self-determination continuum where behavior is driven by extrinsic and intrinsic rewards. Extrinsic motivation is driven by outcomes independent of the behavior and external awards. Intrinsic motivation, on the other side of continuum, is driven by the pleasure and satisfaction inherent in the activity. Ryan and Deci (2000) contend that “humans are liberally endowed with intrinsic motivational tendencies” (p. 70) and it is not necessary to determine causal factors that foster intrinsic motivation. Instead, efforts should be devoted towards understanding contexts and conditions that promote and sustain the natural propensity to be intrinsically motivated.

Developed as a sub-theory of SDT, Cognitive Evaluation Theory (CET) is focused on the social-contextual conditions where intrinsic motivation is fostered and healthy development occurs. CET states that intrinsic motivation is fostered when three basic, innate psychological needs are met. These needs include: (a) competency, feeling capable in relationship to one’s environment; (b) relatedness, shared experiences with others; and (c) autonomy, a sense of choice. Maladjustment occurs and self-determined behavior is undermined when these three human needs are not met.

In the PA domain, Deci and Ryan (1985) contend that the natural course of human activity is to be intrinsically motivated toward maintaining physical capacities. Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) found, however, that older adults typically initiate PA for extrinsic reasons (e.g., to lose weight, improve appearance, avoid health problems). This incongruence may explain why extrinsic motivation is sufficient to initiate regular PA but undermines the development of fun and enjoyment, thus reducing PA sustainability (Wankel, 1993).

SDT predicts that autonomy-supportive environments, versus controlling environments, foster more self-determined forms of intrinsic motivation in PA settings. There is evidence to support this notion with college-aged women (Wilson & Rodgers, 2004), adolescents (Vansteenkiste, Simons, Soenens, & Lens, 2004), adults (Chatzisarantis & Biddle, 1998; Levy &

Cardinal, 2004), and older adults (Losier, Bourque, & Vallerand, 1993). Researchers using the SDT framework with adults in assisted-living facilities have also demonstrated that autonomy-supportive environments tend to be associated with intrinsic forms of motivation toward PA (Vallerand & O'Connor, 1989; Vallerand, O'Connor, & Hamel, 1995). Generally, perceptions of competence, autonomy, and relatedness appear to be associated with PA participation in various populations.

Losier et al. (1993) tested a SDT-based motivational model of leisure behavior in adults 65 years and older. The cross-sectional, stratified sample of 102 French-speaking Canadian elders completed questionnaires that examined how demographic variables, perceived constraints and opportunities, and self-determined motivation predicted leisure satisfaction and participation. The regression-based path model indicated that perceived constraints ($\beta = -0.26$) and opportunities ($\beta = 0.36$) predicted self-determined motivation, with a greater perception of opportunities and fewer perceptions of constraints predicting more intrinsically motivated behavior. Self-determined motivation also positively predicted participation in leisure activities ($\beta = 0.30$), even after controlling for significant demographic variables (e.g., marital status, gender) and leisure satisfaction. The final model predicted 30% of the variance in leisure participation. This study demonstrated, in a sample of elders, that individuals more intrinsically motivated to participate in leisure activities were more likely to report spending time engaged in such activities. This study did not, however, include mediating variables such as autonomy, relatedness, and autonomy that Ryan and Deci (2000) contend underpin the process and context in which self-determined behavior is fostered.

Levy and Cardinal (2004) addressed how these mediating variables may be influenced over the course of a 2-month, mail-mediated PA intervention of 59 women between the ages of 22 and 79. Participants were assigned to either a control (an educationally-based packet on health and exercise), intervention (four-page packet designed to promote a sense of autonomy, competence, and relatedness), or intervention plus booster (intervention packet plus a mailed postcard re-iterating supportive messages) condition. The researchers found that the women in all three conditions increased exercise behavior across the intervention. Of the mediating variables, women in all three groups also demonstrated significant improvements in perceived autonomy. No changes were observed in competence or relatedness in any of the conditions. More research is needed that seeks to examine these changes in the context of a longer, more intensive intervention. It is likely that specific intervention strategies and contexts may be important factors to consider in fostering competence (e.g., goal setting) and relatedness (e.g., group-based).

Self-Regulatory Strategies

Bandura (1986) has defined self-regulation as personal control toward goal-directed behavior or performance. Self-regulation is a prominent construct in the social cognitive theory and is generally hypothesized to mediate the relationship between proximal social cognitive indicators and behavior. For example, in self-efficacy theory, self-regulatory strategies are the active efforts employed to translate self-efficacy into actual behavior (Bandura, 1986; Rhodes & Plotnikoff, 2006). In SDT, self-regulatory behavior is viewed as healthy psychological adaptations under conditions where innate psychological needs are being met (Ryan & Deci, 2000). In general, self-regulatory strategies are any active efforts taken to regulate affect, behavior, and cognition with the purpose of overcoming challenges in behavior adoption. These strategies may include goal setting, self-monitoring, and reinforcement. Bandura (2001) has theorized that individuals with higher levels of self-efficacy to perform PA are more likely to engage in self-regulatory strategies to overcome common barriers and maintain behavior over time.

Anderson, Wojcik, Winett, and Williams (2006) studied self-regulation in a cross-sectional sample of 999 adults (*M* age = 52.70, *SD* = 14.60) recruited as part of a church-based health promotion study. To assess self-regulation, Anderson et al. (2006) tapped into strategies used in the past three months related to PA engagement. These strategies included setting aside time for PA, taking breaks for PA, walking instead of driving, parking further away to walk, getting together with someone else for PA, writing down on a calendar their PA plans, and making contingency plans for bad weather. The researchers found, using a structural model, that self-regulation was the strongest predictor of PA behavior ($\beta = .36$). Self-efficacy was not a direct predictor of PA; instead, was predictive of self-regulation ($\beta = .18$), supporting the notion that self-regulation mediates the self-efficacy-behavior relationship.

While there is theoretical (Bandura, 2001) and empirical (Anderson et al., 2006; Resnick, 2001; Rovniak, Anderson, Winett, & Stephen, 2002) support for the notion that self-regulation is an important mediator for behavior, little is understood about the demographic and contextual circumstances where self-regulation is most commonly used. Umstattd, Saunder, Wilcox, Valois, and Dowda (2006), in a convenience sample of 296 adults aged 50 and over, studied the value of self-reported PA, demographics (gender, age, race, education, income, BMI, self-reported health status), and other social cognitive variables (social support, self-efficacy) in predicting self-regulation. Umstattd et al. (2006) used a more comprehensive measurement of self-regulation compared to Anderson et al. (2006) that included self-monitoring, goal setting, social support, reinforcement, time management, and relapse prevention. The authors reported that self-regulatory strategies were positively predicted by female gender ($\beta = .11$), social support ($\beta =$

.13), self-efficacy (β = .27), and current PA engagement (β = .44). The final model explained 36% of the overall variance in self-regulation.

The empirical studies discussed above collectively provide support for the importance of including self-regulatory strategies in PA interventions for older adults. However, our understanding of self-regulation is limited due to a lack of prospective studies that track self-regulatory processes over time and other methodological inconsistencies. First, self-regulatory variables are seldom included in longitudinal models that include other social cognitive variables. By including self-regulation in these models we can understand how these processes change during initiation and maintenance phases of PA and the effectiveness of these strategies to mitigate different barriers. As shown by Anderson et al (2006) and Umstaddt et al. (2006), researchers are inconsistent in how they measure self-regulation in cross-sectional studies. These self-regulatory strategies measured in cross-sectional studies are also not necessarily consistent with strategies used in intervention studies. This makes it difficult to assess the implications of cross-sectional studies for intervention design.

Social Influences

Central to all the social cognitive theories discussed here is the role that social context plays in the formation and manifestation of attitudes and beliefs. Ajzen (1991) noted that information and influence of others plays heavily in the formation of personal control. Bandura (1997) contends that attitudes and behaviors are formed from a continuous, reciprocal interplay of social and individual factors. In self-efficacy theory, social support is a proximal predictor of self-efficacy and outcome expectancy in older adults (Duncan & McAuley, 1993; Resnick, 2001, Resnick, Orwig, Magaziner, & Wynne, 2002). In self-determination theory, intrinsic motivation and self-determined forms of extrinsic motivation is fostered only when the need for relatedness, or being properly in relationship with others, is met.

Social support, like other social cognitive variables, has been shown to be an important predictor of exercise and PA behaviors in cross-sectional (Brassington, Atienza, Perczek, Lilorenzo, & King, 2002; Chogahara, Cousins, & Wankel, 1998), prospective (Castro, Sallis, Hickman, Lee, & Chen, 1999), and randomized controlled trials (McAuley et al., 2003; Rejeski et al., 2003). Links have also been found between social support and more distal PA outcomes including behavior (Resnick, 2001, Resnick et al., 2002; Estabrooks & Carron, 1999) and subjective well-being (McAuley et al., 2000). Social support for older adults has the potential to promote PA in a variety of ways. Berkman (1995) describes at least four ways in which social support can aid health promotion: instrumental (e.g., providing access to facilities), emotional (e.g., providing encouragement to sustain activity), appraisal (e.g., providing evaluative feedback regarding normative progress), and informational (e.g., providing fitness/exercise knowledge). Social support can provide tangible and instrumental benefits to improve adherence that reduce common barriers for older adults.

Estabrooks and Carron (1999) examined group cohesion (task and social) within a theory of planned behavior framework. Theory of planned behavior constructs and group exercise participation over four weeks were measured in a cross-sectional study of 179 volunteer older adults (*M* age = 67, *SD* = 7.77). The researchers found that task cohesion was significantly related to behavioral attitudes ($\beta = .135$) and perceived behavioral control ($\beta =.281$). Perceived behavioral control also mediated the relationship between task cohesion and intention and had direct effects on attendance to the group after four weeks ($\beta = .127$). Social cohesion, on the other hand, was not directly linked to perceived behavioral control but did predict behavioral attitude ($\beta = .16$). The link between elements of task cohesion and perceived behavioral control indicate that older adults who perceive themselves closer to the group may also perceive greater social support to overcome potential barriers to PA that may arise. Moreover, because the link was exclusive to task cohesion over social cohesion, this may indicate that older adults rely more on instrumental, appraisal, and informational sources of support that are present in task-oriented settings. It should also be noted that the small beta weights reported in this study suggest that other individual- and environmental-level factors are at play that may determine intention toward behavior. It cannot be assumed that group cohesion, or other interpersonal factors, can determine behavior alone. The interaction of a task-orientated group environment, appropriately-tailored, individual-level strategies (i.e., goal setting, mental imagery), delivered within an environment conducive to change is needed to modify psychosocial mediators of behavior change.

McAuley et al. (2003) reported on the long-term role that social support from a group plays in PA maintenance among 174 adults between the ages of 60 and 75. The researchers found, in a structural model, that perceptions of social support at the end of a 6-month exercise intervention predicted self-efficacy (a composite measure of BSE and EXSE; $\beta = 0.30$), which in turn predicted PA at the end of the intervention ($\beta = 0.27$) and at an 18-month follow-up ($\beta = 0.25$). The findings also showed that social support during the intervention was also related to exercise frequency and positive affect. In other words, those individuals who perceived greater amounts of support from other group members exercised more and reported more positive experiences throughout the intervention.

Despite the important role that social support plays in the formation of efficacy beliefs and behavior, more work is needed to fully understand the nature and makeup of successful support networks in the exercise domain. Israel (1982) describes six important characteristics of effective social networks and relationships. These include (a) reciprocity, the extent to which resources and support are both given and received; (b) intensity, the extent to which social relationships offer emotional closeness; (c) complexity, extent to which social relationships serve many functions; (d) density, extent to which network members know and interact with each other; (e) homogeneity, extent to which network members are demographically similar; and (f) geographic dispersion, extent to which network members live in close proximity to a focal person. Additionally, the social psychological literature also suggests that older adults prefer smaller, more intimate social support networks as compared to younger age cohorts (Carstensen, 1995; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). This is especially true when adults have emotional regulation as the goal (Carstensen, 1995). The existing intervention literature is likely to be formally and informally addressing these factors in social support provision, yet few reports are available in how these characteristics are actually being utilized. The explicit use of these characteristics within Project AAMP will be elaborated upon in subsequent sections of this report.

Guiding Theoretical Framework for Intervention

The primary purpose of Project AAMP was to enhance older adults' self-efficacy and intrinsic motivation towards exercise. Figure 2-1 depicts the theoretical framework that was chosen to guide the intervention strategies employed. This framework includes relevant antecedents (Box 1), the active elements of the intervention (Boxes 2 to 4), the theoretical mediators of behavior change (Boxes 5 to 7), and the predicted psychosocial, behavioral, and fitness outcomes (Boxes 8 to 9). Each of the elements of the intervention was derived from self-efficacy theory, self-determination theory, and previous research, and will be described in more detail below.

Antecedents

As shown in Figure 1 (Box 1), the linkages between an individuals' readiness to engage in exercise behavior, or stage of change (DiClemente & Prochaska, 1982), and self-efficacy expectations have important implications for exercise interventions. Self-efficacy expectations appear to be most important for individuals who are just beginning an exercise program (McAuley, 1992; Oman & King, 1998). Similarly, self-efficacy expectations increase almost linearly as individuals' progress from initially contemplating a behavior to actively maintaining these behaviors (Gorely & Gordon, 1995; Hellman, 1997; Herrick, Stone, & Mettler, 1997). Hence, previously sedentary adults typically have low levels of self-efficacy in their capability to begin and maintain an exercise program while those who have been active most of their lives usually have higher self-efficacy expectations with regard to exercise.

Perhaps the greatest advantage of adopting a stages of change framework here is the ability to understand how psychosocial mediators (e.g., efficacy beliefs, intrinsic motivation) change across stages of behavior change. In the precontemplation stage, for example, individuals may rate perceived barriers as being more important than the benefits of activity. For individuals in the action and maintenance stages, day-to-day impediments (e.g., weather, time, stress) represent proximal challenges to completion of individual bouts of PA. Individuals who successfully move through the stages of change consistently report increases of perceived benefits and a reduction of perceived barriers (Gorely & Gordon, 1995; Herrick, Stone, & Mettler, 1997; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus & Owen, 1992; Nigg & Courneya, 1998).

Jordan and Nigg (2002) offered a review of how to tailor interventions for older adults based upon their specific stage of change. Broadly, they posited that individuals will change their behaviors if and when they are ready and individuals vary in their level of readiness. For instance, pre-contemplators often have no intention of increasing their exercise behavior and they may be under-informed or completely uninformed about the health risks of a sedentary lifestyle. They are perhaps demoralized about their ability to begin an exercise program based upon their physical limitations and/or previous exercise experiences. They may also be avoidant of information about their behaviors and individuals at this stage do not think of themselves as exercisers.

The primary intervention goal for individuals in the pre-contemplation stage is to increase their awareness of the need to change (Jordan & Nigg, 2002). Encouraging these individuals to think about the benefits of exercise behavior and facing their fears about their sedentary behaviors may achieve this task. Individuals should be encouraged to think about the possible health risks associated with inactivity and also feel assured to know they can change their behaviors. Individuals in the contemplation stage have indicated their intention to exercise (Jordan & Nigg, 2002). Contemplators are often indecisive or ambivalent about exercise but are aware of the need to begin an exercise regimen. Individuals at this stage should be encouraged to pay attention to news, information about exercise, and opportunities in their community to exercise.

Central to Project AAMP is the notion that individuals in these early stages can begin the process of self-evaluation (i.e., contemplation, preparation) most effectively within the context of a supportive, peer-based intervention. The combination of an autonomy supportive environment where exercise goals and behaviors are modeled and actively supported by physically active, same aged cohort peers would be predicted to enhance self-efficacy expectations and intrinsic motivation to exercise.

Goal Setting

The use of goal setting to motivate behavior has a long and rich theoretical and empirical tradition and goal setting strategies are an established part of many behavioral interventions used by health care providers and psychologists (Hill, 2001). Goals are cognitive mechanisms that pertain to what an individual is striving to attain, an objective, or aim (Burton, Naylor, & Holliday, 2001). Goals often enter and recede from conscious awareness depending on the context and they can provide focus for specific behavioral efforts (Burton et al., 2001). The most widely accepted theoretical framework guiding goal setting research has been offered by Locke and Latham (1990) and their principles inform Project AAMP. In addition, extensive theorizing and research conducted within the sport and exercise sciences (Weinberg, 1994; Weinberg & Weigand, 1993) justify other specific goal setting practices.

To begin, Locke and Latham predicted that goals enhance performance because they (a) focus attention on the task at hand; (b) increase effort and intensity of behavior; (c) encourage persistence even when failure occurs; and (d) promote the development of learning and/or problem-solving strategies. From their work, researchers have shown that specific and difficult goals have been linked to increased performance across a variety of tasks, populations, and time frames (Burton et al., 2001; Kyllo & Landers, 1995; Locke & Latham, 1990; Weinberg, 1994). Specific and difficult goals in an exercise setting might involve a previously sedentary individual striving to reach and maintain national guidelines for PA (Pate et al., 1995) for four consecutive weeks. Researchers in the exercise sciences have also distinguished between performance and outcome goals with the former referring to form, technique, process orientation, and attaining specific performance standards relative to previous performances; outcome goals are more product-oriented and focused on objective outcomes (Kingston & Hardy, 1997; Burton, 1989). While meeting PA guidelines is clearly an outcome goal, a performance oriented goals for this individual would be to walk on a treadmill in an increasingly progressive (e.g., faster pace, using an incline) manner 5 times per week. Finally, a general recommendation from the exercise sciences is to use a combination of short- and long-term goals (Kyllo & Landers, 1995). Short-term goals are effective because they provide more frequent evaluation of success, they are more flexible and controllable, and they focus attention less on social comparisons with others and more on one's own accomplishments (Burton et al., 2001).

Using the above theory and research as a guide, the following specific goal setting guidelines were followed in Project AAMP design: (a) the participants were encouraged to set a combination of performance and outcome goals; (b) all goals were specific and difficult; (c) all goals were measurable and timed; (d) goals were positive and focused on desired behavioral outcomes; and (e) a combination of short and long-term goals were implemented.

Peer mentors were trained extensively to deliver the educational, psychosocial and discussion elements of the goal setting intervention. Mentors were taught how to engage in discussions that promote the formation of short- and long-term goals that were both performance and outcome oriented. In addition, goal setting was addressed early in the intervention (Week 2) to allow opportunities for participants to immediately begin attempts at goal-directed behaviors. Goals set at the beginning of the intervention were regularly re-visited both formally and informally with additional focus given to setting long-term maintenance goals at the end of the intervention.

Goal-setting is a commonly employed self-regulatory strategy (Anderson et al., 2006; Bandura, 2001) in social cognitive theory. As shown in Figure 2-1 (Boxes 2 and 5), goal setting was hypothesized to increase efficacy beliefs and intrinsic motivation by providing successful performance accomplishments (effective short- and long-term goals) and fostering perceptions of autonomy (freedom to choose goals important to the individual) and competence (successful attempts at behavior change). Throughout the intervention, peer mentors encouraged participants to re-visit the goal setting process and gave praise to participants who reached behavioral milestones. Successes were shared with the group as a whole in order to foster relatedness and enhance performance accomplishment.

Mental Imagery

Mental imagery, also known as guided imagery or visualization, is a quasi-sensory experience whereby individuals recreate previous experiences, imagine future anticipated experiences, or create new experience (Hall, 2001). Mental imagery is an important part of many aspects of life including language development, enhancing motivation, learning motor skills, coping with stress, and improving sport performance (Kyllo & Landers, 1995; Weinberg et al., 1990; Weinberg, Bruya, & Jackson, 1985). Recently, researchers have also implicated mental imagery in the exercise domain (Gammage, Hall, & Rodgers, 2000; Giacobbi, Hausenblas, Fallon & Hall, 2003; Hall, 1995; Hausenblas, Hall, Rodgers, & Munroe, 1999; Munroe-Chandler & Gammage, 2005). Specifically, it has been theorized that mental imagery may be associated with increased self-efficacy and motivational processes within exercise settings (Munroe-Chandler & Gammage, 2005). Based upon social cognitive theory (Bandura, 1997), it has been proposed that imagery may increase motivation through its influence on self-efficacy and outcome expectancies (Hall, 2001). Hall suggested that as exercisers image themselves accomplishing a certain outcome, there is an increased likelihood the event will occur (outcome likelihood) and the importance of that outcome (outcome value) may be influenced. These two variables in turn lead to positive outcome expectancies, enhanced motivation to exercise, and increased frequency of exercise behavior. For instance, an individual may imagine himself exercising, completing a workout, and improving his level of fitness. These images would in turn lead to increased motivation to exercise.

It has also been proposed that imagery may influence exercise participation through its effects on self-efficacy and outcome expectations (Hall, 1995). That is, the use of imagery by exercisers may allow individuals to imagine accomplishing desirable outcomes such as improved appearance or fitness, which may increase the likelihood of continued involvement or participation. In support of this contention, evidence has revealed positive associations between exercise imagery and self-efficacy related cognitions and beliefs with regard to exercise behavior (Hausenblas et al., 1999; Rodgers & Gauvin, 1998). Additionally, individuals who are more active and participate in exercise more frequently report using a greater degree of appearance, energy, and technique imagery than less frequent exercisers (Hausenblas et al., 1999; Gammage et al., 2000).

Because most everyone engages in some form of mental imagery (Hall, 2001), and because this is an easily learned skill that is empirically supported for targeted behavioral change interventions with a variety of conditions, behaviors, and populations (Hall, Anderson, & O'Grady, 1994), this applied tool may be useful with older adults to promote exercise behavior. Mental imagery has been effectively used for the treatment of pain, depression, eating disorders, phobic disorders, and other health complaints (Sheikh, 2003). Additionally, mental imagery is a key component within Suinn's cognitive-behavioral model for the treatment of anxiety and is used widely by practitioners for the treatment of stress and behavioral disorders (Suinn, 1990, 1996).

For Project AAMP, the use of mental imagery was hypothesized to have an influence on individuals' self-efficacy expectations through effects on physiological arousal and vicarious experiences sources of efficacy information (Figure 2-1, Box 7). This process is facilitated by allowing participants to observe their peer mentors exercising within exercise settings. Peer mentors were taught to ask open-ended questions and help participants formally and informally use imagery to stimulate mental images of successfully completing exercise routines and behaviors. Formal imagery situations included guided imagery during group sessions (Sessions 6, 7, and 11) and self-directed imagery outside of group sessions. Informal imagery occurred during the sessions while discussing future goals, spontaneous discussions about exercise experiences, as well as images about exercise that took place before, during, or after exercise bouts. It was hypothesized that these images would stimulate physiological and affective responses linked to exercise behavior.

Peer Mentoring

The provision of social support in Project AAMP was accomplished by the use of physically active, same-aged peer mentors as group leaders/facilitators to create a socially supportive environment conducive to behavior change (Figure 2-1, Box 3). Theoretically, the linkage between the use of same age peers as intervention agents with elements of social cognitive theory include relatedness, verbal persuasion, and vicarious experience (Figure 2-1, Box 6). Specifically, meaningful social relationships were hypothesized to satisfy the need for relatedness while the intervention agents and other members of the exercise group engaged in verbal persuasion to encourage goal achievement strategies, adherence to exercise routines, and increased exercise frequency and intensity. Another important theoretical source of self-efficacy expectations derived from peer intervention agents is vicarious experience. By having same age active adult peers, discussing and in some cases modeling exercise behaviors and demonstrating how to use exercise machines (e.g., treadmills) and resistance training exercises, it was hypothesized that previously sedentary adults would experience increased exercise self-efficacy (Figure 2-1, Box 8).

As mentioned previously, specific guidelines for social network characteristics described by Israel (1982) as well as support types described by Berkman (1995) were implemented to effectively engage participants into group processes and the support network. First, peer mentors were trained to engage participants in open and transparent discussions regarding exercise behavior. These discussions served to progressively foster emotional closeness (i.e., intensity) and interaction (i.e., density). Moreover, all members of the group were considered equal contributors that were expected to share personal experiences and anecdotes in order to increase reciprocity in the relationships. Finally, peer mentors were carefully selected to match demographic (i.e., homogeneity) and geographic (i.e., dispersion) characteristics of the participants but this proved to be an interesting challenge throughout our study. All peer mentors met the following characteristics: (a) were 50 years and older; (b) were physically active and adequately trained to deliver the intervention; and (c) roughly matched to the demographic characteristics of the enrolled participants (e.g., race/ethnicity, socio-economic background).

Peer mentors, when possible, attempted to provide emotional, instrumental, informational, and appraisal support for participants. Peer mentors were trained to identify and encourage engagement of potential sources of support for participants. For example, peer mentors helped participants identify other individuals in their lives that may serve as support agents (e.g., family members, friends). Emotional and appraisal support were integral portions of the group process and weekly discussions. These types of support were provided through open-ended and transparent discussions throughout the intervention. For example, appraisal support was provided weekly as individuals discussed unique challenges and barriers that they faced in the past week. Instrumental support was provided in the form of a free exercise facility membership. While peer mentors were not specifically trained to provide informational or educational support, mentors were encouraged to enter into constructive conversations identifying and accessing reliable informational support from individual (e.g., family members) and community (e.g., community centers, exercise facilities, internet) resources.

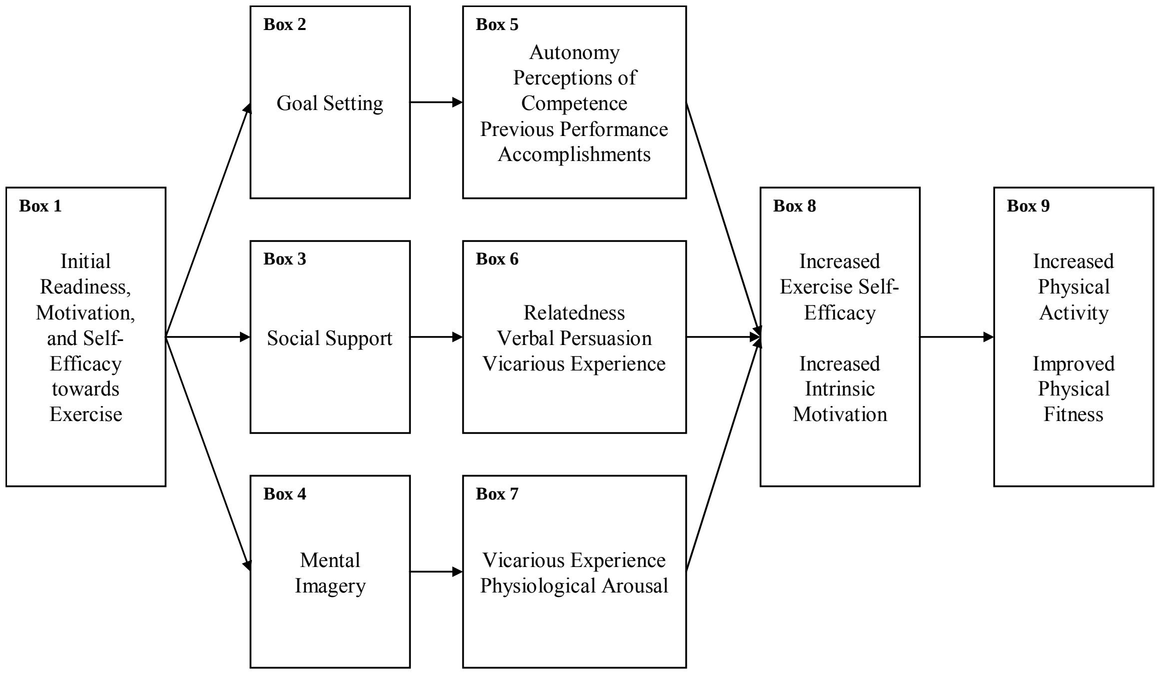


Figure 2-1. Guiding theoretical framework for intervention

CHAPTER 3
METHODS

General Design

The basic question addressed in our study was whether the Project AAMP intervention (specifically the use of peer mentors, goal setting, and mental imagery) can effectively enhance social cognitive variables (i.e., self-efficacy, self-determined behavior), which have demonstrated theoretical linkages to PA behavior and fitness outcomes, among previously sedentary adults age 50 and older. Therefore, the purposes of the study were as follows:

- **Primary purpose:** To examine the effects of Project AAMP, a multi-component 16-week PA intervention for sedentary adults 50 years of age and older, on changes in self-efficacy and intrinsic motivation toward PA.
- **Secondary purpose:** To evaluate subsequent improvement in PA behavior (i.e.; self-reported PA and pedometer count) and fitness parameters (i.e.; cardiorespiratory fitness).

To address these purposes, an experimental design was chosen where participants were randomized to one of two experimental groups: (a) an PA promotion group where subjects participated in a 16-week psycho-educational intervention tailored for older adults and focused on goal setting, mental imagery, and delivered by a same aged peer mentor; or (b) a "health hygiene" control group matched in social contact and peer leadership to the intervention group that discussed topics related to general health for older populations. Measurement of study outcomes occurred daily for behavioral measures, weekly for self-efficacy, and at baseline and posttest for self-determined behavior and the fitness parameters.

Participants

Sample

The study identified 433 individuals aged 50 and older. Figure 3-1 depicts participant flow and recruitment throughout the study period. Participants were drawn from the Gainesville/Alachua County area. Recruitment efforts included announcements in a local newspaper, the University of Florida Older Adult participant registry, and flyers for study locations (Appendices A & B) in community gathering places (e.g., grocery stores, recreation/community centers, retirement communities). To maximize outreach to diverse populations, additional recruitment strategies via several local media outlets focusing on older adults and African American elders were used such as guest columns in the Senior Times as well as active participation in local health fairs.

According to the U. S. Census Bureau (2005), approximately 72% of the Alachua County population is White, 20% are Black or African-American, 5% are Asian, and 3% are Other. Seven percent report Hispanic or Latino (of any race) descent. Recruitment strategies attempted to include members of these racial/ethnic groups at the same rate with which they are represented in the Alachua County population. Racial/ethnic distribution and other demographic information of the final sample are reported in the results section. Institutional approval was obtained for all aspects of the study protocol (#2005-U-0813).

Exclusion Criteria

In total, 160 participants were excluded from participation in the study. Exclusion criteria likely to adversely affect the safety of older adults in the PA intervention are included below along with number of participants excluded based on these criteria:

- Terminal illness with life expectancy of less than 12 months (n = 0).
- Cardiovascular disease (myocardial infarction the last year, chronic heart failure, aortic stenosis, history or cardiac arrest, pacemaker, implanted cardiac defibrillator and uncontrolled angina) (n = 4).
- History of epilepsy, head injury requiring hospitalization, or diagnosed stroke in the last year (n = 16).
- Chemotherapy or radiation treatment for cancer in the last year (n =3).
- Pulmonary disease requiring oxygen or steroid treatment (n = 4).

- Ambulation with assistive device (e.g., cane, walker, wheelchair) (*n* = 14).

Exclusion criteria for factors adversely affecting compliance with study protocols include:

- Unwillingness to be randomly assigned to one of the two experimental conditions or comply with study procedures (*n* = 0).
- Diagnosis of schizophrenia, clinical depression, bipolar disorder, or other major psychiatric illness (*n* = 10).
- Cognitively impaired (*n* = 15).
- History of medical problems, legal problems, or withdrawal symptoms associated with alcohol or drug use (*n* = 4).
- Hearing or speech impairments that make verbal communication difficult (*n* = 10).
- Prescription of heart rate attenuating medication (e.g., beta-blockers; calcium channel-blockers) for high blood pressure (*n* = 36).
- Unable to commit for the entire study period or comply with all study procedures (*n* = 4).

Exclusionary criteria and demographic information (e.g., age, marital status, education level, etc…) were collected by phone with a standardized protocol (Appendix C). Finally, all participants were required to provide a doctor's note verifying exclusionary criteria and stating they were cleared to engage in cardiovascular exercise (Appendix D).

Inclusion Criteria

The Stages of Exercise Change Questionnaire (SECQ; Marcus et al., 1992) was administered during initial phone contact to assess participants' stage of change in the PA domain (Appendix E). The SECQ contains five ordered-category items that assess change readiness along a continuum as follows: pre-contemplation, contemplation, preparation, action, and maintenance. This algorithm was used as a pre-screening tool to exclude participants already in the action and maintenance stages. PA was defined by meeting national recommendations set forth by the American College of Sports Medicine and Centers for Disease Control (Pate et al., 1995). This resulted in a sample pool that included those of primary interest – individuals in the pre-contemplation, contemplation, and preparation stages of PA behavior. Individuals who were screened and fell into the action and maintenance stages of PA were excluded from the protocol (n = 44).

Procedures

The study timeline for a single participant was divided into four phases over 20 weeks: initial screening/eligibility, baseline, intervention, and posttest (Figure 3-2). During the initial screening/eligibility phase (n = 306), participants were screened and nurse/physician permission forms were collected. Eligibility was determined and eligible persons were enrolled into the study (n = 146). Baseline appointment was scheduled during this period for eligible participants who remained interested in the study (n = 91). During the baseline phase, participants were administered the informed consent documents (Appendix F), baseline social cognitive measures, baseline cardiorespiratory fitness test, and PA was monitored daily by pedometer and self-report for one week. During this period, participants were randomized to one of the two intervention arms of the study. Randomization occurred in replicates of approximately 5 to 16 participants to ensure equal group size of 4 to 8 participants for the intervention (n = 44) and health hygiene (n = 47) groups. Program staff was blinded to group assignment during pretesting to avoid bias. Participants were blinded to their group assignment throughout pretesting and the baseline phase of measurements (until the intervention phase began) to avoid bias in levels of baseline PA and self-efficacy and to decrease initial dropout in the health hygiene control. Ten individuals failed to attend any group sessions, despite not knowing group assignment, and were therefore excluded from all analyses. The intervention phase involved 13 weekly sessions over 16 weeks with peer mentors (approximately 1 hour in length) and access to an exercise facility (during the first 12 weeks). Twelve additional individuals were lost to follow-up during the intervention phase of the trial (7 in intervention and 5 in control). Finally, during the posttest phase procedures were repeated from the baseline phase for those participants who were not lost to follow-up in the intervention (n = 34) and health hygiene (n = 35) groups.

Intervention Protocol

Table 3-2 shows the schedule of intervention topics for both the treatment and control arms. Unlimited access to the exercise facility was granted to participants in both arms of the intervention. In order to maintain internal validity, it was essential that participants in both the treatment and control conditions had identical opportunities to engage in PA behavior. Therefore, a no-contact control group was deemed inappropriate to answer the specific aims of the project. The key difference between these groups was that control group participants did not receive individualized instruction and discussion in PA-related goal setting and mental imagery. It should be noted, however, that control group participants could have been motivated to begin PA due to the general health-related information presented, social contact, self-monitoring, and provision of an exercise membership. These changes in behavior were expected to be short-lived, while such a control group design was considered necessary to localize changes in behavior specifically to intervention-specific factors. Intervention sessions were conducted by highly active, trained mentors who had successfully completed a previous iteration of the intervention and been given additional training related to goal setting, mental imagery, and the provision of support messages. Both treatment and control arms received an introduction to the research program and orientation to the fitness facility by program staff during the first week. All other meetings were conducted by the trained peer mentors. In an effort to wean participants from the group meetings and address issues related to sustainability and maintenance of PA routines, both intervention arms met only once over the final four weeks of the intervention protocol.

Treatment arm

During the first week, participants in the treatment arm met with an exercise professional at the facility of which they were enrolled. This individual provided the following: (a) orientation to the facility including familiarizing the participant will the exercise equipment; (b) introduction to facility staff and operations; and (c) completion of facility enrollment procedures. This person also implemented a major educational component of the intervention. They presented information to the participants on the benefits of regular PA tailored specifically for older adults. Information included the components of fitness including cardiorespiratory fitness, resistance training, and flexibility. This individual also taught the participant to calculate their target heart rate and work with the participant to develop a personalized plan of PA.

During the Week 2 session of the intervention, participants met with the peer mentor for the first time. The primary purpose of this session was to begin to develop trust and rapport between the participants and the mentor. Mentors were trained to ask open-ended questions and participants were invited to share information about their physical activity history during this session.

The sessions during Week 3 through Week 10 were semi-structured in nature, focusing on various components of behavior change including creating an PA support system, goal setting, mental imagery, and explorations of barriers to PA. These components were delivered within the context of a mentoring relationship, relying upon a combination of supportive questions, statements, discussions, and education. Readings were assigned that were designed to inform the participants of the benefits of PA and the tenets of mental imagery and goal setting. Weeks 3, 6, and 7 had a specific educational focus that taught the tenets of goal setting and mental imagery.

The final sessions between Week 10 and Week 16 focused on sustainability and maintenance of PA behavior. Specifically, the main emphases for these sessions were to wean participants from the peer mentoring relationship and the group-based intervention. As part of this process, the participants were educated about ways to PA and maintain an active lifestyle at home. As such, the participants were given specific homework assignments related to setting goals for specific, measurable, and quantifiable home-based PA behaviors, outcomes, and routines. Participants were given the opportunity to practice these sustainability skills after Week 12 when the exercise facility membership was withdrawn. Participants discussed the challenges and barriers of maintenance during Week 14, the final intervention session.

Control arm

The purpose of the control arm of the intervention was to control for potential social contact effects. Therefore, these sessions were also delivered by peer mentors. Discussion topics centered on basic health hygiene and were broad-ranging, geriatrically-tailored topics selected from National Institute's of Health senior health topical guide (http://nihseniorhealth.gov; developed by the National Institute on Aging and National Library of Medicine, 2004). Homework assignments, discussion questions, and appropriate praise and reinforcement were elicited by the peer mentors in a similar framework as the treatment arm. Peer mentors were selected from a similar pool of community volunteers and appropriate training and quality control took place prior to and during the study.

Ecological Validity

Careful attention was given to design recommendations set forth by the RE-AIM framework (Reach, Efficacy, Adoption, Implementation, Maintenance) described by Glasgow et al. (1999). The RE-AIM framework was established to guide the evaluation of public health interventions and clinical trials and to improve the ecological validity and impact of health behavior interventions. Some of the unique elements of Project AAMP address these factors and are outlined below.

Peer mentors

First, peer mentors were selected to be used throughout the intervention instead of highly-educated behavioral counselors in order to meet the "adoption" recommendation from RE-AIM (Glasgow et al., 1999). Peer mentors, if effective, offer a relatively inexpensive alternative to health promotion compared to research personnel and highly-trained counselors. This increases the potential for future adoption of Project AAMP in a variety of contexts and settings where resources may be insufficient (e.g., community centers, YMCA's). Although these individuals may possess varying levels of knowledge about PA promotion and behavior change, all mentors were selected based on their successful adoption of a consistent and long-term personal PA regime as well as participation in a previous iteration of Project AAMP. The primary purpose of these mentors were to: (a) provide affirming social support messages; (b) engage participants in in-depth discussions about PA behaviors and barriers; and (c) introduce and explore with participants the psychological skills of mental imagery and goal setting. In other words, one of the major goals of Project AAMP was to apply the guiding theoretical model (Figure 2-1) to non-research personnel. Additionally, using intervention agents matched in age and experience to participants enhances the social integration of the peer mentors to provide the social support and encouragement needed to promote positive behavior change in the PA domain. Characteristics of the mentors that were used are discussed in detail in the results section.

Quality control and monitoring

Quality control measures were taken to address the "implementation" recommendation from the RE-AIM framework. Implementation refers to the extent to which an intervention is delivered in the manner in which it was intended (Glasgow et al., 1999). All intervention sessions in treatment and control arms were video- or audio-recorded and monitored by the research team for content, proper delivery of psycho-educational materials, and potential digression from the specified content. Quality control checklists and scoring procedures were used to give the peer mentors, in both the treatment (Appendix G) and control (Appendix H) conditions, feedback about ways to improve their efforts to facilitate group meetings. Tailored quality control feedback was given for the education sessions where the goal setting and mental imagery components are implemented. Program staff met weekly with the mentor after each of the first five sessions to give feedback and coaching. Additional training and feedback was provided as needed throughout the intervention. All feedback was recorded and discussed with the peer mentor prior to the next weekly group session. Monitoring of group sessions was maintained by program staff throughout the protocol.

Sustainability

Another important design feature of Project AAMP was that all participants were given a 12-week free membership to one of two exercise facilities: (a) a staff and faculty gym sponsored by the College of Health and Human Performance at the University of Florida; or (b) a gym facility at a suburban church in west Gainesville, Florida. The participants did not have access to these facilities after Week 12 of the intervention, however social cognitive, PA behavior, and fitness measurements were assessed after Week 12 and again at the end of the 16-week study protocol. The rationale for withdrawing access to the facility at this time was to determine the extent to which the participants sustain PA when not offered membership to an exercise facility. This was an effort to meet Glasgow and colleagues' "maintenance" recommendation focused on the extent to which the target health behavior is maintained over time (Glasgow et al., 1999). Similarly, peer mentors were not specifically relied upon to give recommendations or impart knowledge of specific PA routines or plans; rather, mentors encouraged, reinforced, and supported the participants' efforts to seek out information about PA from credible outside sources (e.g., trained facility staff, ACSM website). Participants were encouraged to access available resources at the exercise facilities and trained staff persons with questions concerning how to properly use exercise equipment. Such efforts were intended to mimic the challenges posed by adults within the PA domain.

Measures

Study measures were selected to specifically address the primary and secondary purposes of the study and the guiding theoretical framework (Figure 2-1). To address the primary purpose of the study (i.e.; the impact of the intervention on self-efficacy and intrinsic motivation toward PA), a series of social cognitive measures were used to assess changes across the intervention. To address the secondary purpose of the study (i.e., the subsequent changes in physical activity behavior and fitness outcomes), both self-report and objective measures of behavior and cardiorespiratory fitness were administered. Additionally, measures of depression, body mass index (BMI), and blood pressure were measured to explore potential covariates of intervention adoption and behavioral change. Please see Table 3-2 for a detailed schedule of the assessment timeline.

Social Cognitive Measures

Measures of self-efficacy were administered weekly throughout the intervention. The repeated testing schedule was used to address short-term sustainability and temporality of the intervention. In addition, this repeated assessment allowed for formal testing of the effects of the withdrawal of the exercise facility membership and the reduced contact with the peer mentors and group environment during Week 12. It was not possible to administer the measure of self-determined behavior each week due to its length. This measure was administered only at pre- and post-test. All social cognitive measures were given within the same testing period and computer-administered to increase standardization.

Barriers self-efficacy

The BSE (McAuley, 1992; Appendix I) is a 13-item measure that taps participant's perceptions of confidence to maintain regular PA (three times per week) despite commonly identified barriers. This scale was developed using attributional analysis to identify commonly cited barriers that impede PA maintenance (McAuley, Poag, Gleason, & Wraith, 1990). McAuley and colleagues (e.g., Duncan & McAuley, 1993; McAuley, 1992, 1993; McAuley, Courneya, Rudolph, & Lox, 1994) then used this instrument with numerous samples and observed that bad weather, time management, lack of interest/boredom, pain and discomfort, location/accessibility, personal stress, and exercising alone were the most commonly cited barriers to PA. These researchers then integrated theoretical and measurement considerations espoused by Bandura (1986, 1997) to create this 13-item scale. Respondents indicate their confidence on a scale of 0% (*no confidence at all*) to 100% (*completely confident*); their responses are summed and divided by the total number of items to provide a score that can range between 0% to 100% with higher scores indicating greater self-efficacy to overcome barriers to PA. The BSE has been shown to be predictive of PA behavior and contain adequate internal consistency across a number of diverse research contexts and populations, including use with older adults (McAuley et al., 2005). With the current sample, the internal consistency of this measure was excellent ($\alpha = .95$).

Exercise self-efficacy

The exercise self-efficacy measure (EXSE; McAuley, 1993b; Appendix J) is an 8-item measure that taps confidence to maintain exercise (three times per week at moderate intensity for 40 minutes) consecutively for a progression from 1 week to 8 weeks. Respondents indicate their confidence on a scale of 0% (*no confidence at all*) to 100% (*completely confident*); their responses are summed and divided by the total number of items to provide a score that can range between 0% to 100% with higher scores indicating greater self-efficacy toward exercise. This measure has demonstrated excellent reliability across a number of studies (αs > .90) and has been used widely with older populations (Blissmer & McAuley, 2002; McAuley et al., 2003). With the current sample, the internal consistency of this measure was also excellent (α = .99).

The BSE was combined with the EXSE measure to form a composite self-efficacy variable (SE) to reflect overall self-efficacy toward exercise behavior. This composite was formed to address the first study purpose. This composite technique was used due to high correlations among the measures across all timepoints (.66 to .85, *p's* < .001). The composite variable was calculated by transforming scale scores into z-scores and summing across the two measures.

Self-determined behavior

The Exercise Motivation Scale (EMS; Li, 1999; Appendix K) is a 31-item measure of exercise motivation designed to assess motivational tendencies in the exercise context. It was developed based upon Deci and Ryan's (1985) theorizing about the nature of the motivation construct. As such, the EMS consists of eight subscales: amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation to learn, intrinsic motivation to accomplish tasks, intrinsic motivation to experience sensations. The EMS has shown adequate factorial evidence to support its 8-factor structure, but can also be weighted across the 8-subscales to form a single indicator of self-determined behavior along the self-determination continuum (Vallerand & Rousseau, 2001). The EMS recently demonstrated good internal consistency reliability estimates on its subscales (.75 to .90) and evidence of divergent (i.e., social desirability) and convergent validity (i.e., stages of change) in a sample of adults (Wininger, 2007). With the current sample, the internal consistencies of the measure subscales were adequate (α's > .75), with the exception of introjected regulation, which demonstrated poor internal consistency (α = .49). The overall measure internal consistency was very good (α = .85).

Physical Activity Measures

Both a self-report and objective measure of PA was selected to assess changes in free-living movement throughout the intervention as well as reports of structured exercise bouts. It was expected that these measures would tap aspects of PA uniquely and complement one another to form a more comprehensive measure of changes in activity level. The measures were assessed daily and averaged across week and phases of the intervention.

Self-reported physical activity

The Leisure-Time Exercise Questionnaire (LTEQ) is a three-item scale that asks participants to rate how often they engaged in mild, moderate, and strenuous leisure-time exercise (Godin, Jobin, Bouilon, 1986; Godin & Shepherd, 1985). The LTEQ allows researchers to calculate a total MET estimation (MET-mins/wk) by weighting the intensity level and summing for a total score using the following formula: 3(mild), +5(moderate), and +9(strenuous). Although typically used as a 7-day recall of PA behavior, in the present study the LTEQ was used as a daily measure and summed across the week to reduce recall bias. Recent literature has chosen to not include mild minutes in calculations of PA (Karvinen et al., 2007) given that moderate or vigorous activity is needed for health benefits (Pate et al., 1995). Minutes of moderate-to-vigorous physical activity (MVPA) were computed from the LTEQ by adding the number of moderate and strenuous bouts reported and multiplying by 20. This value was then summed across the week to represent minutes of MVPA per week. Both the MET estimate (MET-mins/wk) and minutes of MVPA were used as dependent variables for self-reported PA. Minutes of MVPA was also used to categorize individuals into three baseline groups based upon PA public health recommendations for older adults: (a) those who reported ≥150 minutes of MVPA met national guidelines; (b) those who accumulated some but < 150 minutes of MVPA were considered insufficiently active; and (c) those who reported no moderate or vigorous PA were considered inactive (Nelson et al., 2007). Previous research has supported the validity and reliability of LTEQ score interpretations with adult (Godin, Jobin, & Bouilon, 1986; Jacobs, Ainsworth, Hartman, & Leon, 1993) and older adult populations (Karvinen et al., 2007; Ruppar & Schneider, 2007). Please see Appendix L for the daily record where LTEQ and pedometer data were collected.

Pedometer

Participants were asked to wear the AE 120 pedometer (Yamax SW200 engine). This pedometer is a small device worn on the hip to measure activity level by counting steps (works by a horizontal, spring-suspended lever arm, which moves up and down with vertical accelerations of the hip). Participants wore the pedometer during the entire waking day, and were asked to register the final number of steps in a log at wake time regarding the previous day's activity. They were instructed, after recording, to reset the number of steps to zero before the next day. Convergent validity of pedometers has demonstrated correlations with accelerometers, observation, energy expenditure, and self-report measures of PA, while divergent validity is available for sedentary behavior (see Tudor-Locke, Williams, Reis, & Pluto, 2002 for a review). Tudor-Locke et al. (2005) examined the number of days needed to estimate mean steps/day counts in adults and found that a minimum of three days (preferably with the inclusion of Sunday) is needed for accurate mean step counts. The current protocol collected continuous use data throughout the intervention and averaged over the week and phase to estimate total steps/day.

Physiological Measures

Cardiorespiratory fitness

A submaximal graded exercise test employing a modified Balke treadmill protocol (ACSM, 2000) with continuous heart rate monitoring was used to obtain estimations of cardiorespiratory fitness (VO_2 max). The modified Balke is a treadmill protocol that involves increases in slope while speed is kept at a constant. Participants' heart rate was monitored throughout the protocol and for two minutes prior to testing. Within the first minute of testing participants were asked to find a comfortable walking pace on the treadmill. After the first minute, treadmill grade increased 1% and continued to increase at 90-second intervals until heart rate reached 85% of age-approximated maximal heart rate. The following equation was used to estimate cardiorespiratory fitness: $VO_2max = (0.1 \times speed) + (1.8 \times Final\ Grade \times Speed) + 3.5$. Please see Appendix M for the data collection tool that was used. Permission from the participant's physician was granted prior to administration. The measure of cardiorespiratory fitness was assessed during the pretest week prior to the intervention and again at posttest concurrently with the administration of the social cognitive measures. It should be noted that such an approach is a less accurate method of ascertaining cardiorespiratory fitness than employing a maximal graded exercise stress test; however, for a population of sedentary older adults it is considered safe and adequate and has been used elsewhere (McAuley, 1992).

Body mass index

Weight and height were collected from participants at baseline and posttest. Weight was measured to the nearest kilogram using a regularly calibrated balance beam scale. Height was measured by self-report. Body mass index (BMI) was calculated using the following equation: weight (kg) / height^2 (m^2). The following guidelines have been published for major classification: underweight (<18.5), normal (18.5 to 25), overweight (25 to 30), and obese (>30) (WHO, 2005). BMI was used to characterize the sample at baseline and as an exploratory predictor of intervention-related outcomes.

Blood pressure

Automated non-invasive blood pressure was assessed using the Omron HEM-711AC blood pressure monitor weekly throughout the intervention. Systolic, diastolic, and pulse measurements were recorded. Automated measurement was used to standardize the procedure. Measures at baseline and post-test were taken twice. For the first measurement, participants were asked to sit upright in a chair with his or her feet flat on the floor and without limbs crossed for five minutes. Participants were asked to repeat this posture for two additional minutes after which the second measurement was taken. These values were averaged. Blood pressure was used to characterize the sample at baseline and was not explored as an outcome of the study.

Depression Measures

Geriatric Depression Scale

The Geriatric Depression Scale (GDS; Yesavage et al., 1983) was administered to assess depressive symptomatology. The GDS is a 30-item self-report scale of yes/no questions about symptoms of depression (e.g., Do you feel that your life is empty?). One point was given for each depressive symptom endorsed. This measure has been shown to be a reliable and valid measure of depressive mood in adults 65 years and older.

Beck Depression Inventory

The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) was also administered to assess depressive symptomatology. The BDI-II consists of 21 groups of statements related to cognitive and somatic depression symptoms (e.g., sadness, changes in sleeping pattern). Individuals select one of four statements that describes the severity of their symptoms over the past two weeks (e.g., 0 = I do not feel sad, 1 = I feel sad much of the time, 2 = I am sad all the time, 3 = I am so sad or unhappy that I can’t stand it). The scale has a clinical range of 14 to 19 points for mild depression symptoms and 20 to 28 for moderate depression symptoms.

Measures of depression were administered at baseline and posttest timepoints. Two measures of depression were selected to capture both broad-level and age-specific dimensions of depressive symptomatology. Both measures were used to characterize the sample at baseline. The BDI-II was chosen as an exploratory predictor of intervention-related outcomes given its established reliability and validity with adult samples above and below 65 years of age (Beck et al., 1996; Brink, Yesavage, Lum, Heersema, Adey, & Rose, 1982).

Sample Size and Power Considerations

Effect size estimates are available for three of the primary outcomes of the current protocol: exercise self-efficacy (BSE and EXSE), self-reported exercise behavior (LTEQ), and cardiorespiratory fitness (VO_2max). Given that self-efficacy and other social cognitive constructs are the primary outcomes of the study, the current protocol relied on these sample estimates to power the present protocol. Additional power analyses are provided here to estimate expected effect sizes in other study outcomes to address the secondary purpose of this paper (i.e., subsequent changes in PA behavior and cardiorespiratory fitness).

Sample size estimates for BSE were calculated based upon the results of a previous pilot study that implemented a similar theoretical framework as proposed here on a sample of 24 individuals. Our intervention differed in the following ways: (a) it was delivered by trained graduate assistants (not peer mentors); (b) it did not include a control group; and (c) it was abbreviated in length (8 weeks opposed to 16 weeks). Changes in BSE immediately following the reduced 8-week intervention and a 12-week follow-up were impressive. Single-group repeated measures effect sizes were estimated for BSE at 0.78 and a power curve indicates a sample size of 21 participants needed to reach statistical significance with desirable power (0.80) and alpha (0.05). Figure 3-3 displays this power curve graphically.

While the previous study was similar in the theoretical nature and intensity of the current intervention, it was limited in that it did not include a control group (an important factor given the expected improvements in our health hygiene control group) and did not provide estimates for EXSE. To address these limitations, an additional power analysis was conducted based upon means and standard deviations reported by McAuley et al. (1999). McAuley and colleagues conducted a 6-month, randomized controlled trial examining change trajectories in EXSE in two experimental groups of adults 55 and over ($N = 174$): (a) stretching/toning; and (b) walking. Both groups improved EXSE scores over the course of the 6 months; however, the walking group exhibited significantly greater improvements compared to the stretching/toning group. The mixed between-within repeated measures effect size was estimated for EXSE at 0.38 and a power curve indicated a sample size of 60 participants (30/cell) needed to reach statistical significance with desirable power (0.80) and alpha (0.05). Figure 3-4 displays this power curve graphically. It should be noted that the stretching/toning group in the McAuley et al. (1999) study experienced significant gains in EXSE across the intervention. Within the current study, the control group participants could have been motivated to begin PA due to the general health-related information presented, social contact, and provision of an exercise membership. Therefore, some improvement in this group is expected. This power analysis accounts for this improvement and calculates a sample size to produce a significant effect in the intervention group above and beyond the expected gains in the control group.

The sample size estimates for self-reported PA behavior were derived from improvements in LTEQ scores observed from the same 8-week, intervention-group only pilot study reported earlier. Changes in LTEQ immediately following the reduced 8-week intervention and a 12-week follow-up were impressive. Single-group repeated measures effect sizes were estimated for BSE at 1.28 and a power curve indicated a sample size of 7 participants needed to reach statistical significance with desirable power (0.80) and alpha (0.05). Figure 3-5 displays this power curve graphically.

Finally, for cardiorespiratory fitness (VO_2max), means and standard deviations were reported by Kramer, Hahn, and McAuley (2001) and small to moderate improvements were achieved ($ES = 0.34$) for a 6-month cardiorespiratory focused intervention. Based upon this effect size and conventionally desirable power (0.80) and alpha (0.05), statistical significance is expected with a total of 70 participants (35/cell). It should be noted that this effect size estimate and subsequent power analysis should be interpreted with caution given that the intervention was 6-months in length (2 months longer than the current intervention) and the specific focus of the physical training was exclusively cardiovascular in nature. This is not, however, viewed as the primary outcome of the intervention and more appropriate effect size estimates will be used for future grant proposals.

Data Analysis

Frequencies, means, and standard deviations were calculated on all demographic, social cognitive, behavioral, and physiological measurements to describe participant characteristics at baseline. Independent samples t-tests were conducted to identify predictors of dropout or incomplete data. Alpha criterion was set at $p < .05$, with marginal values reported up to $p < .10$. All statistical procedures were conducted using SPSS 15.0 (SPSS, 2006).

Multilevel Models for Change

Multilevel models for change (Singer & Willett, 2003) were used to examine changes in self-efficacy (a BSE and EXSE composite), self-reported PA (MET estimation and minutes of

MVPA separately), and pedometer steps. These models were used to address dependent variables in which repeated assessments occurred. Data was aggregated across five study phases to tap unique aspects of behavioral adoption: week 0 (baseline), weeks 1 to 4 (initiation), weeks 5 to 8 (maintenance), weeks 9 to 12 (maintenance), and weeks 13 to 16 (sustainability). All analyses were conducted separately using the aggregated study phases and treating time in weeks as a continuous predictor. Model estimates were similar in both models for all dependent variables, and so the more parsimonious treatment of time (aggregated phases) are presented and discussed here. The fundamental question addressed in these analyses was whether group assignment moderated within- and between-person changes in self-efficacy and PA behavior. Because group attendance, site of the intervention, and group mentor were likely to affect protocol adherence, these variables were included as model covariates to control for these effects. Group mentor was controlled for using a series of six dichotomized variables (i.e., dummy-coding procedure). Stepwise, nested model testing procedures included the following:

- The unconditional means model was performed to assess levels of within- and between-person variability in the study variables.

- The unconditional growth model was tested with fixed and random effects of multiple polynomial specifications of time (e.g., linear, quadratic, cubic) to determine the best fit to the data.

- The main effects conditional growth model was tested with the addition of group assignment and the model covariates to examine level differences (initial status) in the dependent variable.

- The final interactions conditional growth model was tested where model covariates were examined for their moderating effects on the time trend. This final step addressed both primary and secondary purposes of this investigation; whether the intervention group displayed greater improvements in self-efficacy, self-reported PA, and pedometer steps compared to the health hygiene control.

- The -2 log likelihood (-2LL), Akaike's Information Criterion (AIC), and Bayesian Information Criterion (BIC) were used to determine model goodness-of-fit at each level of model testing. Chi-square difference tests were conducted to formally assess model improvement.

The rationale for using multilevel models for change is the simultaneous modeling of within-person and between-person change in the study outcomes. One fundamental characteristic of PA behavior is between-person variability, at daily, weekly, and seasonal levels of analysis. By accounting for these individual fluctuations we were able to produce more precise model-based population estimates (Singer & Willett, 2003).

Repeated Measures Analyses of Variance

Repeated measures analyses of variance (R-ANOVA) were conducted to assess changes from baseline to posttest in self-determined exercise behavior and cardiorespiratory fitness (VO^2max). The fundamental question addressed here was whether group assignment significantly moderated improvements in the dependent variables such that the intervention group improved more than the health hygiene control group. Group attendance, site of the intervention, and group mentor were included as model covariates to control for protocol adherence. The rationale for using R-ANOVA was that only two timepoints of measurement were included for these analyses. While multilevel models can accommodate baseline-posttest data, intrinsic motivation and cardiorespiratory fitness were considered relatively stable measures. Modeling within-person fluctuations in these measures were not considered vital in addressing the study purposes.

Exploratory Predictors

Finally, exploratory analyses were performed for all dependent variables using the analytical approaches discussed above. The analyses were conducted using baseline predictors that were statistically associated with dropout status (BMI, depression) or where theoretical support existed for examining the relationship (gender, age, baseline VO^2max) (Mazzeo et al., 1998). Because these relationships were viewed as exploratory, they were computed only after controlling for the planned analyses and are discussed separately.

Missing Data Handling

The percentage of missing data was 19.9% for the self-efficacy composite, 6.5% for the MET estimation and minutes of MVPA, and 8.5% for the pedometer steps. Missing data clustered toward the end of the intervention when group meetings were less regular. To accommodate missing data in the multilevel models for change, full-information maximum likelihood estimation (FIML) was used as part of the SPSS 15.0 computer program (SPSS, 2006). FIML estimation has been shown to be more appropriate when simultaneously assessing fixed and random effects and performing nested model tests (Singer & Willett, 2003). For the current study, FIML estimation allowed the inclusion of partial data from participants who dropped out of the study (n = 12) as well as the estimation of daily or weekly data that was missing from completed participants. All model tests were replicated with the smaller sample of completers (n = 69) and were found to yield similar model estimates compared to the total sample (N = 81), but with less statistical power. FIML estimation is not available for R-ANOVA and therefore traditional listwise deletion procedures were used and the analyses were conducted with the sample of completers (n = 69).

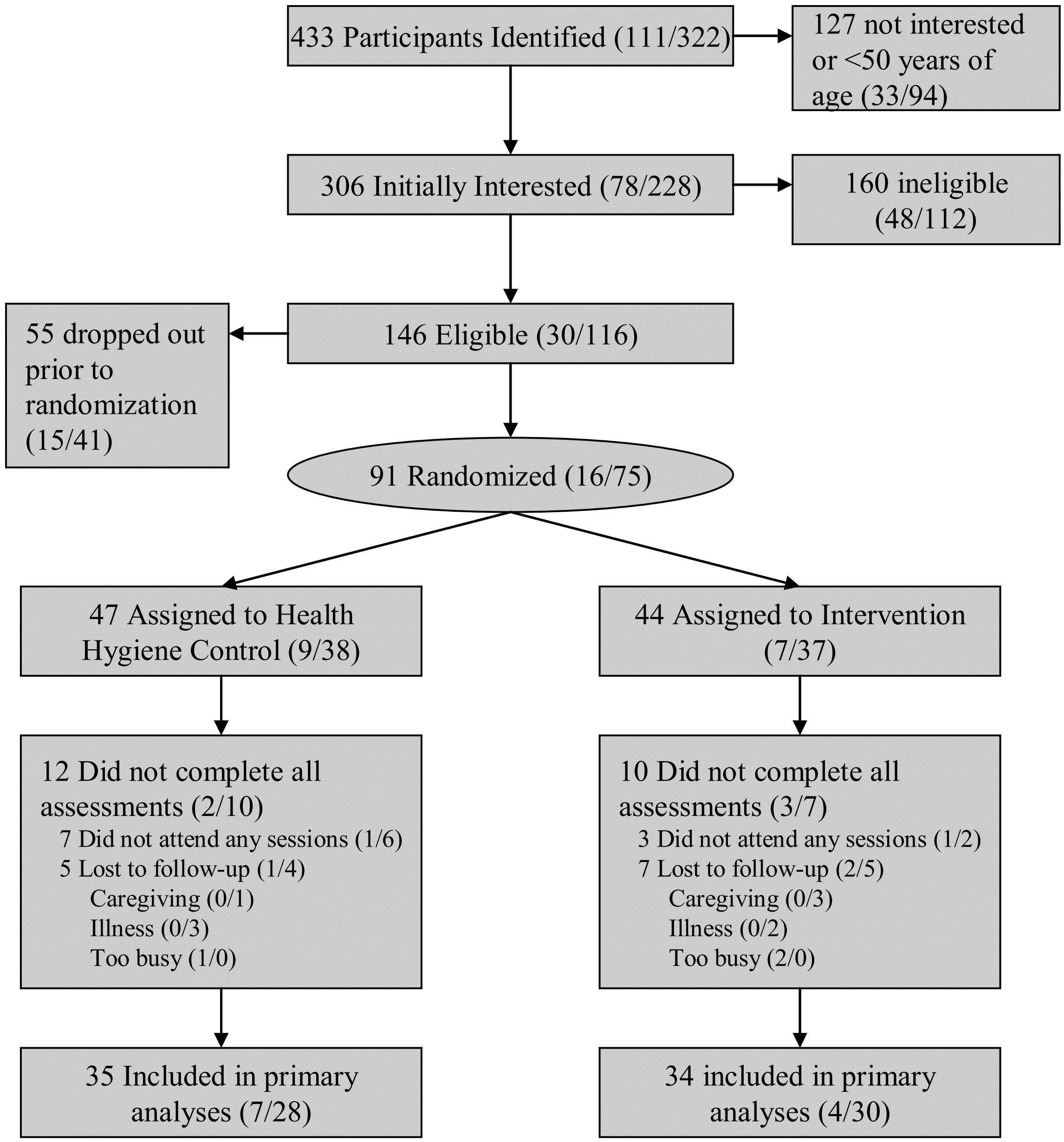


Figure 3-1. Screening/baseline, randomization, and follow-up. Note. Data are reported as number of men/women.

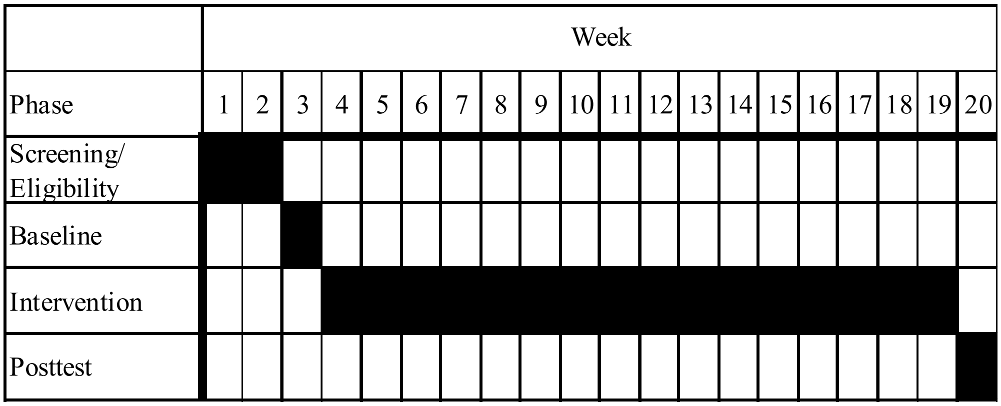


Figure 3-2. Study timeline.

Table 3-1. Concurrent topical schedules for intervention groups.

Week	Intervention	Health Hygiene Control
1	Introduction to program and orientation to fitness facility	Introduction to program and orientation to fitness facility
2	Getting to Know You Goal Setting Part I	Exercise
3	Goal Setting Part II	Osteoporosis
4	Defining Exercise Behavior	Alzheimer's Disease
5	Barriers to Exercise	Cancer Screening
6	Mental Imagery I	Hearing Loss
7	Mental Imagery II Progress toward Stated Goals	Arthritis
8	Getting Good at Exercise	Vision Loss
9	Revisiting Barriers and Goals	Sleep
10	Exercise Behavior and Accomplishments	Balance Problems
11	Sustainability: Continuing Progress and Maintaining Success	Nutrition
12	Setting Maintenance Goals (Exercise facility membership ends)	COPD/Heart Failure (Exercise facility membership ends)
13	*No meeting*	*No meeting*
14	Sharing Future Goals and Social	Conclusion and Social
15	*No meeting*	*No meeting*
16	*No meeting*	*No meeting*

Note. In the event of unavoidable session cancellations (e.g., observed holidays), session content was adjusted over subsequent weeks to maintain a consistent 16-week intervention length.

Table 3-2. Outline of assessment plan

Measure Type	Daily	Weekly	BL/Posttest
Social cognitive		BSE EXSE	EMS
Physical activity	LTEQ Pedometer		
Physiological			VO2max BMI Blood pressure
Depression			GDS BDI-II

Note. BL = baseline; BSE = Barriers Self-efficacy; EXSE = Exercise Self-efficacy; EMS = Exercise Motivation Scale; LTEQ = Leisure-time Exercise Questinnaire; BMI = body mass index; GDS = Geriatric Depression Scale; BDI-II = Beck Depression Inventory-II.

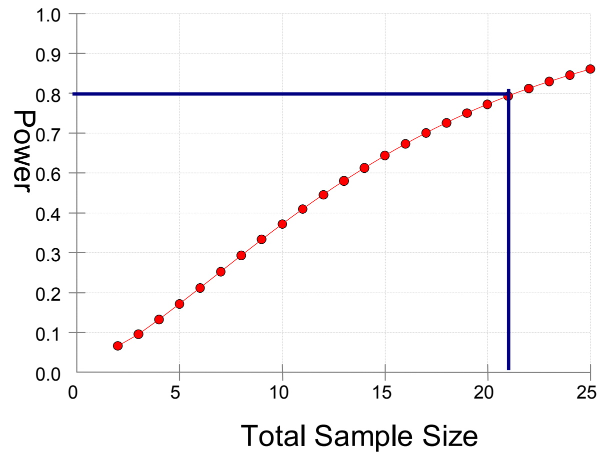


Figure 3-3. Power curve for barriers self-efficacy in an eight-week, intervention group only physical activity intervention.

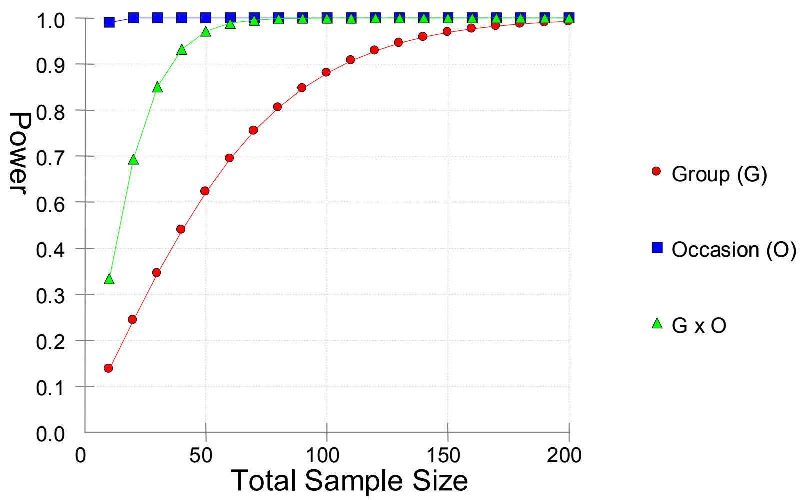


Figure 3-4. Power curve for EXSE in a mixed-between ANOVA design across a six-month physical activity intervention.

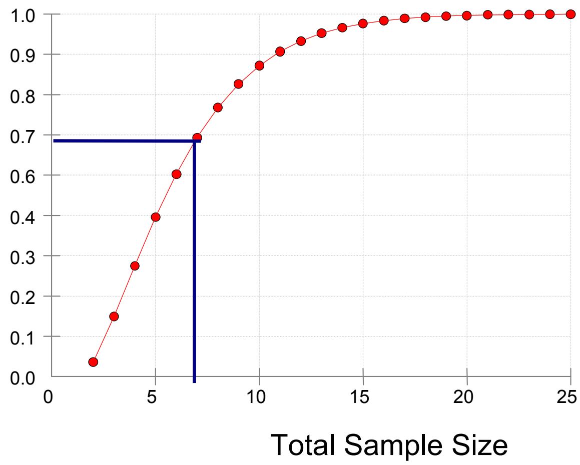


Figure 3-5. Power curve for self-reported physical activity in an 8-week, intervention-group only physical activity intervention.

CHAPTER 4
RESULTS

Sample Characteristics

Demographic Information

Sixty-nine participants completed baseline and posttest assessments. Baseline demographic characteristics were similar in the randomized groups (Table 4-1). Mean age was approximately 63 to 64 years of age, with a slight majority of participants being 65 years or older. More than half of the sample was married, with progressively fewer numbers of participants divorced, widowed, or never married respectively. The sample was primarily female, white, college-educated, and of non-Hispanic descent. By design, all participants were considered physically inactive (Pate et al., 1995), were 50 years or older, and were free of disease or disability preventing PA participation or study protocol compliance.

Study Variables

Baseline measurements of study variables were relatively similar in the randomized groups. Psychosocial (Table 4-2), physiological (Table 4-3), and PA (Table 4-4) measures are displayed as a function of randomized group.

The intervention group displayed significantly greater EXSE scores at baseline compared to the health hygiene control (t (78) = -2.45, p = .017) (Table 4-2). BSE scores at baseline trended in this direction, but were not significant (t (78) = -1.31, p = .194). The self-efficacy composite score, formed by combining the BSE and EXSE measures in a z-metric, was also significantly higher in the intervention group (t (78) = -2.15, p = .035). Self-determined PA behavior, measured by the EMS, did not display significant differences between groups. Both measures of depression were consistent in their indications of a sample with minimal depressive symptomatology (Beck et al., 1996; Brink, Yesavage, Lum, Heersema, Adey, & Rose, 1982).

Measurement of cardiorespiratory fitness (VO^2max) indicated the sample was "untrained" based upon age and gender classifications discussed by the American College of Sports Medicine (2000) (Table 4-3). BMI measurement indicated the sample was moderately "overweight" based upon published guidelines (WHO, 2005). Mean blood pressure indicated that the sample was primarily prehypertensive and hypertensive (Chobanian et al., 2003).

PA levels were characteristic of an inactive sample (Table 4-4). Individuals reported on average 65 minutes of MVPA in the baseline week. Few individuals reported meeting PA recommendations during the baseline week of observation, with most reporting insufficient levels of activity, and some reported no PA. As can be seen by the MET estimation, most reported PA was in the mild or moderate range during this initial week. Daily pedometer steps indicated a low active sample based upon published guidelines (Tudor-Locke, 2005).

Group attendance was tracked to assess adherence to the study protocol. Thirteen of the 16 sessions contained intervention-related material delivered by the peer mentors. Sessions 13, 15, and 16 were testing only and were therefore not included in attendance tracking. Study completers attended 10.75 (SD = 1.87) out of 13 possible sessions. No differences in attendance were present between intervention and health hygiene control groups. Group attendance was included as a covariate in the primary and secondary analyses to control for protocol adherence.

Attrition

Overall, 85% of participants (83% in intervention and 87% in health hygiene control) completed baseline and post-test assessments, with a total of 12 individuals who were lost to follow-up. Analyses were conducted to compare demographic and baseline assessments of study variables among study completers and those who dropped out. No demographic variables were significantly different (Table 4-5). Among baseline study variables, the GDS (t (78) = -2.211, p = .038), BDI-II (t (78) = -2.25, p = .027), and BMI (t (72) = -2.67, p = .009) were found to be significantly lower for study completers compared to those who dropped out (Table 4-6). Post hoc exploration indicated that BMI difference was due to a single extreme value (BMI = 47.80), who reported attrition due to caregiving responsibilities. The elimination of this value from the analysis yielded a non significant BMI difference. Given the statistical associations of these variables to protocol adherence, these variables were used in exploratory analyses as predictors of intervention-related outcomes.

The small sample size precluded analyses of differential dropout by group assignment. Post-hoc reasons provided by the participants illustrated that caregiving responsibilities, injury or illness unassociated with the study protocol, and busyness were the reasons reported for dropout (see Figure 3-1). Caregiving and injury were more common among women while busyness was reported exclusively by the men who were lost to follow-up. The distribution of these reasons across intervention and health hygiene control groups appeared equal.

Study Replicates and Mentors

A total of eight study replicates were completed. One replicate consisted of concurrently held intervention and health hygiene control groups. Site of the intervention was balanced by replicate – four replicates at the University facility and four replicates at the community church. Replicate size ranged from 5 to 14 participants, with group size ranging from 2 to 7. Table 4-7 contains descriptions of group assignment by gender, retention, and mentor characteristics.

In total, 7 mentors completed the 8 replicates (16 total groups). Mentors, on average, were 67.29 ± 4.19 years of age (range = 61 to 72), had 18.29 ± 1.80 years of education (Master's degree equivalent), and completed 2.29 ± 1.38 groups. Although small sample sizes among groups based on mentor made statistical comparisons difficult, cursory observations indicated that differences between mentors existed in dropout rate and baseline levels of PA. Mentor and site of the intervention were controlled for in the primary and secondary analyses to account for these differences.

Tests of Normal Distribution

Visual inspection of the repeated measures dependent variables suggested the presence of skewness and kurtosis in the data. Formal tests of normal distribution confirmed significant skewness and kurtosis that violated the assumption of normal distribution for parametric tests (Table 4-8). Positive skewness was present in the PA variables and negative skewness was present in the self-efficacy composite score. Positive kurtosis was present in the self-report measures of PA and mild negative kurtosis was present in the pedometer counts. The Kolmogorov-Smirnov test suggested, for all dependent variables, significant departures from normal distribution for the raw values. To adjust for these violations of normality, square-root and loglinear transformations of the data were conducted. Square-root transformations appeared to provide the greatest improvements in skewness and kurtosis and these data transformations are presented alongside the raw estimates in Figure 4-1. The square-root transformations yielded marked improvements in the formal tests for skewness and kurtosis for the PA variables, but no improvements in the self-efficacy composite score were observed. It should be noted that the self-efficacy composite score had previously undergone transformations when combining BSE and EXSE scores in a *z*-metric that likely improved normal distribution diagnostics. Evidence of significant departures from normality persisted even after these transformations; however, visual inspection of the square-root transformed descriptive data and Q-Q plots compared to the raw values (Figure 4-1) indicated improvements that approximated a normal distribution for the PA variables, but not the self-efficacy composite. The square-root transformed data was consequently used in the secondary analyses for PA changes, while the raw self-efficacy composite score was used in the primary analysis of self-efficacy changes.

Primary Analyses: Social Cognitive Change

The primary question addressed was whether the 16-week PA intervention resulted in significantly greater social cognitive changes in the intervention group compared to the health hygiene control group. This was addressed at the weekly level through repeated assessment of BSE and EXSE formed into a self-efficacy composite measure. At the pre-post level, self-determined behavior was assessed with the self-determined index score of the EMS. Table 4-9 displays correlations among the social cognitive dependent variables and the exploratory predictors at baseline.

Self-Efficacy

A multilevel model for change (Singer & Willett, 2003) was used to assess within- and between-person changes in the composite self-efficacy scores across the 16-week intervention (Table 4-9). The fundamental question addressed was whether group assignment moderated within- and between-person changes in self-efficacy. The self-efficacy composite score was collected at the weekly level, however time was conceptualized across five phases of the intervention: baseline, weeks 1 to 4, weeks 5 to 8, weeks 9 to 12, and weeks 13 to 16. To control for potential confounds of program participation, group attendance, group mentor, and site of the intervention were included as model covariates.

First, the unconditional means model was tested with no predictors in order to understand within- and between-person variation in self-efficacy. The unconditional means model in Table 4-10 (first column) shows that significant variability at the within- and between-person levels exists in self-efficacy. The intraclass coefficient was 0.831, indicating the majority of variance was between-persons. In other words, 83.1% of the variance in self-efficacy was between-persons. Within-person fluctuations in self-efficacy were small.

The next model, the unconditional growth model (Table 4-10, second column), added time as a fixed and random effect, but remained unconditional as no Level-2 predictors were added. Series of nested model tests were conducted to examine the effects of linear, quadratic, and cubic time trends on self-efficacy. Higher-order polynomial time trends did not significantly improve model fit compared to the linear trend and were therefore not retained for subsequent models. The fixed effect of time showed a modest, yet significant, decrease in self-efficacy over the course of the intervention. The random effect of time was also significant, indicating that there were significant individual differences in growth trajectories as a function of linear time. The addition of time to the model explained 7% and 20% of the between- and within-person variance respectively. The unconditional growth model had significantly improved model fit compared to the unconditional means model, χ^2 (2) = 261.29, p <.001.

The main effects conditional growth model (Table 4-10, third column) represents the addition of fixed effects of four time-invariant predictors of self-efficacy: group assignment, attendance, site of the intervention, and mentor. The main effects conditional growth model assesses level (initial status) differences in self-efficacy as a function of these predictors. The community church site showed marginally higher self-efficacy compared to the university facility, while group assignment, group attendance, and mentor were not significant. The addition of the fixed effects of these predictors explained 10% of the remaining between-person variance. Because these variables were time-invariant, random effects were not tested and within-person variance did not change. Significant within- and between-person variance remained unexplained. Finally, model fit statistics indicated the conditional growth model with main effects did not significantly improve model fit.

The interactions conditional growth model (Table 4-10, fourth column) tested interaction effects of the covariates on the linear time trend reported in the main effects conditional growth model. The negative linear time trend remained significant, as did the marginal main effect for site of the intervention. The time x group assignment effect, our main hypothesized test, was not significant. Significant and positive time x attendance fixed effect was observed, indicating that individuals who attended group sessions more regularly increased self-efficacy significantly more than those who did not. Site of the intervention and mentor interactions did not moderate the time trend. Because interaction effects include the time predictor, random effects estimates of these variables can be studied. The random effects of time x group were not significant, indicating that individual differences in the linear time trend in self-efficacy as a function of group assignment were not present. The addition of the random effects of the model covariates on the linear time trend caused the model to not converge, and were therefore omitted from the analyses. No additional within- or between-person variance was explained with the inclusion of these interaction effects. Finally, the conditional growth model with interactions did not significantly improve model fit.

In summary, the final model displayed a modest, yet significant, negative time trend for self-efficacy across the intervention. Our hypothesis that individuals in the intervention group would display significantly greater gains in self-efficacy over the course of the intervention was not confirmed. The addition of the main effects and interactions of model covariates yielded only modest differences in initial status and time trend. Significant amount of within- and between-person variation in self-efficacy remained unexplained by the model predictors. Figure 4-2 displays graphically the empirical data and model-based estimates of self-efficacy by group assignment.

Self-Determined Behavior

A mixed between-within analysis of variance was conducted with time (baseline, post-test) being the within-subjects factor and group assignment (intervention, health hygiene control) as the between-subjects factor. Group attendance, site, and mentor were included as covariates. The Levene's tests for the homogeneity of variance assumption were not significant at both timepoints. Mauchly's test was not performed because there were only two timepoints. Table 4-11 shows a summary table of the analysis of variance with main effects and possible within-between interactions. To assess change in self-determined behavior across the intervention, the time x group interaction effect was not significant, but trended in the hypothesized direction. The effect size was small however (Cohen, 1992). Figure 4-3 shows this pattern graphically.

Post-hoc analyses were conducted to understand what aspects of self-determined behavior were impacted by the intervention. Mixed between-within analyses of variance were conducted for each of the EMS subscales to determine which level of extrinsic and intrinsic behavior was impacted. No significant differences were observed on the individual subscales after including the model covariates.

Secondary Analyses: Physical Activity and Cardiorespiratory Changes

The secondary purpose of this research was to evaluate subsequent improvement in PA behavior (i.e.; self-reported PA and pedometer count) and fitness parameters (cardiorespiratory fitness) as a result of the intervention. PA was assessed daily throughout the intervention by self-reported daily logs and use of pedometer. The self-reported PA (measured by the LTEQ) was converted into minutes of MVPA and a MET estimate (see Methods section). At the baseline-posttest level, changes in cardiorespiratory fitness were measured by sub-maximal oxygen consumption (VO^2max).

Physical Activity Behavior

Self-reported PA and pedometer counts were assessed concurrently and daily throughout the intervention. These measures were averaged at the weekly level and time was conceptualized across the five phases of the intervention: baseline, weeks 1 to 4, weeks 5 to 8, weeks 9 to 12, and weeks 13 to 16. Means and standard deviations for PA dependent variables at each phase are displayed in Table 4-12. Correlations are displayed in Table 4-13. As expected, minutes of MVPA and the MET estimate were highly correlated given their origination from the same self-report measure. Pedometer steps were uncorrelated with either self-report measure.

Moderate-to-vigorous physical activity

A multilevel model for change (Singer & Willett, 2003) was used to assess within- and between-person changes in minutes of MVPA across the 16-week intervention. The fundamental question addressed was whether group assignment moderated within- and between-person changes in minutes of MVPA.

Stepwise and nested multilevel model tests are displayed in Table 4-14. The unconditional means model (Table 4-14, first column) showed significant variability at the within- and between-person levels exists in minutes of MVPA. The intraclass correlation indicated 59.3% of the variance in MVPA was between-persons. The unconditional growth model (Table 4-14, second column) indicated a significant, positive linear time trend and a negative, quadratic time trend. This would indicate an increase in MVPA followed by a modest, curvilinear decline. The random effect of linear time was also significant, indicating that there were individual differences in growth trajectories. The addition of the random effect for quadratic time caused the model not to converge and was therefore removed from subsequent model tests. The addition of time to the model explained 25% and 19% of the between- and within-person variance respectively. The unconditional growth model significantly improved model fit compared to the unconditional means model, χ^2 (3) = 141.63, p <.001.

In the main effects conditional growth model (Table 4-14, third column), the negative and quadratic time trends remained significant. Participants at the community church facility displayed higher MVPA scores across all timepoints. The addition of the main effects explained 17% and 0% of the between- and within-person variability respectively. This model did not result in improved model fit compared to the previous model.

In the interactions conditional growth model (Table 4-14, fourth column), the linear time trend was no longer significant; however, the quadratic time trend and the main effect for site retained significance. Significant time x attendance interaction effect emerged, indicating that individuals who attended more group sessions, regardless of group assignment, reported more minutes of MVPA compared to those who attended fewer sessions. The addition of the interaction effects explained no additional between- or within-person variability. This model was marginally improved from the previous model, χ^2 (9) = 16.37, p = .060.

In summary, both groups increased the number of minutes of MVPA over the course of the intervention. The time trend suggests curvilinear change in minutes of MVPA. Our hypothesis that individuals in the intervention group would display significantly greater gains in MVPA over the course of the intervention was not confirmed, although empirical data and model-based estimates suggest modest differences may exist if adequate power were present (Figure 4-4). Both groups were unable to achieve the minimal PA recommendations (Nelson et al., 2007; Pate et al., 1995), although intervention group participants maintained activity levels within 20 minutes of the recommendations during weeks 8 to 12 and after.

MET estimate

A multilevel model for change (Singer & Willett, 2003) was used to assess within- and between-person changes in MET estimate across the 16-week intervention. The MET estimate differed from minutes of MVPA in that it included mild forms of PA and incorporated both intensity and duration into the calculation. The fundamental question addressed was whether group assignment moderated within- and between-person changes in the overall MET expenditure (MET-mins/day).

Nested, multilevel model tests are displayed in Table 4-15. The unconditional means model (Table 4-15, first column) showed significant variability at the within- and between-person levels existed in MET-mins/day. The intraclass coefficient indicated 72.0% of the variance in MET-mins/day was between-persons. The unconditional growth model (Table 4-14, second column) indicated a significant positive linear time trend and a negative quadratic time trend. This would indicate curvilinear increase in MET-mins/day followed by a modest decline. The random effect of linear time was also significant, indicating that there were significant individual differences in growth trajectories. The addition of the random effect for quadratic time caused the model not to converge and was therefore removed from subsequent model tests. The addition of time to the model explained 10% and 19% of the between- and within-person variance respectively. The unconditional growth model significantly improved model fit compared to the UMM, χ^2 (3) = 124.65, p <.001.

The main effects conditional growth model (Table 4-15, third column) and interactions conditional growth model (Table 4-15, fourth column) followed a similar pattern of results as the models for minutes of MVPA. The linear time trend was significant in the main effects model, but was no longer significant when the interactions were added. The quadratic time trend retained significance in both models. The main effects for intervention site showed that participants at the community church site displayed marginally higher levels of MET-mins/day, regardless of time, compared to the university facility participants. No additional within- or between-person variability was explained with these models. Neither of these models improved model fit compared to the unconditional growth model.

In summary, the addition of mild forms of PA and more sensitive calculations for PA intensity in the MET-mins/day calculations yielded similar findings to the MVPA model. Our hypothesis that individuals in the intervention group would display significantly greater gains in MET-mins/day over the course of the intervention was not confirmed. Figure 4-5 indicates similar patterns of growth in MET-mins/day for both groups.

Pedometer

A multilevel model for change (Singer & Willett, 2003) was also used to assess within- and between-person changes in pedometer steps across the 16-week intervention. Stepwise and nested multilevel model tests are displayed in Table 4-16.

The unconditional means model (Table 4-16, first column) showed significant variability at the within- and between-person levels existed in pedometer steps. The intraclass coefficient indicated 71.5% of the variance in steps was between-persons. The unconditional growth model (Table 4-16, second column) indicated a significant positive linear time trend and a negative quadratic time trend, similar to what was observed in minutes of MVPA and MET-mins/day. The random effect of linear time was also significant, indicating individual differences in growth trajectories existed. The addition of the random effect for quadratic time caused the model not to converge and was therefore removed from subsequent model tests. The addition of time to the model explained 16% of the within-person variance and no additional between-person variance. The unconditional growth model significantly improved model fit compared to the UMM, χ^2 (3) = 87.00, p <.001.

The main effects conditional growth model (Table 4-16, third column) showed that none of the predictors that were introduced were significantly predictive of pedometer steps. The linear and quadratic effects retained significance. The addition of the main effects explained 8% and less than 1% of the between- and within-person variability. Model fit did not improve compared to the previous model.

The interactions conditional growth model (Table 4-16, fourth column) tested whether the model covariates moderated the time trend for pedometer steps. First, the linear and quadratic time trends retained significance in this final model. The fixed effects interactions were not significant, indicating that model predictors did not moderate the significant time trends. However, after controlling for the interactions, main effects for group and attendance emerged. This indicated that regardless of time, intervention group participants and those who attended more group sessions reported more pedometer steps. The random effects for time x group and time x site interactions were able to be included and the model converged. Both of these estimates were positive and significant, indicating individual difference in growth trajectories existed based upon group assignment and site of the intervention. The addition of these interaction effects explained only 2% and less than 1% of the between- and within-person variability respectively. Model fit was significantly improved compared to the main effects conditional growth model, χ^2 (9) = 18.45, p = .030.

In summary, both groups increased the number of pedometer steps taken over the course of the intervention. The time trend suggests curvilinear change in steps. Our hypothesis that individuals in the intervention group would display significantly greater gains in steps taken over the course of the intervention was not confirmed. In fact, Figure 4-6 suggests a decline after weeks 8 to 12 in the intervention that was not present in the control group.

Cardiorespiratory Fitness

A mixed between-within analysis of variance was conducted to examine changes in cardiorespiratory fitness, as measured by a submaximal oxygen consumption test (VO^2max) using the Balke protocol. Time (baseline, post-test) was the within-subjects factor and group assignment (intervention, health hygiene control) was the between-subjects factor. The Levene's tests for the homogeneity of variance assumption were not significant at both timepoints. Mauchly's test was not performed because there were only two timepoints. The first test examined VO^2max without including model covariates (attendance, site, and group mentor). The main effect of time was significant, F (1) = 10.173, p = .002, η^2 = .151. Both groups significantly improved in cardiorespiratory fitness from baseline to posttest, although the effect size was small in magnitude (Cohen, 1992). The time x group interaction was not significant indicating that the intervention group did not improve more than the health hygiene control, contrary to our hypothesis. Model covariates of intervention site, attendance, and group mentor were added. Table 4-17 displays the results of this hypothesized model. After adding these covariates, the main effect of time was no longer significant. Figure 4-7 displays the adjusted means of VO^2max graphically.

Post-Hoc Analyses: Exploratory Predictors

Post-hoc analyses were conducted to explore the effect of other predictors on the intervention. These predictors were selected based upon their associations with dropout status (i.e., BMI, depression) or their potential utility in understanding demographic characteristics of those who improved as a result of intervention (i.e., gender, age, fitness level). Because these were viewed as exploratory predictors, they were added to the models after controlling for the hypothesized predictors and covariates presented previously, and are presented separately here.

Social Cognitive Changes

The exploratory predictors were added to the models displayed in Table 4-9 for the self-efficacy composite score. The fixed effect of female gender emerged as a significant and negative predictor of self-efficacy, estimate (SE) = -1.165 (.557), p = .040. This indicates that females displayed lower levels of self-efficacy compared to males, regardless of time. No significant predictors moderated the linear time trend, meaning that changes in self-efficacy were not significantly different as a function of the exploratory predictors. The addition of the model predictors did improve overall model fit compared to the final interactions conditional growth model presented earlier, χ^2 (9) = 320.188, p <.001.

The exploratory predictors were added to the mixed between-within ANOVA model displayed in Table 4-10 for self-determined behavior. Age emerged as a marginal between-subject predictor of self-determined behavior, (F (1) = 3.761, p = .059). Inspection of group means indicated older individuals had lower levels of self-determined behavior. No interaction effects were significant.

Physical Activity Changes

The exploratory predictors were added to the final multilevel models of change for minutes of MVPA (see Table 4-14), MET-mins/day (see Table 4-15), and pedometer steps (see Table 4-16). For brevity, only significant main effects, interactions, and model fit improvements are reported in Table 4-18. For all three models, the addition of the exploratory predictors significantly improved model fit. For the minutes of MVPA model, the main effect of VO^2max was significant and positive, indicating individuals with higher VO^2max at baseline reported more minutes of MVPA over the course of the intervention, regardless of timepoint. None of the main effects or interactions were significant in the MET estimate model. Finally, age emerged as a negative and significant main effect predictor of pedometer steps, indicating younger individuals reported more pedometer steps, regardless of timepoint.

Cardiorespiratory Fitness Changes

The exploratory predictors were added to the mixed between-within model for VO^2max (see Table 4-16). As would be expected, the main effects of gender (F (1) = 12.776, p <.001, η^2 = .233), age (F (1) = 17.250, p <.001, η^2 = .291), and BMI (F (1) = 6.940, p = .012, η^2 = .142), were significant. Regardless of group assignment or time of VO^2max assessment, females, older participants, and individuals with higher BMI displayed lower cardiorespiratory fitness. The time x attendance interaction was also marginally significant (F (1) = 3.162, p =.083, η^2 = .070), indicating individuals who attended more group sessions (regardless of group assignment) experienced greater improvements in VO^2max. No other predictors moderated the time trend. Finally, attendance, gender, age, and BMI were tested in three-way interactions to see if they moderated the time x group effect. These were not significant.

Table 4-1. Baseline demographic characteristics of participants by randomized group ($N = 81$).

Characteristic	Health Hygiene control (n = 40)	Intervention group (n=41)	Total Sample
Age ± SD, years	63.35 ± 9.07	63.49 ± 8.26	63.42 ± 8.62
Age group, n (%)			
50 to 64 years	20 (50.0)	19 (46.3)	39 (48.1)
65 years and over	20 (50.0)	22 (53.7)	42 (51.9)
Gender, n (%)			
Female	32 (80.0)	35 (85.4)	67 (82.7)
Male	8 (20.0)	6 (14.6)	14 (17.3)
Marital status, n (%)			
Married	22 (55.0)	22 (53.7)	44 (54.3)
Divorced	12 (30.0)	11 (26.8)	23 (28.4)
Widowed	2 (5.0)	5 (12.2)	7 (8.6)
Single, or never married	4 (10.0)	3 (7.3)	7 (8.6)
Education ± SD, years	16.38 ± 2.31	15.93 ± 2.20	16.15 ± 2.25
Educational status, n (%)			
High school/GED	2 (5.0)	3 (7.3)	5 (6.2)
Some college or vocational training	11 (27.5)	10 (24.4)	21 (25.9)
College graduate	8 (20.0)	11 (26.8)	19 (23.5)
Some postbaccalaureate or Master's degree	14 (35.0)	15 (36.6)	29 (35.8)
Doctoral degree	5 (12.5)	2 (4.9)	7 (8.6)
Race, n (%)			
White	37 (92.5)	37 (90.2)	74 (91.4)
African-American	1 (2.5)	2 (4.9)	3 (3.7)
Asian	1 (2.5)	0 (0.0)	1 (1.2)
Biracial	0 (0.0)	0 (0.0)	0 (0.0)
Other	0 (0.0)	2 (4.9)	2 (2.5)
Ethnicity, n (%)			
Hispanic/Latino	1 (2.5)	2 (4.9)	3 (3.7)

Note. All group differences were not significant ($p > .10$).

Table 4-2. Baseline psychosocial variables by randomized group.

Baseline assessment	Health Hygiene control (n = 40)	Intervention group (n=41)	Total Sample
Self-efficacy composite	-0.41 ± 1.90*	0.45 ± 1.68*	0.02 ± 1.84
Barriers Self-efficacy	63.65 ± 24.13	70.38 ± 21.98	67.06 ± 23.17
Exercise Self-efficacy	67.25 ± 27.86*	81.69 ± 24.82*	74.47 ± 27.20
Self-determined index score	15.84 ± 5.58	16.86 ± 6.77	16.35 ± 6.19
Intrinsic	4.31 ± 0.76	4.47 ± 0.92	4.39 ± 0.84
Integrated regulation	4.63 ± 0.76	4.73 ± 0.85	4.68 ± 0.81
Identified regulation	5.41 ± 0.60	5.37 ± 0.61	5.39 ± 0.60
Introjected regulation	3.44 ± 0.90	3.28 ± 0.94	3.36 ± 0.92
External regulation	1.93 ± 0.82	1.94 ± 0.94	1.94 ± 0.88
Amotivation	1.48 ± 0.68	1.40 ± 0.79	1.44 ± 0.74
Geriatric Depression Scale	5.13 ± 4.89	4.85 ± 4.29	4.99 ± 4.56
Beck Depression Inventory-II	6.87 ± 5.80	5.63 ± 4.79	6.24 ± 5.31

Note. *p < .05.

Table 4-3. Baseline physiological variables by randomized group.

Baseline assessment	Health Hygiene control (n = 40)	Intervention group (n=41)	Total Sample
VO_2max	27.93 ± 7.95	27.55 ± 7.12	27.74 ± 7.50
BMI, kg/m^2	26.77 ± 5.68	28.39 ± 6.53	27.56 ± 6.12
Blood pressure			
Systolic, mmHg	134.43 ± 17.16	139.04 ± 18.29	136.73 ± 17.77
Diastolic, mmHg	79.86 ± 9.81	80.51 ± 11.12	80.19 ± 10.42
Pulse, bpm	75.29 ± 11.96	75.06 ± 11.93	75.18 ± 11.87
Blood pressure classification, *n* (%)			
Normal	8 (20.0)	5 (12.2)	13 (16.0)
Prehypertensive	16 (40.0)	17 (41.5)	33 (40.7)
Hypertensive	16 (40.0)	19 (46.3)	35 (43.2)

Note. All group differences were not significant (p >.10). BMI = body mass index; Blood pressure classifications were as follows: Normal = systolic < 120 and diastolic < 80; Prehypertensive = systolic 120-139.99 or diastolic 80-89.99; Hypertensive = systolic 140+ or diastolic 90+ (Chobanian et al., 2003).

Table 4-4. Baseline physical activity variables by randomized group (n = 76)[†].

Baseline assessment	Health Hygiene control (n = 36)	Intervention group (n=40)	Total Sample
MVPA, mins/wk	76.81 ± 106.91	55.25 ± 60.34	65.46 ± 85.70
National PA Guidelines, *n* (%)			
Meeting guidelines	6 (16.7)	3 (7.5)	9 (11.8)
Insufficient PA	17 (47.2)	27 (67.5)	44 (57.9)
No PA	13 (36.1)	10 (25.0)	23 (30.3)
LTEQ, MET-min/day			
Mild	2.85 ± 2.57	2.84 ± 3.10	2.84 ± 2.84
Moderate	3.28 ± 5.69	1.72 ± 1.74	2.47 ± 4.18
Strenuous	0.50 ± 1.36	0.55 ± 2.16	0.52 ± 1.81
Total	6.63 ± 7.12	5.10 ± 4.46	5.83 ± 5.90
Pedometer, steps/day	5796.82 ± 2865.62	6123.55 ± 3016.38	5966.72 ± 2929.71

Note. All group differences were not signficant (p > .10); [†]Baseline physical activity data was missing for five participants; All values were reported daily and summed across the baseline week of observation; LTEQ = Leisure-time Exercise Questionnaire; MVPA = moderate-to-vigorous physical activity; PA = physical activity; National physical activity guidelines were defined as 150 or more minutes of moderate-to-vigorous physical during the week (Nelson et al., 2007).

Table 4-5. Baseline demographic characteristics of completed and attrited groups.

Characteristic	Completed sample (n = 69)	Attrited Sample (n = 12)	Total Sample
Age ± SD, years	63.91 ± 8.71	60.58 ± 7.80	63.42 ± 8.62
Age group, n (%)			
50 to 64 years	31 (44.9)	8 (66.7)	39 (48.1)
65 years and over	38 (55.1)	4 (33.3)	42 (51.9)
Gender, n (%)			
Females	58 (84.1)	9 (75.0)	67 (82.7)
Males	11 (15.9)	3 (25.0)	14 (17.3)
Marital status, n (%)			
Married	37 (53.6)	7 (58.3)	44 (54.3)
Divorced	19 (27.5)	4 (33.3)	23 (28.4)
Widowed	7 (10.1)	0 (0.0)	7 (8.6)
Single, or never married	6 (8.7)	1 (8.3)	7 (8.6)
Education ± SD, years	16.19 (2.2)	15.92 (2.5)	16.15 ± 2.25
Educational status, n (%)			
High school/GED	4 (5.8)	1 (8.3)	5 (6.2)
Some college or vocational training	18 (26.1)	3 (25.0)	21 (25.9)
College graduate	16 (23.2)	3 (25.0)	19 (23.5)
Some postbaccalaureate or Master's degree	25 (36.2)	4 (33.3)	29 (35.8)
Doctoral degree	6 (8.7)	1 (8.3)	7 (8.6)
Race, n (%)			
White	63 (91.3)	11 (91.7)	74 (91.4)
African-American	3 (4.3)	0 (0.0)	3 (3.7)
Asian	1 (1.4)	0 (0.0)	1 (1.2)
Biracial	0 (0.0)	1 (8.3)	1 (1.2)
Other	2 (2.9)	0 (0.0)	2 (2.5)
Ethnicity, n (%)			
Hispanic/Latino	3 (4.3)	0 (0.0)	3 (3.7)

Note. All group differences were not significant (p > .10).

Table 4-6. Baseline study variables of completed and attrited groups.

Characteristic	Completed sample (*n* = 69)	Attrited Sample (*n* = 12)	Total Sample
Psychosocial Measures			
SE	0.03 ± 1.87	-0.03 ± 1.70	0.02 ± 1.84
BSE	67.57 ± 23.48	64.10 ± 22.01	67.06 ± 23.17
EXSE	73.99 ± 27.20	77.19 ± 28.28	74.47 ± 27.20
Self-determined behavior	16.39 ± 6.20	16.15 ± 6.45	16.35 ± 6.19
GDS	4.54 ± 4.49*	7.50 ± 4.30*	4.99 ± 4.56
BDI-II	5.69 ± 5.22*	9.33 ± 4.91*	6.24 ± 5.31
Physical Activity Measures			
LTEQ, METS/day			
Mild	3.05 ± 2.92	1.46 ± 1.81	2.84 ± 2.84
Moderate	2.44 ± 4.23	2.67 ± 4.04	2.47 ± 4.18
Strenuous	0.60 ± 1.93	0.00 ± 0.00	0.52 ± 1.81
Total	6.09 ± 5.95	4.13 ± 5.55	5.83 ± 5.90
Pedometer, steps/day	6125.06 ± 2934.32	4908.52 ± 2866.93	5962.86 ± 2935.93
Physiological Measures			
VO_2max	27.90 ± 7.51	26.85 ± 7.74	27.74 ± 7.50
BMI, kg/m^2	26.79 ± 5.74**	31.93 ± 6.66**	27.56 ± 6.12
Blood pressure			
Systolic, mmHg	136.00 ± 18.09	141.32 ± 15.56	136.73 ± 17.77
Diastolic, mmHg	79.62 ± 9.15	83.73 ± 16.52	80.19 ± 10.42
Pulse, bpm	74.93 ± 12.40	76.68 ± 8.07	75.18 ± 11.87

* $p < .05$; ** $p < .01$. Note. SE = self-efficacy composite score; BSE = barriers self-efficacy; EXSE = exercise self-efficacy; GDS = geriatric depression scale; BDI-II = Beck depression inventory-II; LTEQ = leisure-time exercise questionnaire; BMI = body mass index.

Table 4-7. Replicate and mentor characteristics.

Replicate	Site	Group Assignment	Randomized	Attrited	Completed	Mentor characteristics: Gender	Age	Years of Education
1	University facility	Intervention	0/2	0/0	0/2	M	72	20
		Control	0/3	0/0	0/3	M	69	20
2	University facility	Intervention	0/5	0/1	0/4	M	69	20
		Control	2/3	0/1	2/2	F	67	18
3	University facility	Intervention	0/4	0/0	0/4	F	61	16
		Control	0/4	0/1	0/3	M	67	18
4	University facility	Intervention	2/2	1/1	1/1	M	69	20
		Control	0/6	0/2	0/4	M	72	20
5	Community church	Intervention	2/5	1/1	1/4	M	67	18
		Control	1/6	1/0	0/6	F	63	16
6	Community church	Intervention	2/4	0/0	2/4	M	67	18
		Control	1/2	0/0	1/2	F	63	16
7	Community church	Intervention	1/5	0/0	1/5	M	67	18
		Control	1/4	0/0	1/4	F	61	16
8	Community church	Intervention	0/7	0/2	0/5	M	67	18
		Control	3/4	0/0	3/4	F	67	18

Note. Data are reported as the number of men/women; Randomization includes participants who attended 1 or more group sessions; M = male; F = female. 16 years of education is equivalent to a Bachelor's-level college degree.

Table 4-8. Assessments of normal distribution for raw and square-root transformed dependent variables.

	MVPA		MET Estimate		Pedometer		Self-efficacy	
	Raw	Square-root transformed	Raw	Square-root transformed	Raw	Square-root transformed	Raw†	Square-root transformed
Skewness	1.60	0.20	1.52	0.32	0.49	0.03	-0.64	-1.19
Skewness SE	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Skewness *Z*	22.21	2.83	21.04	4.50	6.75	0.44	-8.69	-16.09
p	<.001	.005	<.001	<.001	<.001	.660	<.001	<.001
Kurtosis	3.02	-0.52	2.52	0.15	-0.31	-0.51	-0.17	1.52
Kurtosis *SE*	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15
Kurtosis *Z*	20.96	-3.71	17.50	1.03	-2.13	-3.56	-1.14	10.26
p	<.001	<.001	<.001	.303	.033	<.001	.254	<.001
Kolmogorov-Smirnov *Z*	5.91	4.03	4.8	1.95	2.08	1.14	2.3	3.41
Asymptotic *p*	<.001	<.001	<.001	.001	<.001	.151	<.001	<.001

Note. $p < .05$ indicate departures from normality; †Raw data represents *z*- transformed composite variable. MVPA = moderate-to-vigorous physical activity.

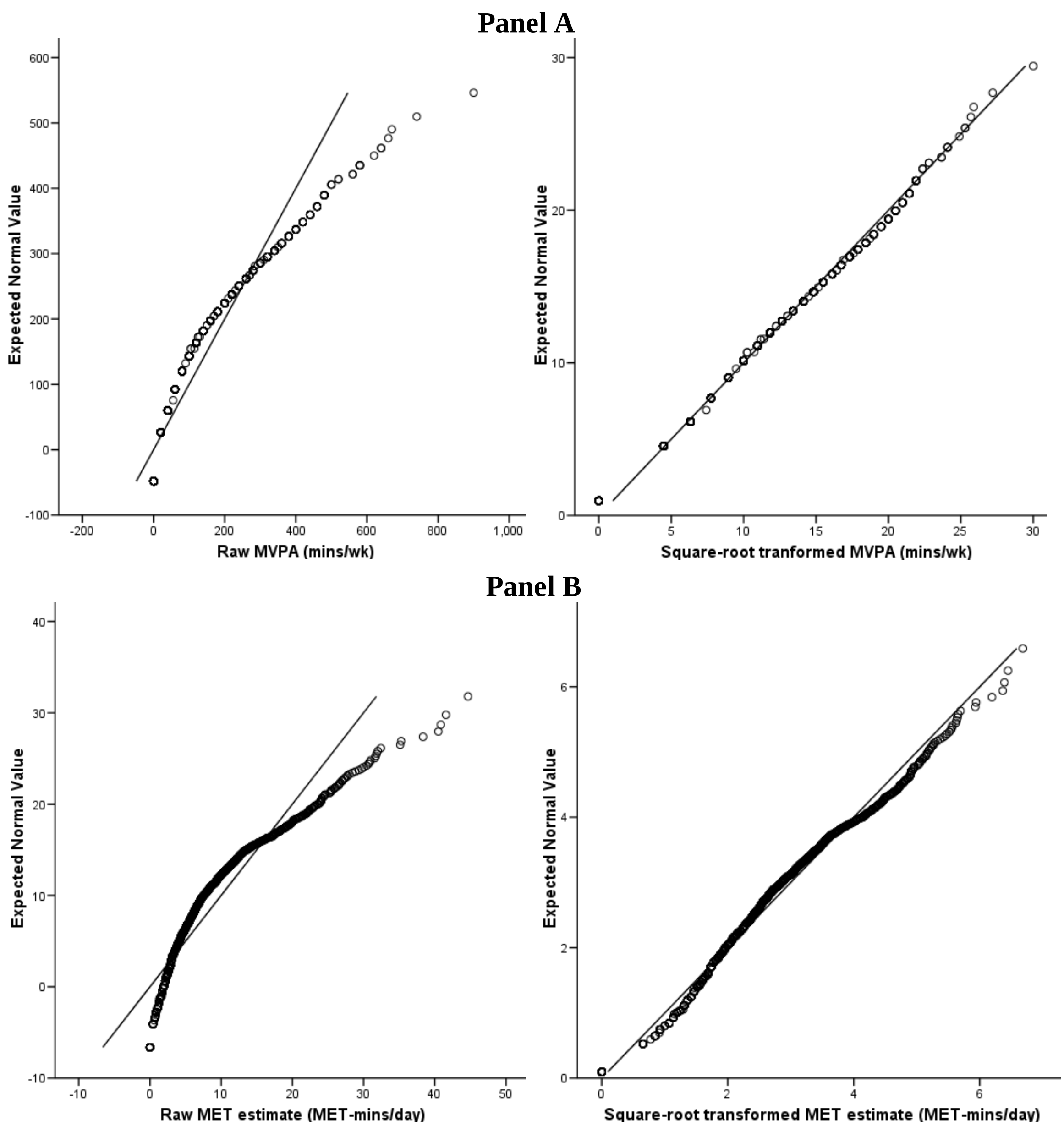
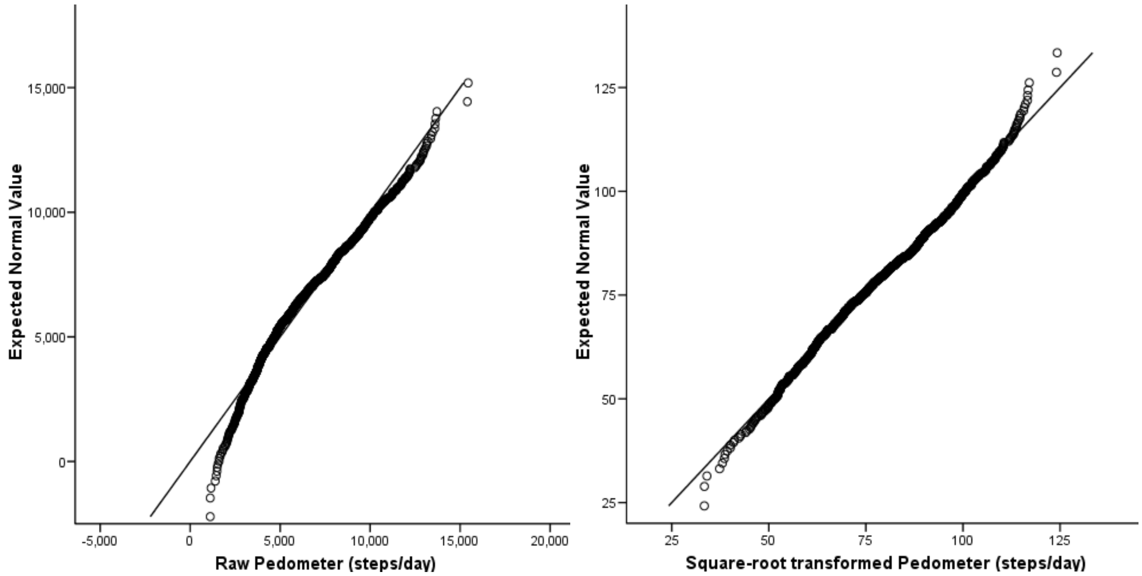


Figure 4-1. Q-Q plots for raw and square-root transformed repeated measures dependent variables. Panel A) Minutes of moderate-to-vigorous physical activity; Panel B) MET estimate; Panel C) Pedometer steps; Panel D) Self-efficacy composite score.

Panel C



Panel D

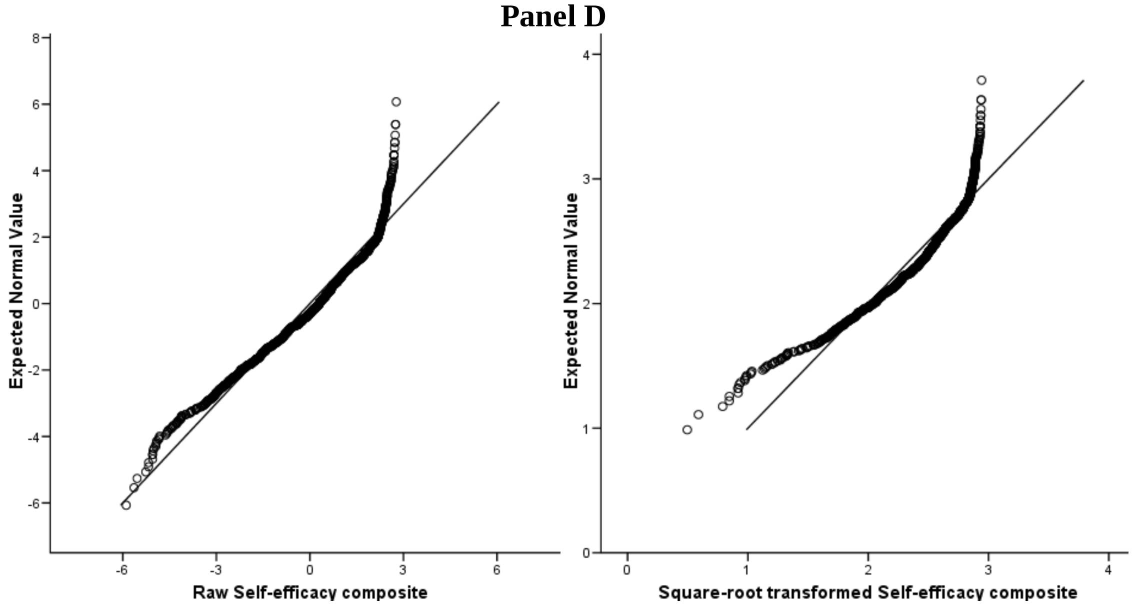


Figure 4-1. Continued.

Table 4-9. Correlations among social cognitive variables and model covariates at baseline.

	1	2	3	4	5	6	7
1. SE	1						
2. SD	.323**	1					
3. Female	-.204	.102	1				
4. Age	.063	-0.272*	-.046	1			
5. BMI	.116	.091	-.068	-0.264*	1		
6. VO^2max	.014	.145	-.377**	-.357**	-0.251*	1	
7. BDI-II	-0.236*	.077	.152	.007	.033	.044	1

Note. *p < .05; **p < .01. SE = self-efficacy composite score; SD = self-determined behavior index score; BMI = body mass index; BDI-II = Beck Depression Inventory-II.

Table 4-10. Self-efficacy composite score model tests with group assignment, attendance, site of the intervention, and group mentor as model covariates.

	Unconditional Means Model	Unconditional Growth Model	CGM Main effects	CGM Interactions
Fixed effects				
Initial status				
Intercept	-.09 (.19)	.04 (.02)	-1.56 (1.01)	-1.26 (1.02)
Group			.80 (.86)	.75 (.86)
Attendance			.08 (.07)	.06 (.07)
Site			1.01 (.58)†	.98 (.59)†
Rate of change				
Time (linear)		-.08 (.04)*	-.08 (.04)*	-.48 (.24)*
Time x group				.03 (.18)
Time x attendance				.04 (.02)*
Time x site				-.02 (.11)
Random effects				
Level-1				
Within-person	.58 (.03)***	.46 (.02)***	.46 (.02)***	.46 (.02)***
Level-2				
Intercept	2.99 (.48)***	2.79 (.50)***	2.51 (.42)***	2.54 (.42)***
Time			.09 (.02)***	.05 (.02)**
Time x group				.04 (.04)
Time x attendance				-[a]
Time x site				-[a]
Fit statistics				
-2LL	2830.12	2568.83	2560.74	2546.77
n parameters	3	5	14	24
AIC	2836.12	2578.83	2588.74	2594.77
BIC	2851.10	2603.47	2657.74	2713.06
Change in -2LL from previous model	-	261.29***	8.09	13.97

Note. $^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$. [a]Model did not converge when added; standard errors are between parentheses; Group mentor was included in the model but not reported; CGM = conditional growth model; -2LL = -2 log likelihood; AIC = Akaike's information criterion; BIC = Bayesian information criterion.

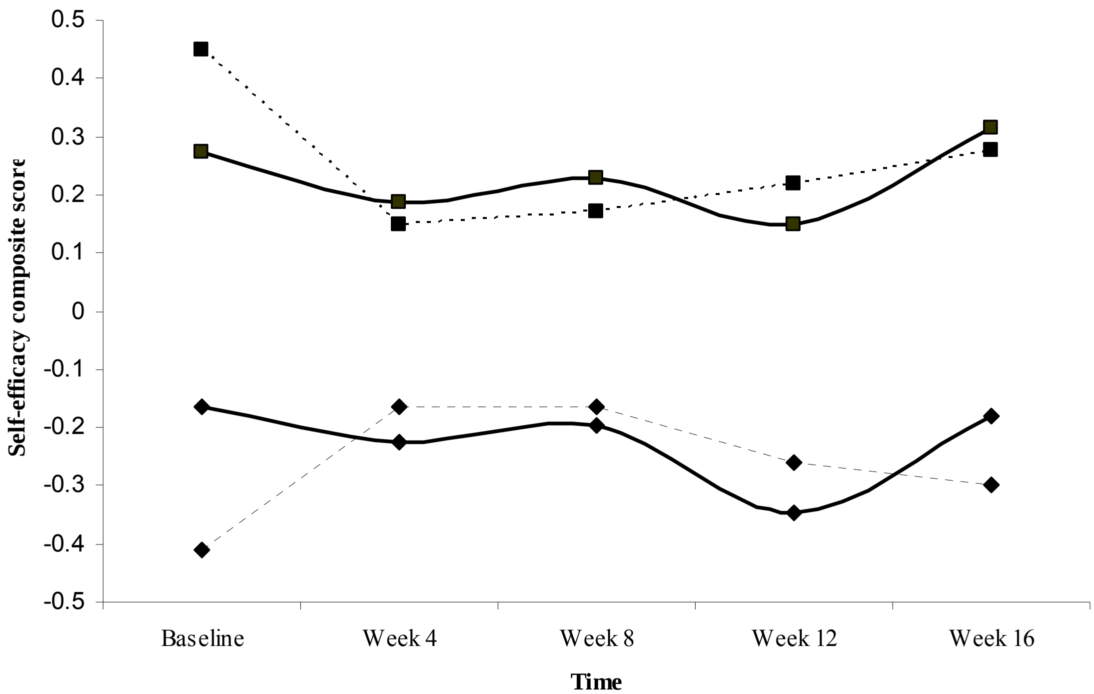


Figure 4-2. Self-efficacy composite score empirical data and model-based estimates by group assignment adjusted for attendance, site of the intervention, and mentor. Note. Empirical data are noted with dotted lines; Model-based estimates are noted with smoothed solid lines; Intervention group is noted with solid squares; Control group is noted with solid diamonds.

Table 4-11. Mixed between-within ANOVA table for self-determined behavior index score (N = 68).

Source	Sum of squares	*df*	Mean Square	*F*	*p*	η^2
Between-subject						
Group	94.31	1	94.31	1.55	0.22	0.02
Site	38.10	1	38.10	0.65	0.42	0.01
Attendance	20.28	1	20.28	0.34	0.56	0.01
Within-subject						
Time	1.10	1	1.10	0.09	0.76	0.00
Time x group	30.35	1	30.35	2.48	(0.12)	0.04
Time x site	17.33	1	17.33	1.43	0.24	0.02
Time x attendance	13.34	1	13.34	1.10	0.30	0.02

Note. Marginal significance noted in parentheses. Group mentor included in the model but not reported.

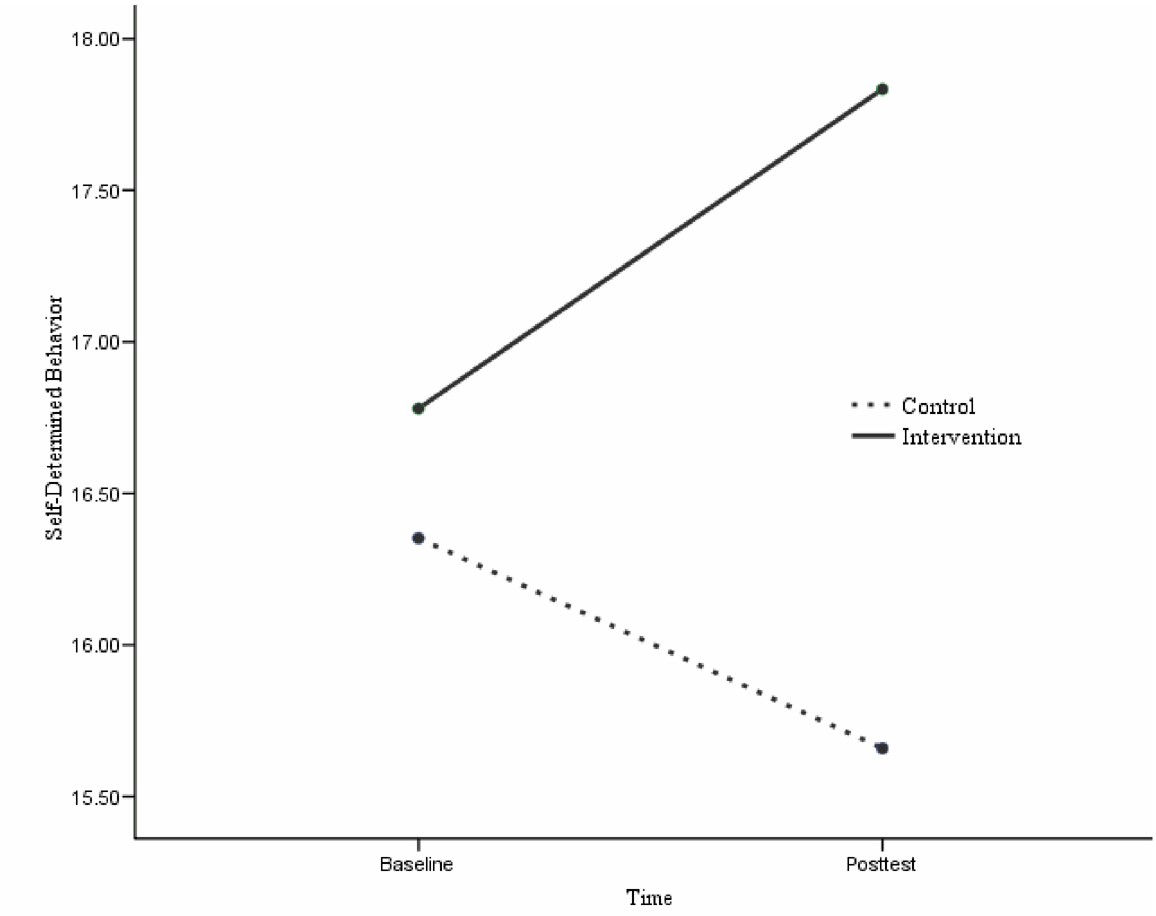


Figure 4-3. Model-based estimates of self-determined behavior index score by group assignment adjusted for group attendance, site, and group mentor.

Table 4-12. Means and standard deviations of pedometer steps, minutes of moderate-to-vigorous physical activity, and LTEQ score across intervention timepoints.

	Time				
	BL	Week 4	Week 8	Week 12	Week 16
Pedometer, steps/day					
M	5966.72	6485.38	6533.41	6573.67	6497.88
SD	2929.71	2786.81	2726.82	2391.33	2638.13
MVPA, mins/wk					
M	65.46	120.60	129.47	128.60	124.39
SD	85.70	118.33	134.86	132.63	143.57
MET estimate, MET-min/day					
M	5.43	8.52	8.74	8.53	8.67
SD	4.77	7.22	7.29	6.91	7.70

Note. BL = baseline. Week 4 = aggregated weeks 1 to 4; Week 8 = aggregated weeks 5 to 8; Week 12 = aggregated weeks 9 to 12; Week 16 = aggregated weeks 13 to 16.

Table 4-13. Correlations among physical activity variables and exploratory model predictors.

Measure	1	2	3	4	5	6	7	8
1. MVPA	1							
2. Pedometer	-.015	1						
3. MET estimate	.906***	-.014	1					
4. Female	.040	-.200	.044	1				
5. Age	.201	-0.321**	.237*	-.048	1			
6. BMI	.031	.011	-.082	-.064	-.265*	1		
7. VO^2max	-.153	.263*	-.088	-.381**	-.364**	-.250*	1	
8. BDI-II	.109	-.206	.103	.150	.006	.042	.033	1

Note. *p < .05; **p < .01; ***p < .001; MVPA = moderate-to-vigorous physical activity (mins/wk); MET estimate = metabolic estimate (MET-min/day); Pedometer is in steps/day; BMI = body mass index; BDI-II = Beck Depression Inventory-II.

Table 4-14. Moderate-to-vigorous physical activity model tests for with group assignment controlling for group attendance, site of intervention, and group mentor.

	Unconditional Means Model	Unconditional Growth Model	CGM Main effects	CGM Interactions
Fixed effects				
Initial status				
Intercept	9.06 (.56)***	6.88 (.58)***	3.48 (2.76)	4.62 (2.86)
Group			3.22 (2.22)	2.98 (2.29)
Attendance			.06 (.18)	-.03 (.19)
Site			3.33 (1.55)*	3.35 (1.59)*
Rate of change				
Time (linear)		2.41 (.37)***	2.40 (.37)***	.60 (1.08)
Time (quadratic)		-.50 (.08)***	-.50 (.08)***	-.52 (.08)***
Time x group				.47 (.75)
Time x attendance				.16 (.08)*
Time x site				-.03 (.48)
Random effects				
Level-1				
Within-person	15.74 (.68)***	12.81 (.57)***	12.83 (.58)***	12.78 (.57)***
Level-2				
Intercept	22.98 (3.87)***	17.20 (3.25)***	14.34 (2.79)***	14.49 (2.78)***
Time (linear)		1.57 (.35)***	1.53 (.35)***	1.00 (1.01)
Time (quadratic)		-[a]	-[a]	-[a]
Time x Group				-[a]
Time x Attendance				.00 (.01)
Time x site				-[a]
Fit statistics				
-2LL	6666.29	6524.66	6512.82	6496.45
n parameters	3	6	15	24
AIC	6679.29	6536.66	6542.82	6546.45
BIC	6687.43	6566.94	6618.52	6672.61
Change in -2LL from previous model	-	141.63***	11.84	16.37†

Note. $^{\dagger}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$; [a]Model did not converge when added; Standard errors are between parentheses; Group mentor was included in the model but not reported; CGM = conditional growth model; -2LL = -2 log likelihood; AIC = Akaike's information criterion; BIC = Bayesian information criterion.

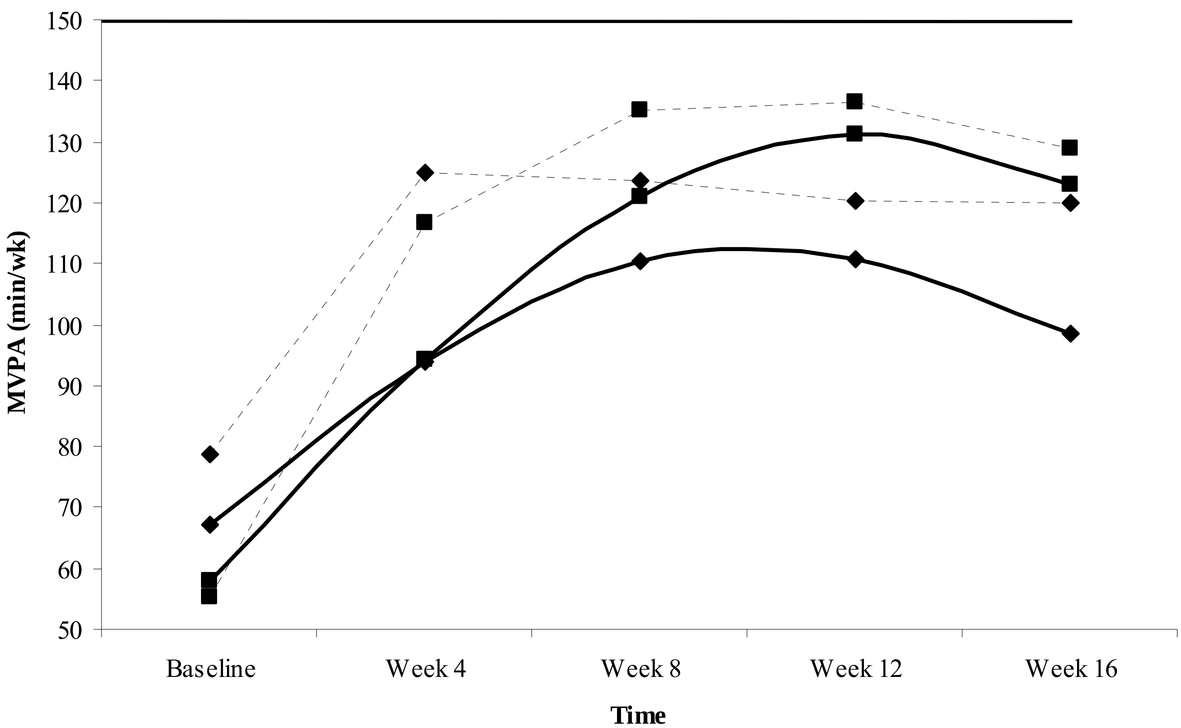


Figure 4-4. Moderate-to-vigorous physical activity empirical data and model-based estimates by group assignment adjusted for group attendance, site, and group mentor. Note. MVPA = moderate-to-vigorous physical activity; Empirical data are noted with dotted lines; Model-based estimates are noted with smoothed solid lines; Physical activity guideline of 150 minutes of MVPA/week (Nelson et al., 2007) is noted with solid line with no markers; Intervention group is noted with solid squares; Control group is noted with solid diamonds.

Table 4-15. MET estimate model tests with group assignment controlling for group attendance, site of intervention, and group mentor.

	Unconditional Means Model	Unconditional Growth Model	CGM Main effects	CGM Interactions
Fixed effects				
Initial status				
Intercept	2.60 (.12)***	2.22 (.12)***	1.05 (.63)†	1.15 (.64)†
Group			.32 (.51)	.28 (.52)
Attendance			.05 (.04)	.04 (.04)
Site			.68 (.36)†	.68 (.36)
Rate of change				
Time (linear)		.38 (.06)***	.37 (.06)***	.22 (.18)
Time (quadratic)		-.07 (.01)***	-.07 (.01)***	-.07 (.01)***
Time x group				.09 (.12)
Time x attendance				.01 (.01)
Time x site				.02 (.08)
Random effects				
Level-1				
Within-person	.42 (.02)***	.34 (.02)***	.34 (.02)***	.34 (.02)***
Level-2				
Intercept	1.08 (.18)***	.97 (.17)***	.84 (.15)***	.84 (.15)***
Time (linear)		.04 (.01)***	.04 (.01)***	.03 (.01)*
Time (quadratic)		-[a]	-[a]	-[a]
Time x Group				-[a]
Time x Attendance				-[a]
Time x site				.01 (.02)
Fit statistics				
-2LL	2533.94	2409.39	2398.83	2390.35
n parameters	3	6	15	24
AIC	2539.94	2421.39	2428.83	2440.35
BIC	2555.08	2451.67	2504.53	2566.51
Change in -2LL from previous model	-	124.65***	10.56	8.48

Note. †$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$; [a]Model did not converge when added; Standard errors are between parentheses; Group mentor was included in the model but not reported; CGM = conditional growth model; -2LL = -2 log likelihood; AIC = Akaike's information criterion; BIC = Bayesian information criterion.

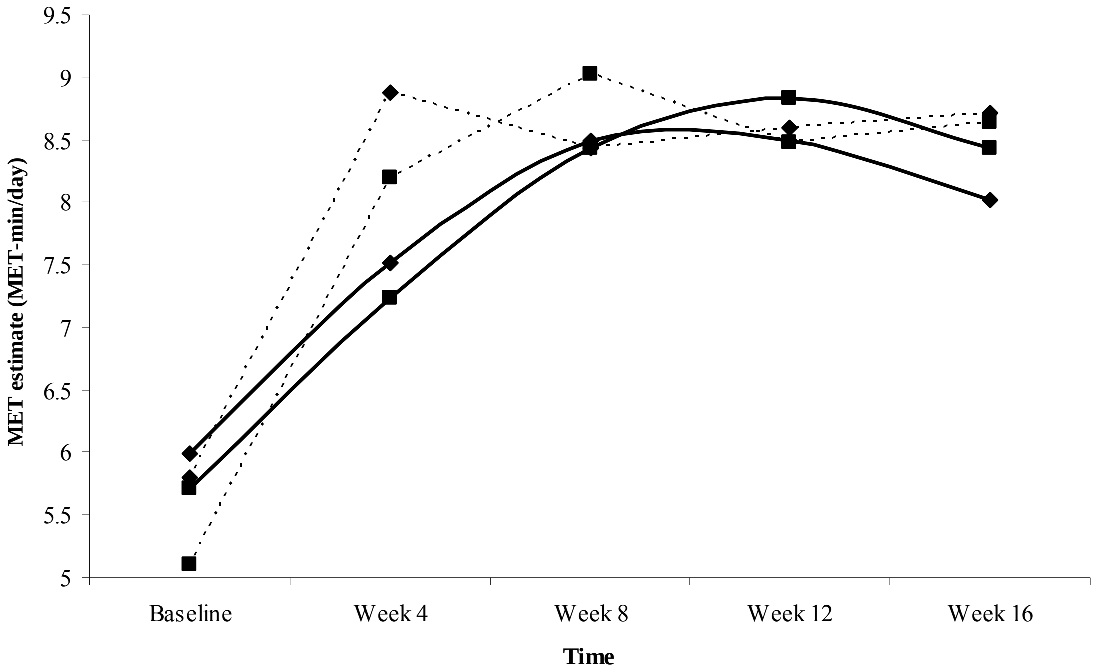


Figure 4-5. MET estimate empirical data and model-based estimates by group assignment adjusted for group attendance, site, and group mentor. Note. Empirical data are noted with dotted lines and diamond markers; Model-based estimates are noted with smoothed solid lines; Intervention group is noted with solid squares; Control group is noted with solid diamonds.

Table 4-16. Pedometer steps model tests with group assignment controlling for group attendance, site of intervention, and group mentor.

	Unconditional Means Model	Unconditional Growth Model	CGM Main effects	CGM Interactions
Fixed effects				
Initial status				
Intercept	78.21 (1.65)***	75.33 (1.87)***	58.10 (9.70)***	55.44 (9.74)***
Group			11.80 (7.93)	14.23 (7.94)†
Attendance			0.88 (.63)	1.06 (.64)†
Site			6.36 (5.51)	7.49 (5.51)
Rate of change				
Time (linear)		3.23 (.88)***	3.20 (.88)***	6.49 (2.40)**
Time (quadratic)		-0.65 (.18)***	-0.64 (.18)***	-0.68 (.18)***
Time x group				-1.92 (1.42)
Time x attendance				-0.27 (.17)
Time x site				-1.05 (.97)
Random effects				
Level-1				
Within-person	82.95 (3.60)***	69.70 (3.17)***	69.63 (3.16)***	69.56 (3.15)***
Level-2				
Intercept	208.31 (34.39)***	225.77 (38.80)***	207.19 (35.81)***	203.10 (34.98)***
Time (linear)		7.99 (1.97)***	8.15 (2.00)***	0.06 (1.65)
Time (quadratic)		-[a]	-[a]	-[a]
Time x group				4.95 (3.00)†
Time x attendance				-[a]
Time x site				7.61 (3.65)*
Fit statistics				
-2LL	8560.00	8473.00	8466.67	8448.22
n parameters	3	6	15	24
AIC	8566.00	8485.00	8496.67	8500.22
BIC	8581.12	8515.24	8572.26	8631.45
Change in -2LL from previous	-	87.00***	6.33	18.45*

Note. †*p* < .10; **p* < .05; ***p* < .01; ****p* <.001; [a]Model did not converge when added; Standard errors are between parentheses; Group mentor was included in the model but not reported; CGM = conditional growth model; -2LL = -2 log likelihood; AIC = Akaike's information criterion; BIC = Bayesian information criterion.

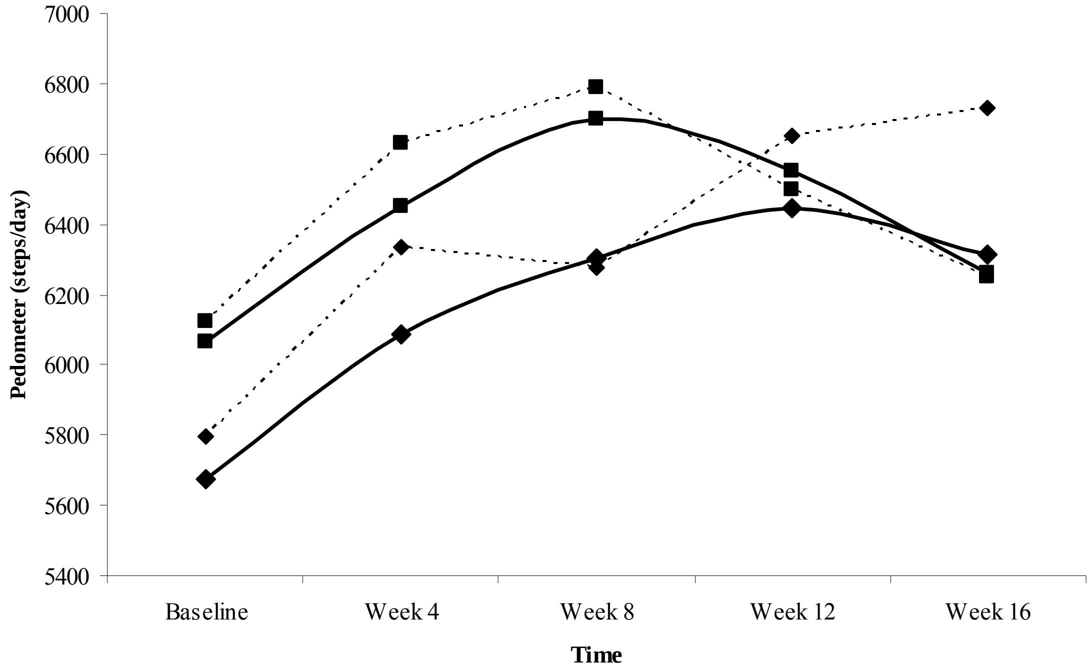


Figure 4-6. Pedometer steps empirical data and model-based estimates by group assignment adjusted for group attendance, site, and group mentor. Note. Empirical data are noted with dotted lines and diamond markers; Model-based estimates are noted with smoothed solid lines; Intervention group is noted with solid squares; Control group is noted with solid diamonds.

Table 4-17. Mixed between-within differences in cardiorespiratory fitness by group assignment controlling for attendance, site of the intervention, and group mentor ($N = 68$).

Source	Sum of squares	*df*	Mean Square	*F*	*p*	η^2
Between-subject						
Group	66.47	1	66.47	0.61	0.44	0.01
Attendance	30.74	1	30.74	0.28	0.60	0.00
Site	206.92	1	206.92	1.89	0.17	0.03
Within-subject						
Time	22.18	1	22.18	1.16	0.29	0.02
Time x group	11.92	1	11.92	0.62	0.43	0.01
Time x attendance	34.07	1	34.07	1.78	0.19	0.03
Time x site	37.59	1	37.59	1.97	0.17	0.03

Note. Group mentor was included in the model but not reported.

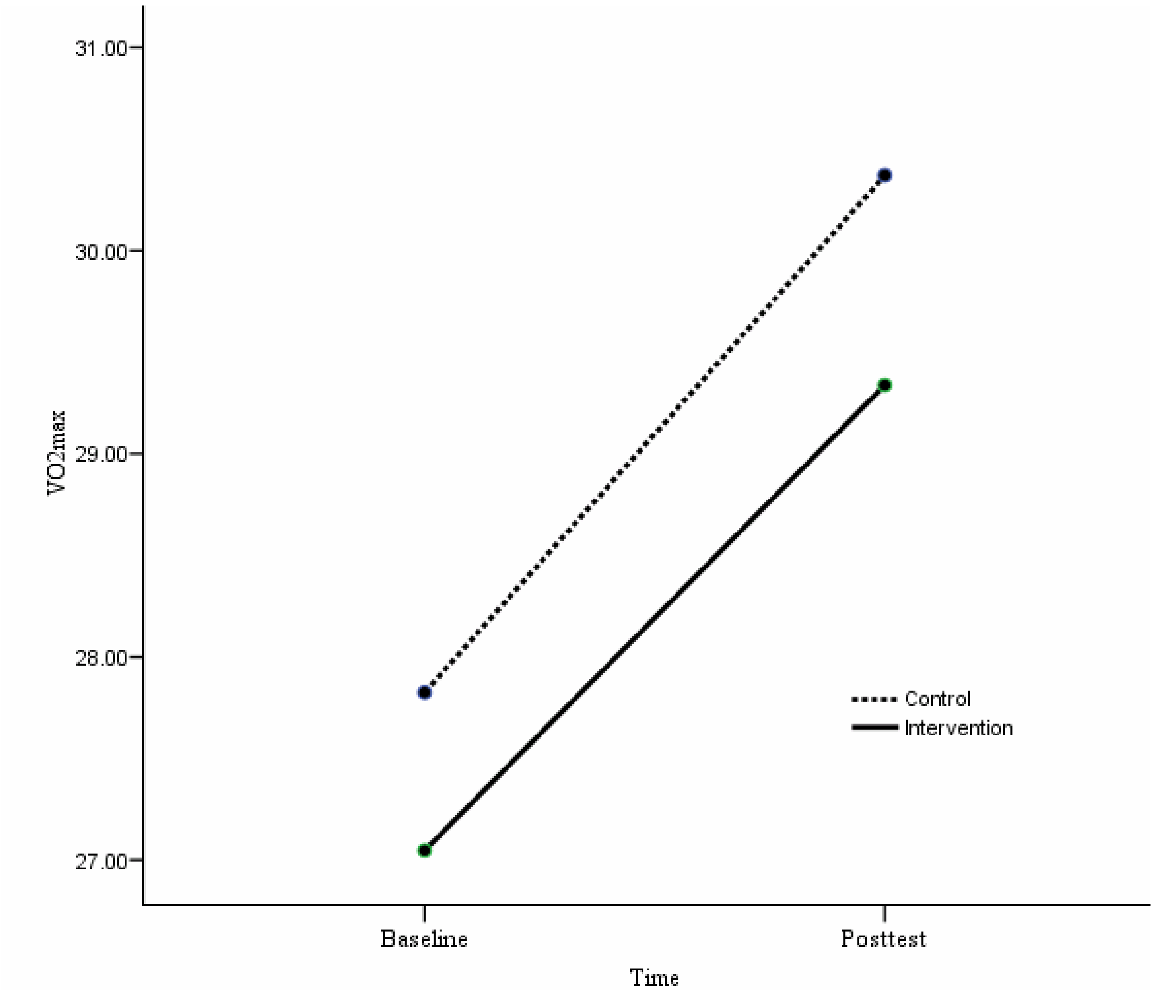


Figure 4-7. Model-based estimates of cardiorespiratory fitness by group assignment adjusted for group attendance, site of the intervention, and group mentor (*N* = 68).

Table 4-18. Significant fixed effects for exploratory predictors and changes in model fit for three separate models of moderate-to-vigorous physical activity, MET estimate, and pedometer steps.

	Estimate	*SE*	*df*	*t*	*p*	Change in -2LL from final hypothesized model
MVPA model						721.68***
VO^2max	0.05	0.09	82.78	2.00	0.05	
MET estimate model						259.26***
Pedometer model						946.55***
Age	-0.90	0.26	75.63	-3.45	0.001	

Note. ***p < .001; MVPA = moderate-to-vigorous physical activity.

CHAPTER 5
DISCUSSION

The general objective of our study was to determine whether a peer-assisted PA intervention, based largely upon social cognitive and social ecological foundations of behavior change, could lead to changes in beliefs, attitudes, and behaviors regarding PA. Social cognitive based beliefs and attitudes (e.g., self-efficacy) were measured along with self-reported PA and pedometer steps over a 16-week randomized trial. Collectively the results of our study indicated mixed support for the hypotheses that the intervention impacted social cognition and PA levels.

Summary of Findings

Changes in Social Cognition

The primary purpose of the study was to examine whether the intervention could improve social cognitive beliefs and attitudes regarding PA behavior over a control group matched for social contact and peer mentorship. Social cognitive beliefs and attitudes measures were self-efficacy and self-determined behavior. For self-efficacy (BSE and EXSE composite), both groups exhibited modest, yet significant, declines in self-efficacy. This finding did not support a primary research hypothesis. For self-determined behavior, a marginally significant time x group interaction was observed, indicating that the intervention group moved toward more intrinsic forms of motivation for exercise and PA behavior compared to the control group. This marginal effect showed tenuous support for another primary research hypothesis.

Self-efficacy

The lack of improvements, and modest declines in fact, regarding self-efficacy were surprising given the large body of evidence demonstrating short-term and long-term relationships between self-efficacy and PA behavior with older adults (McAuley et al., 2005). Because improvements in PA were observed in both groups in our intervention, changes in self-efficacy were to be expected. The negative time trend suggests that perhaps participants became increasingly discouraged by unsuccessful attempts at PA initiation. This may have occurred if participants set unrealistic goals, were not able to effectively plan for and overcome barriers, or were simply not prepared for the challenge of adopting a new behavior. This would be consistent with Bandura's (1986, 1997) theorizing that past performance accomplishments strongly predict self-efficacy toward a behavior.

Despite not observing the broad time x group effects expected, the weekly assessment of self-efficacy allowed us to observe temporal changes across different phases of the intervention. Unfortunately, the study lacked sufficient power to pick up these small effects and suggests a need for additional data. As shown by the empirical data plots in Figure 4-2, self-efficacy in the intervention group had a marked decline across the first phase of the trial (weeks 1 to 4), followed by a steady, yet modest increase from week 4 to the end of the intervention. The health hygiene control displayed mirrored results, within initial increase followed by a steady, modest decline. The short-term changes observed from baseline through the first phase reveal interesting findings about the PA behavior initiation process. Because intervention group participants set realistic and challenging personal goals, it is possible that early attempts at reaching those goals were unsuccessful, resulting in initial declines in self-efficacy. In later weeks, as these goals were appropriately modified (see Table 3-1; goals were re-visited in weeks 7, 9, 12, and 14) and group social support became stronger, self-efficacy began to rise. If this were true, one would expect long-term assessments of self-efficacy (i.e., 6-months, 1-year) would result in increases in self-efficacy that exceed baseline levels.

A couple of methodological concerns may also help to disentangle these unexpected results. First, because these measures were given repeatedly over the intervention (18 times total) and were part of a larger battery of weekly psychosocial and neuropsychological measures, it is possible that fatigue or boredom was experienced by participants and artificial uniformity in responses resulted. This was evidenced by internal consistencies for BSE ($\alpha = .95$) and EXSE ($\alpha = .99$) that were abnormally high and higher than previously published reports using these measures (McAuley et al., 1999; McAuley et al., 2005). Additionally, the intraclass coefficient for the self-efficacy composite was markedly high, indicating little week-to-week within-person fluctuations. This calls into question the validity of weekly assessment of the BSE and EXSE measures. While the repeated assessment of these measures is a novel methodological strategy that is worthy of continued study, care must be taken in choosing the appropriate temporal spacing of assessments. To our knowledge no previous studies have assessed changes in self-efficacy at the weekly level. In the current study, four-week timelags that had conceptual meaning (i.e., initiation, maintenance) may have been more appropriate and would have avoided fatigue and boredom while still capturing important processes of behavioral change.

Second, both measures of self-efficacy included specific behavioral targets that were not consistent or explicitly reinforced by the intervention. The behavioral target stated in the directions for the BSE measure is to exercise three times per week for three months, with no specifications of intensity or duration (see Appendix I). The behavior target for EXSE, on the other hand, is to exercise for 40 or more minutes on three days of the week (see Appendix J). The mismatch of these behavior targets may have caused confusion for participants leading to a certain degree of measurement error. Moreover, neither of these behavioral targets were consistent with the instructions given to participants on the appropriate intensity, duration, or mode of PA. Because both measures have been widely used with general and older adult populations (Blissmer & McAuley, 2002; McAuley et al., 2003; McAuley et al., 2005), have undergone some psychometric testing (Duncan & McAuley, 1993; McAuley, 1992, 1993; McAuley, 1993b; McAuley et al., 1994), and have demonstrated some remarkable consistencies in reliability and validity evidence for many years, future peer-assisted interventions should ensure that these measures are modified to more clearly and directly tap into specific behavioral targets established for the intervention (i.e., ACSM/CDC physical activity recommendations). In our study, the self-directed and autonomous nature of the intervention made this type of behavioral target difficult to achieve, which make conclusions about how self-efficacy toward PA changed over the course of the intervention difficult to ascertain.

It should also be noted that the addition of model covariates and exploratory predictors explained further variance in initial status (i.e., main effects) and the time trend (i.e., interactions) in self-efficacy. The intervention site appeared to play a marginal role, with individuals at the community church displaying higher self-efficacy compared to the university facility. While reasons for this disparity are tenuous, ecological differences between the facilities such as parking, traffic, and general aesthetics may have played a role. This is an interesting finding to note, confirming previous theoretical discussions regarding the impact of ecological factors on individual-level constructs such as self-efficacy (King et al., 2002; Satariano & McAuley, 2003). Also, attendance positively moderated the time trend in self-efficacy. This suggests that a dose-response relationship may exist between some component of the intervention and self-efficacy. Because this effect was not localized to the intervention group (i.e., a three-way interaction), it remains unclear if the discussions about PA, the peer mentoring relationship, or merely the social contact were responsible for this effect.

Self-determined behavior

While only marginally significant, baseline-posttest changes in self-determined behavior indicated that intervention group participants significantly moved toward more intrinsically-motivated PA behavior over the course of the intervention. This was perhaps due to the self-determined environments that were created as part of the AAMP intervention. Specifically, perceptions of autonomy and competence were fostered through self-directed behavior where encouragement was given for setting realistic and attainable goals. Relatedness was fostered through same aged peers that created supportive environments where behavioral change could be achieved. It should be noted, however, that the effect size for this change was small. This latter finding may have been due to a ceiling effect, as self-determined behavior at baseline fell well above the midpoint of the self-determination continuum, indicating individuals began the study with more intrinsic forms of motivation toward PA (see Figure 4-3).

The implications of motivation toward PA that is more intrinsic in nature (e.g., having fun while exercising) compared to extrinsic (e.g., exercising to improve appearance) are valuable. While Frederick and Ryan (1993) suggest that extrinsic motivation may foster PA initiation, intrinsic motivation is clearly linked to long-term maintenance of PA behavior (Ryan et al., 1997). Given this, it is important to note that age was inversely associated with intrinsic behavior in the current study. It may be that older individuals interpreted physical activities available to them as not enjoyable or their reasons for PA were targeted exclusively upon avoidance of certain health conditions and therefore they felt compelled to engage in these activities. Younger individuals in the study may have had reasons for PA that were more intrinsically motivated (i.e., identified regulation, integrated regulation, intrinsic motivation), such as PA for health promotion or PA for enjoyment. This suggests that when establishing an intervention where autonomy is encouraged, the PA options presented to individuals must take into account the preferences and capabilities of the target group. In this case, intrinsic motivation may have been fostered more in the older participants had activities been present that they preferred and enjoyed, specifically supervised lower intensities activities (e.g., chair dancing, water aerobics).

Unlike self-efficacy, self-determined behavior was only measured at baseline and posttest. The absence of a Week 12 assessment makes it difficult to understand the full effect of the intervention on self-determined behavior. It may be that intrinsic motivation was at its height at Week 12 and declined after the peer mentor and group meetings were reduced in weeks 13 to 16. On the other hand, intrinsic motivation may take time to be developed and the monotonic increase as pictured in Figure 4-2 is more accurate. This leaves additional questions to be answered about the process of change in self-determined behavior and how the intervention may have impacted that change. Future research should address when changes in self-determined behavior occur through repeated assessment and if these changes are sustained long-term.

Changes in Physical Activity

The results of all three dependent variables for PA (minutes of MVPA, MET-mins/day, and pedometer steps/day) indicated significant and curvilinear improvements in PA over the course of the intervention. PA levels, across all three models, could be characterized with the following time trend: (a) lowest levels of PA were at baseline; (b) monotonic increase during weeks 1 to 4 and weeks 5 to 8 phases; (c) an apparent "lev eling-off" during the weeks 9 to 12 phase; and (d) a modest, yet significant curvilinear decrease during the weeks 13 to 16 phase. While descriptive observations indicated slightly more favorable improvements in PA as measured by the MVPA and MET estimates for the intervention group, no significant time x group interactions were observed in any of the three PA models. This indicated that the intervention group did not experience statistically significant increases in PA as compared to the control group. Nevertheless, the significant time trend indicates a couple of important points regarding the intervention. First, despite differences in magnitude between measures of PA, significant improvements in PA were observed in all three measures and these improvements required up to 12 weeks to reach their peak. These significant time trends suggest that participants in both conditions were indeed sedentary at baseline and experienced meaningful improvements in PA behaviors. Few individuals during the baseline week of observation met national PA recommendations. Moreover, baseline pedometer values were considerably lower (6,125 v. 7,473) and more variable (2,934 v. 1,385) compared to a recently published meta-analysis of 26 intervention and observational studies of middle-aged and older adults (Bravata et al., 2007). This can be contrasted with model-based estimates at their peak at 130 minutes of MVPA, 8.5 MET-mins/wk for LTEQ scores, and 6600 pedometer steps/day, indicating not only statistical improvements but also improvements with practical significance. For example, individuals moved from less than 60 minutes a week of MVPA to almost reaching the ACSM/CDC recommendations of 150 minutes of MVPA each week (Nelson et al., 2007). It should be noted, however, percentage of improvement in PA from baseline to peak varied markedly by PA measurement (116% for MVPA, 55% for MET-mins/wk, and 10% for pedometer steps/day). These disparate changes by PA measurement would indicate that behavioral change occurred most dramatically among minutes of MVPA (the most sensitive measure of moderate and vigorous activities), and less dramatically among MET-mins/day and pedometer steps (more sensitive to all types of leisure-time activity and movement patterns). This finding would suggest that the intervention had its greatest impact on the types of activity suggested by the ACSM/CDC physical activity guidelines for older adults (Nelson et al., 2007) and have demonstrated links with important health outcomes including improved cardiovascular health (Mazzeo et al., 1998; Singh, 2002), reduction in coronary heart disease risk (Haskell et al., 1992), and premature mortality (Bean et al., 2004; Lee & Paffenbarger, 1996).

Second, the maintenance effect that occurred during the weeks 9 to 12 phase demonstrates that gains in PA behavior can be sustained at least initially if behavioral reinforcements and social ecological determinants remain constant. While more research is clearly needed, both groups benefited from regular meeting with a group mentor, access to an exercise facility, and continuous behavioral feedback and self-monitoring (i.e., use of pedometer, recording daily activity). The gains that were achieved initially were largely maintained during the maintenance phase, a finding that may have implications for long-term interventions that seek to encourage maintenance of behaviors. Researchers should focus on establishing environments with the following characteristics: (a) regular and appropriate social influences that cue behavioral patterns from initiation stage; (b) ensuring when possible that financial and environmental constraints to PA are minimized; and (c) self-monitoring skills are in place.

Finally, the modest decline in PA during the final phase provides another line of reasoning as to the plausibility of using peer mentors as behavior change agents. During this final phase, two important elements of the intervention were modified: the exercise membership was withdrawn from the participants and contact with the peer mentors was reduced significantly (only one session compared to four sessions during previous phases). All self-monitoring continued throughout this phase. One may argue that the decline in activity could be attributed to the lack of an exercise facility. While the extent of facility use was not monitored in our study, and participants were encourage to engage in PA both within and outside the facility, cursory observations indicated that the facility equipment was seldom used at any point in the intervention. Participants preferred to be physically active at home or at other community locations. This is consistent with past literature that suggests older adults may prefer home-based

PA (King, Haskell, Taylor, Kraemer, & DeBusk, 1991; King, Haskell, Young, Oka, & Stefanick, 1995; Perri, Martin, Notelovitz, Leermakers, & Sears, 1997).

The alternative explanation then is that the declines can be attributed to reduced contact with the peer mentor and the group environment. This suggests that the use of a peer mentor may account for at least a portion of the original improvements in PA, and may also aid in maintenance of PA behavior. The delivery of the intervention by a peer mentor may have fostered an environment of relatedness that was conducive to change according to self-determination theory (Deci & Ryan, 1985). Likewise, peer mentors may have served as significant social influences by discussing or demonstrating PA behaviors (i.e., vicarious experience), educating participants about the benefits of PA (i.e., verbal persuasion), or encouraging participants that they can reach their PA goals (i.e., perceptions of competence). Even without gains in self-efficacy, there is evidence to suggest that social support may directly influence PA behavior (Resnick, 2001, Resnick et al., 2002; Estabrooks & Carron, 1999). Finally, peer mentors may have also have been able to influence individuals' perceptions of competence through making encouraging statements, reminding participant of past success in behavioral change, and modeling positive behaviors. Deci and Ryan (1985) have suggested that perceptions of competence is the strongest mediator of intrinsic motivation, so the influence of these statements on PA behavior may have been important. When contact with the peer mentors was then withdrawn in the final phase of the intervention, some declines in PA behavior were observed. Moreover, the fact that peer mentors in the health hygiene group, who simply engaged participants in discussions about age-appropriate health topics (e.g., cancer screening, osteoporosis), were able to increase PA significantly (with a similar modest decline in the final phase) provides even more support for the use of peer mentors as behavior change agents.

Finally, differences in PA as a function of the measure used were evident throughout the study. Indeed, low correlations between pedometer steps/day and both minutes of MVPA and MET-mins/day were observed. These low correlations have been observed in other studies that have measured self-report and objective measures of PA concurrently. It is important, however, to understand that these measures theoretically tap into distinct aspects of PA behavior, and exclude and underestimate others. MET-mins/day includes mild, moderate, and vigorous activity and simultaneously can account for both intensity and duration of activity. This MET estimate however may overestimate activity as it includes mild activities that require minimal effort and have minimal health benefits (Pate et al., 1995). Minutes of MVPA has the advantage of allowing comparisons in activity directly to the ACSM/CDC PA guidelines (Pate et al., 1995; Nelson et al., 2007) by only including moderate and vigorous forms of activity. The disadvantage of the MVPA calculation is that it underestimates energy expenditure and the added benefit of vigorous over moderate types of activity. Both MET-mins/day and minutes of MVPA have the disadvantage of self-report bias, although the current study tried to minimize this bias by having daily instead of weekly recall. Finally, while pedometer counts have the advantage of being objective, they have a number of well-documented limitations, including the inability to capture intensity of movement and water activities, diminishing calibration over time, and biased readings when not worn appropriately (Tudor-Locke et al., 2002). All of these limitations could have lead to measurement error and biased the results. Future research should carefully consider the use of accelerometers and other methods to minimize measurement error for PA and health-related research. Accelerometers can capture movement of all types and have the capability of recording movement at second and minute intervals. Additionally, accelerometer cut-points have now been established that allow for calculations of minute-by-minute classifications of moderate and vigorous activities (Bassett, Ainsworth, Swartz, Strath, O'Brien, & King, 2000; Melanson, Melanson, & Sirard, 1998). This makes comparisons with PA guidelines possible.

Changes in Cardiorespiratory Fitness

Without controlling for the model covariates, individuals (regardless of group assignment) significantly improved their cardiorespiratory fitness over the course of the intervention. This was consistent with the observed changes in PA over the intervention. These effects diminished after including the model covariates, however the time trend continued in the hypothesized direction. Given the observed gains in PA over the course of the intervention, modest improvements in cardiorespiratory fitness were expected, despite the relatively short period in which these effects were observed. Future extensions of peer-assisted research should consider adding measurement timepoints of six months and one year to demonstrate longer-term maintenance of PA resultant improvements in cardiorespiratory fitness. The lack of significance after adding model covariates indicates that our sample was under-powered to detect such small changes in fitness, and perhaps, there was considerable between-subject variability in improvement that was captured by the model covariates.

The implications of detecting changes in cardiorespiratory fitness are essential in demonstrating the efficacy of any PA intervention. Cardiorespiratory fitness has established links to premature mortality, reductions in chronic disease, and longevity (DiPietro, 2001; Liu-Ambrose et al., 2004; Lee & Paffenbarger, 1996). In addition to fitness outcomes, future research should include other secondary outcomes that are linked to physical functioning and quality of life including perceptions of physical and psychological health, life satisfaction, physical performance, and instrumental activities of daily living and activities of daily living.

Strengths and Limitations

Strengths

Perhaps the greatest strength of our study was the novelty of its intervention components. To our knowledge this is the only study to examine the effects of a peer-assisted PA intervention within a group-based setting. Peer mentors have recently been used in one-on-one behavioral counseling setting (Castro, Pruitt, French, & King, 2008), however Project AAMP is the first study where mentors have been recruited, trained, and delivered a social cognitive based PA intervention to a group of sedentary adults within such an autonomous framework. This is also the first PA intervention that has made the use of mental imagery a major component of the intervention. The guiding theoretical framework (see Figure 2-1) represents a novel integration of goal setting, social support, and mental imagery designed to impact social cognitive beliefs and attitudes that underpin PA behavior.

Another strength of our intervention was its close adherence to recommendations of the RE-AIM framework (Glasgow et al., 1999). The purpose of these recommendations was to improve the ecological validity and impact of health behavior interventions. The current intervention addressed these recommendations by using peer mentors (adoption: peer mentors are a relatively inexpensive alternative to highly-trained behavioral counselors), monitoring quality control (implementation: peer mentors were monitored and provided feedback for delivery of intervention content), and assessing short-term sustainability (maintenance).

Overall retention of program participants was a strength of the study as 85% of those who began the study completed the final assessments. Even after accounting for the 10 individuals who were randomized but dropped out prior to their knowledge of group assignment, this retention rate was 76%. This retention rate is similar to recently published interventions of autonomous lifestyle interventions (Dunn, Marcus, Kampert, Garcia, Kohl, & Blair, 1999;

Jancey et al., 2006; Jancey, Lee, Howat, Clarke, Wang, & Shilton, 2007) and lower than more structured, center-based trials (Cox, Burke, Gorely, Beilin, & Puddey, 2003; Life Study Investigators, 2006). Missing data among study completers was a minimal concern as adherence to daily logs was excellent, despite some dropoff during the final phase of the intervention. Incomplete data among study dropouts was accommodated with FIML estimation procedures that produced less biased estimates compared to listwise deletion or mean replacement procedures.

Finally, the use of repeated, concurrent assessment of the social cognitive and behavioral outcomes was another design strength of the study. Repeated assessment of self-efficacy allowed us to understand the course of change in self-efficacy across initiation and maintenance stages of behavioral adoption for the current sample. Also, repeated assessments of self-efficacy allowed us to determine the appropriate temporal spacing of measurement for future studies. Daily assessment of PA reduced recall bias. Concurrent assessment of self-report and objective forms of PA behavior allowed us to study how different dimensions of movement were impacted by the intervention. Repeated assessment also allowed us, for both self-efficacy and PA, to simultaneously explain both within- and between-person differences in study outcomes. While our multilevel models primarily were able to predict between-person differences, this design feature is essential in understanding how to reduce within-person fluctuations (i.e., increase consistency) in PA behavior over time.

Limitations

A few important limitations of this research bear mention. First, great efforts were taken in the selection of an appropriate control condition to match for social contact effects. This required the use of peer mentors to deliver age-tailored health information to control group participants. This information and social contact, along with a desire from participants to initiate PA and monitor activity with the daily logs, perhaps created a control group where participants were motivated to increase PA and therefore poorly representative of a “usual care” condition. This made firm conclusions about the intervention (particularly the utility of peer mentors) and its effects on PA behavior difficult to establish. Future researchers that seek to examine the use of peer mentors and the guiding integrative social cognitive model should take care in research design to avoid this pitfall. The utility of peer mentors may best be examined in future research with a three-group design that includes a “usual-care” control, a previously efficacious intervention delivered by trained professionals, and an identical intervention delivered by peer mentors. Traditional time x group tests could examine if improvements for both intervention groups exceed those of the control condition while equivalence testing could examine if peer-assisted delivery was equivalent to delivery by trained professions. Future studies that seek to examine the intervention framework presented here (see Figure 2-1) may consider a waitlist control design to examine how the active components of the intervention (goal setting, mental imagery, and social support) uniquely impacted PA behavior free of the social contact influences of peer-assisted delivery format and compared to a true no-contact control. Moreover, researchers are encouraged to step back and separately evaluate the individual components of the intervention (e.g., peer mentoring, goal setting, mental imagery) before moving forward to the test the “packaged,” multi-component intervention.

A second limitation was the exclusion of specific behavioral targets for the intervention group participants. This was done purposefully to support the self-determined foundations of the intervention and to encourage autonomy in behavior change. Likewise, the lack of direct PA supervision was put in place to encourage long-term maintenance and sustainability after program completion and any supervision was withdrawn. These two factors may have left participants with insufficient guidance to initiate favorable levels of PA compared to a robust control group. It should be noted, however, that despite a lack of behavioral targets, results of minutes of MVPA indicated that individuals in the intervention group were able to come close to achieving the ACSM/CDC PA guidelines (Pate et al., 1995; Nelson et al., 2007) while still providing choice and flexibility in the amount, intensity, and mode of PA. This is an important observation because autonomy was a central characteristic of our intervention but perhaps a greater degree of structure and guidance is necessary in order to increase PA levels toward public health recommendations.

The third limitation of this research deals with the lack of generalizability of its findings. Of the 433 individuals who expressed initial interest in the study, only 16% (N = 69) completed the study protocol (see Figure 3-1) and the majority of these individuals were white females. Because many individuals lost interest before the study began, it is difficult to ascertain the full range of potential influences on program participation. Exclusionary criteria also limited our generalizability, with the largest number of participants were for being on heart-rate attenuating medications, PA levels, and cognitive status respectively. Finally, efforts were made during the recruitment process to over-recruit non-Whites (particularly Blacks) and men. These efforts proved unsuccessful as only 8.6% of the final sample was non-White and 15.9% were men. Future researchers should focus on recruiting and retaining a more diverse sample consistent with population demographics in the United States.

The fourth limitation of this research deals with assessing the effectiveness of individual mentors. While continuous monitoring by research staff was conducted to ensure adherence to the guiding model and research protocol by the mentors, little was done to assess what distinguished effective from ineffective mentors. The underlying assumption was that same aged peer mentors would more effectively engage participants, yet it was clear that individual differences between mentors may have determined a large range of group and participant outcomes. Although we were able to statistically control for these variant outcomes and address intervention-level changes free of mentor-specific differences, a question we were unable to address was what characteristics made a mentor particularly effective at enhancing self-efficacy beliefs and PA behavior. This is an important question to address for future studies that use peer mentors. Social cognitive theory (Bandura, 1986, 1997) suggests that the match between participant and modeling agent characteristics is an important determinant of the formation of self-efficacy beliefs through vicarious experiences, verbal persuasion, and perceptions of performance accomplishments. There was some suggestion throughout the intervention process that attrition among women increased in groups where the mentor was male. Likewise, groups where mentors were perceived as more supportive and empathetic resulted in the greatest PA gains. Because formal examinations of these observations were not possible, future social cognitive interventions should focus on and collect additional information about the mentors and the mentor-participant interactions. Furthermore, recordings of the group meetings and interviews of the participants at posttest were collected and may, in the future, clarify what individuals perceived to be effective strategies and characteristics of the peer mentors.

The final limitation deals with the imprecision of measurement and the relative large variability associated with the PA and self-efficacy measurements. By nature, day-to-day and week-to-week fluctuations in PA behavior are normal and can be efficiently estimated with multilevel modeling approaches. This was evidenced by large standard deviations in the PA measures after the baseline phase, indicated that as individuals became more active variability in the activity also increased. This large amount of variability however made interpretations of estimates at the week-level difficult. Consequently time was aggregated across behavioral phases (initiation, maintenance, sustainability), which resulted in slightly less powerful models (however estimates remained similar). Perhaps another source of power loss was the inflated standard errors that were present in the PA measures. Unfortunately, normal variability in PA behavior not accounted for by the model predictors and measurement error associated with self-reported PA and pedometer could not be distinguished from one another. In conclusion, the imprecision of self-report and objective measurements of PA in our study made small and moderate effects (e.g., time x group interactions) difficult to detect in the models. More accurate assessments of PA (i.e., accelerometers) in future studies could potentially detect small effects that were observed in the descriptive data.

Future Directions

While specific research recommendations have been made throughout this discussion section to extend various lines of research or address limitations of the current study, a few broad recommendations are presented below as future directions that build upon the strengths of the current intervention.

First, the guiding theoretical framework (see Figure 2-1) presented in the current intervention is flexible and has the potential to be utilized across a wide range of health behaviors (weight management, smoking cessation), with a wide range of targeted populations (e.g., children, chronically ill), in a variety of communication and delivery formats (e.g., internet, telephone, mail-based). Future researchers interested in targeting specific sub-groups may consider adapting the current intervention, or various components of the intervention, in ways to enhance adoption and minimize relevant barriers.

Second, the results of our study, along with a growing body of literature in other health domains (Riegel & Carlson, 2004; Sheppard, et al., 2008; Zimmerman & Bingenheimer, 2002), provides preliminary evidence to support the use of peer mentors as a viable alternative to standard delivery formats. Theoretically-driven intervention strategies that use peer-assisted delivery formats may reduce program resources and increase ecological validity of the intervention. While a lack of time x group interactions precludes us from making definitive recommendations about peer mentors and the theoretical model, the increases in intrinsic motivation and the positive improvements in behavior established these strategies as viable alternatives to more traditional approaches.

Finally, future iterations of the current intervention would be improved by more fully engaging macro- and meso-environmental factors that are associated with PA. Social ecological approaches (King et al., 2002) that account for environmental, individual, and transactional influences on volitional behavior are needed. This can be accomplished by situating future intervention efforts in a variety of community settings and adapting the interventions to reduce relevant barriers for that community. Community-based participatory approaches may help to inform the specific modifications that need to be made for the intervention to be successful. The engagement of community resources and ecological influences may boost the overall power of the intervention.

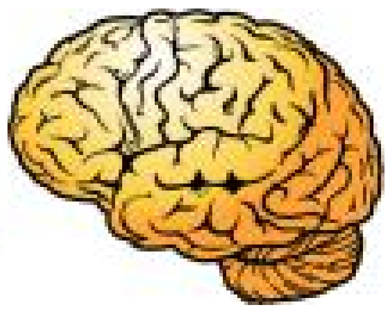
Conclusion

In conclusion, this project sought to examine the utility of a peer-assisted PA intervention for increasing social cognitive beliefs and attitudes regarding PA and increasing PA behavior. The findings showed mixed results. The intervention did not increase self-efficacy, marginally increased intrinsic motivation in the intervention group, and showed positive, curvilinear growth for PA and small improvements in cardiorespiratory fitness in both groups. Future research should continue to explore ways to increase PA behavior in older adult populations through the use of peer mentors and a theoretical model that can be easily and inexpensively delivered to a wide range of population subgroups.

APPENDIX A
RECRUITMENT FLYER: LIVING WELL

ADULTS AGED 50 YEARS AND OLDER

VOLUNTEERS NEEDED FOR EXERCISE AND HEALTH STUDY FOR OLDER ADULTS



CONNECT WITH OTHER OLDER ADULTS WHO SHARE YOUR CONCERN FOR EXERCISE AND HEALTH

Some details:

- **Seeking seniors who** *do not currently exercise regularly.*
- **All senior volunteers will participate in small groups. Participants will receive mentoring and education about either exercise or health issues.**
- **Participants will attend 18 weekly sessions, including regular testing and the health promotion classes**
- **All participants will receive a limited membership to the University of Florida's *Living Well* fitness facility, at no cost. The non-renewable membership is limited to twelve weeks.**
- **Weekly testing will monitor exercise participation, as well as any changes in fitness, health, emotional and mental functioning.**
- **Participants will also wear an activity monitoring device, and complete a daily one-page exercise and sleep log.**

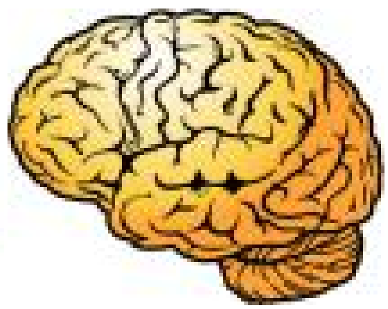
If you would like more information, please contact **Matt Buman** for more information at (352) **392-0584 ext. 1236** or via e-mail at **mbuman@hhp.ufl.edu**

This study has been approved by the Institutional Review Board (IRB02) at the University of Florida.

APPENDIX B
RECRUITMENT FLYER: WESTSIDE BAPTIST CHURCH

ADULTS AGED 50 YEARS AND OLDER

VOLUNTEERS NEEDED FOR EXERCISE AND HEALTH STUDY FOR MIDLIFE AND OLDER ADULTS



CONNECT WITH OTHER MIDLIFE AND OLDER ADULTS
THE STUDY WILL BE CONDUCTED HERE IN WEST GAINESVILLE
AT WESTSIDE BAPTIST CHURCH

Some details:

- **Seeking adults and seniors who** *do not currently exercise regularly.*
- **All volunteers will participate in small groups. Participants will receive mentoring and education about either exercise or health issues.**
- **Participants will attend 18 weekly sessions, including regular testing and the health promotion classes**
- **All participants will receive a limited membership to the** Westside Baptist Church fitness facility**, at no cost. You will also have the option to pay to extend your membership after the study is completed.**
- **Weekly testing will monitor exercise participation, as well as any changes in fitness, health, emotional and mental functioning.**
- **Participants will also wear an activity monitoring device, and complete a daily one-page exercise and sleep log.**

If you would like more information, please contact **Matt Buman** for more information at (352) **392-0584 ext. 1236** or via e-mail at **mbuman@hhp.ufl.edu**

This study has been approved by the Institutional Review Board (IRB02) at the University of Florida.

APPENDIX C
DEMOGRAPHIC AND SCREENING INSTRUMENT

ASK GENDER (2) ONLY IF NOT KNOWN OR UNABLE TO DETERMINE. OTHERWISE, CODE QUEST. 2 AND NOW ASK PREFERRED TITLE QUESTION.

2. Are you male or female?

MALE........................... 1 [Is that Mr., Dr., Rev., or other?]
RECORD PREFERRED TITLE ON CONTACT RECORD.

FEMALE.......................2 [Is that Mrs., Miss, Ms., Dr., Rev., or other?]
RECORD PREFERRED TITLE ON CONTACT RECORD.

3. What is your date of birth? .___/____/._______

IS PARTICIPANT'S AGE WITHIN 6 WEEKS OF 50th BIRTHDAY OR OLDER TODAY?

YES 1

NO 2	**INELIGIBLE: READ SCRIPT BELOW AND END INTERVIEW**

AGE INELIGIBILITY CLOSE-OUT SCRIPT:

These are the only questions I need to ask. This research study is designed for people who are age 50 or older. I would like to thank you for the time you have taken to speak with me. We will not need to contact you again for this study, but could we contact you in the future for other studies? Thank you.

3a. Is English your first language? YES ……………………………….1
NO ……………………………….2

4. What is your marital status?
[READ RESPONSE CATEGORIES IF UNABLE TO ANSWER]

MARRIED, ...1
LIVING AS MARRIED, ...2
SEPARATED, ...3
DIVORCED,...4
WIDOWED, ...5
SINGLE, OR NEVER MARRIED? 6

5. Does anyone live in the home with you?
YES..........1 NO.........2

6. What is the highest grade of school or level of education that you <u>completed?</u>[CODE ONLY ONE RESPONSE]

DID NOT GO TO SCHOOL	00	VOCATIONAL/TRAINING/ SOME COLLEGE AFTER HS GRAD	13
GRADE 1	01	ASSOCIATE DEGREE	14
GRADE 2	02	COLLEGE GRAD/BA-BS	16
GRADE 3	03	SOME PROFESSIONAL SCHOOL AFTER COLLEGE GRAD	17
GRADE 4	04	MASTER'S DEGREE	18
GRADE 5	05	DOCTORAL DEGREE (PhD, MD, DVM, DDS, JD, etc.)	20
GRADE 6	06		
GRADE 7	07		
GRADE 8	08		
GRADE 9	09		
GRADE 10	10		
GRADE 11	11		
GRADE 12/GED	12		

7. What race do you consider yourself? (PROBE: White, Black/African American, Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native, or another race?)

WHITE/CAUCASIAN 1

BLACK/AFRICAN AMERICAN 2

ASIAN 3

NATIVE HAWAIIAN/PACIFIC ISLANDER......................4

AMERICAN INDIAN/ALASKAN NATIVE.......................5

BIRACIAL...6

* SPECIFY:____

OTHER 7

* SPECIFY: _______________________________________

DON'T KNOW 8

IF PARTICIPANT IS UNABLE TO ANSWER 7, <u>PROBE:</u> Which race do you most identify with or consider yourself to be?

8. Are you Hispanic or Latino?

YES..........1 NO..........2

9. The next questions are about your vision. Do you wear glasses or contact lenses to read?
YES..........1 NO..........2

BEGINNING WITH ITEM 10a, AND FOR ALL OTHERS, DO NOT TERMINATE INTERVIEW IF INELIGIBLE. COLLECT ALL DATA, THEN READ INELIGIBILITY SCRIPT BEFORE ITEM 15.

10a. How much difficulty do you have reading ordinary print in the newspaper, [wearing glasses or contact lenses]? Would you say...

no difficulty..1 (11)

a little or some difficulty..2 (11)

extreme difficulty ....3 = **INELIGIBLE** (11)

you stopped reading because of your eyesight ....4 = **INELIGIBLE** (11)

you stopped reading for other reasons or you are not interested in reading...5 (11)

10b. How much difficulty do you have hearing conversation partners, when in small groups and there is background noise? (multiple conversations, music, white noise) What about with your hearing aid(s) on? Would you say...

no difficulty..1 (11)

a little or some difficulty..2 (11)

extreme difficulty ....3 = **INELIGIBLE** (11)

you stopped participating in small group/ social settings because of your hearing......................4 = **INELIGIBLE** (11)

you stopped participating in small group/social settings for other reasons or you are not interested in reading...5 (11)

The next few questions are about medical conditions you might have.

11. Has a doctor or a nurse ever told you that you have:

	YES	**NO**	**DK**	**N/A**
a. Alzheimer's Disease, or dementia	1 = **INELIGIBLE**	2	8	

b. Huntington's disease, with dementia symptoms	1 = **INELIGIBLE**	2	8	
c. Parkinson's disease with dementia symptoms	1 = **INELIGIBLE**	2	8	
d. Recurring epilepsy?	1 = **INELIGIBLE**	2	8	
e. Stroke?	1 = ASK NEXT QUESTION	2	8	
f. [Was it in the past year?]	1**= INELIGIBLE**	2	8	- 7
g. [Do you have limb weakness or paralysis as a result?]	1= **INELIGIBLE**	2	8	-7
h. heart attack or myocardial infarction?	1 = ASK NEXT QUESTION	2	8	
i. [Was it in the past year?]	1**= INELIGIBLE**	2	8	- 7
j. A head injury requiring hospitalization any time in your lifetime?	1= **INELIGIBLE**	2	8	
k. been hospitalized for psychiatric illness at any point in your lifetime, or do you currently have a psychiatric illness?	1= **INELIGIBLE**	2	8	
l. cancer, other than skin cancer, within the past 5 years?	1= ASK NEXT QUESTION	2 **(14)**	8 **(14)**	
m. [Are you currently receiving chemotherapy or radiation treatment for this cancer?]	1= **INELIGIBLE**	2	8	-7
n. Did you ever receive radiation treatment for a cancer above the chest?	1= **INELIGIBLE**	2	8	-7
o. Do you have a pacemaker or internal defibrillator?	1= **INELIGIBLE**	2	8	
p. Do you use portable oxygen?	1= **INELIGIBLE**	2	8	

q. Do you take steroids or cortisone?	1= **INELIGIBLE**	2	8	Meds for Asthma,OK
r. Do you use a cane or walker?	1= **INELIGIBLE**	2	8	
s. Did you ever have medical problems as a consequence of alcohol or drug use?	1= **INELIGIBLE**	2	8	
t. Did you ever have legal problems as a consequence of alcohol or drug use?	1= **INELIGIBLE**	2	8	
u. Did you ever have withdrawal symptoms related to alcohol or drug use?	1= **INELIGIBLE**	2	8	
v. Are you currently on any medication?	1 = ASK NEXT QUESTION	2	8	
w. [If known, are you currently on any calcium channel blockers or beta blockers?] List Meds: (Name and purpose) ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________ ____________________________	1= **INELIGIBLE** Acebutolol (Monitan, Secral) Atenolol (Apo- Atenolol, Novo-Atenol, Ternormin) Betaxolol (Kerlone) Bisprolol (Zebeta) Carteolol (Cartrol) Labetalol (Normodyne) Oxprenolol (Trasicor, Slow-Trasicor) Bepridi (Vascor) Diltazem (Cardizem, Cardizem CD, Cardizem LA, Cardizem SR, Dilacor-XR) Betaxolo (Kerlone) Toprol Norvasc <u>If still unsure, look in book or</u> <u>Rxlist.com (clinical pharmacology)</u>	2	8	

APPENDIX D
NURSE/PHYSICIAN CHECKLIST AND PERMISSION

Project AAMP (Active Adult Mentoring Project)
College of Public Health and Health Professions
Adrienne Aiken Morgan

PO Box 100165
Gainesville, FL 32610-0165
Phone: (352) 273-5098

Please type or print clearly

Physician's Name ___________________________ Phone # _______________________

Patient's Name ______________________________ (Project AAMP participant)

Program exclusion checklist (please check any that apply to this patient):

- ☐ Terminal illness with life expectancy of < 12 months
- ☐ Myocardial infarction in the last 6 months
- ☐ Chronic heart failure (New York Classification III to IV)
- ☐ Aortic stenosis
- ☐ Cardiac arrhythmia
- ☐ Cardiac stent
- ☐ Cardiac arrest
- ☐ Implanted cardiac defibrillator
- ☐ Pacemaker
- ☐ Coronary artery bypass graft
- ☐ History of cardiac arrest
- ☐ Uncontrolled angina
- ☐ Stroke or TIA
- ☐ Peripheral vascular disease
- ☐ Pulmonary disease requiring oxygen or steroid treatment
- ☐ Receiving chemotherapy or radiation for cancers
- ☐ Ambulation with assistive devices
- ☐ Poorly controlled diabetes
- ☐ Smoked regularly (>4 cigarettes per day) in past 3 years
- ☐ Any of the following calcium channel or beta blockerS

<u>Beta Blockers</u>
Acebutolol (Monitan, Sectral)
Atenolol (Apo-Atenolol, Novo-Atenol, Tenormin)
Betaxolol (Kerlone)
Bisoprolol (Zebeta)
Carteolol (Cartrol)
Labetalol (Normodyne, Trandate)
Oxprenolol (Trasicor, Slow-Trasicor)

<u>Calcium Channel Blockers</u>
Bepridil (Vascor)
Diltiazem (Cardizem, Cardizem CD, Cardizem LA, Cardizem SR, Dilacor-XR)
Betaxolo (Kerlone)

Note: Trade Names in parenthesis

I hereby give my patient permission to:

1. Participate in an exercise program ☐ **YES** ☐ **NO**
2. Complete a health and fitness assessments* ☐ **YES** ☐ **NO**

*The **<u>fitness assessment</u>** includes resting heart rate and blood pressure measurements and an 85% sub-maximal cardiovascular test (heart rate only, no EKG)

Special instructions or indicated activities: ____

Contraindications to any activities: ____

______________________________ ____________
Nurse/Physicians' Signature [Required] **Date**

APPENDIX E
STAGES OF EXERCISE CHANGE QUESTIONNAIRE

"I am now going to ask you a few questions about your recent exercise habits. To do this, I will need to read to you a definition of what we mean by "regular exercise" so that we understand each other. Are you ready to hear the definition?" [WAIT UNTIL PARTICIPANT SEEMS ATTENTIVE AND READY TO LISTEN]

"Regular exercise is any planned voluntary physical activity (such as brisk walking, aerobics, jogging, bicycling, swimming, basketball, etc.) performed to increase physical fitness. Such activity should be performed *3 to 5 times per week* for a minimum of *20 minutes per session*. Exercise does not have to be painful to be effective, but should be done at a level that increases your breathing rate and causes you to break a sweat. Is this definition clear to you?" [IF YES, CONTINUE. IF NO, CLARIFY ANY CONFUSIONS, PROBE FOR EXAMPLES OF ACTIVITIES THEY SUGGEST]

(Record Persons report of Routine)____
____
____
____
____

15a. Based on this definition, do you *currently* exercise regularly?

YES..1 = **INELIGIBLE**

NO..2 GO TO QUESTION #15b

[QUESTIONS #2 AND #3 ARE CODED AS ONE ITEM]

15b. Do you intend to begin exercising regularly?

YES..1 GO TO QUESTION #15c

NO..2 SKIP QUESTION #15c

15c. Do you intend to begin exercising regularly in the next 30 days or the next 6 months?

Next 30 days……..1 Next 6 months…….2APPENDIX A

APPENDIX F
INFORMED CONSENT

PLEASE READ THIS ENTIRE DOCUMENT CAREFULLY

TO: All Research Participants
FROM: Dr. Peter Giacobbi, Jr.
RE: Informed Consent
STUDY TITLE: Beliefs, Attitudes, and Impact of an Exercise Program for Older Adults

PURPOSE OF THIS STATEMENT: The purpose of this statement is to summarize the study I am conducting, explain what I am asking you to do, and to assure you that the information you and other participants share will be kept confidential to the extent permitted by law. Specifically, nobody besides the Principal Investigator and a research assistant will be able to identify you in this study and your name will not be used in any research reports that result from this project. The purpose of this study is to help us understand the attitudes and beliefs adults hold about exercise and physical activity.

WHAT YOU WILL BE ASKED TO DO: If you agree to participate in this study, you will be asked to participate in 13 informational sessions during a four-month period. Additionally, you will be asked to complete daily and weekly surveys along with pre and post test assessments (See Table Below). You do not have to answer any question you do not wish to answer and participation in this study will not affect your membership with the Living Well Center. In addition to the interview data, we will collect information about your height, weight, and body composition prior to interviews one and eight. You will also be asked to wear an RT3 Accelerometer and/or a pedometer. These devices are safe to wear and about the size, shape, and weight of a standard pager.

Daily Measures	Weekly Measures	Pre/Post Measures
Leisure Time Exercise Questionnaire – physical activity Sleep Diary – quality and quantity of sleep Wearing an RT3 accelerometer/pedometer which measures daily physical activity	Symbol Digit Number Comparison Letter Series Positive and Negative Affect Scale – general mood Reaction Time Task – reaction time General Self-efficacy Scale – overall sense of confidence Sleep Self-efficacy Scale – how confident you can fall asleep and sleep effectively Exercise Self-efficacy Scale – how confident you can perform exercise tasks Barriers Self-efficacy Scale – how confident you can overcome barriers to exercise Letter-Number sequencing Blood Pressure Readings Task Modification – Stair Climbing	Late Life FDI – how well you can perform everyday tasks Trail Making Test A and B N-Back – your attention, memory capability, and how quickly you can process information Controlled Word Association – language ability Logical Memory of WMS-III – how well you can remember words Geriatric Depression – Semi-structured interview about your exercise experiences Balke Protocol – general measure of physical fitness State-Trait Anxiety Inventory Exercise Motivation Scale – measures your motivation to exercise Task Modification Tasks

TIME REQUIRED: Your participation in this study will take place over a 14-week period. This will include an initial 45-minute session during the first week. Then we will meet for seven 45-minute interviews, one per week. The daily surveys should take approximately 5 minutes to complete while the weekly surveys will take 20 to 30 minutes. The Pre/Post surveys will take approximately 30 minutes during each time period (the beginning and end of the study).

RISKS AND BENEFITS: There are no known risks expected from participating in this study. As a result of your participation, you may develop insights about yourself that could help your future development in physical activity settings. If as a result of taking any of these surveys you wish to discuss anything with a counselor we will provide appropriate referrals to local agencies that may assist you (e.g., Alachua County Mental Health Agency).

COMPENSATION: In exchange for your participation in this study you will be given access to the Living Well Faculty Fitness Center. No other compensation will be provided.

CONFIDENTIALITY: Your identity will be kept confidential to the extent provided by law. Your completed survey will be assigned a code number and all surveys will be kept in my office (Room 124 Florida Gym) in a locked file cabinet. Your name will not be used in any report.

VOLUNTARY PARTICIPATION: Your participation in this study is completely voluntary. There is no penalty for not participating.

RIGHT TO WITHDRAW: You have the right to withdraw from the study at anytime without consequence.

WHOM TO CONTACT IF YOU HAVE QUESTIONS ABOUT THIS STUDY: Dr. Peter Giacobbi, Jr., Department of Exercise and Sport Sciences, 100 Florida Gym, PO Box 118207, Gainesville, FL, 32611; ph. (352) 392-0584

WHOM TO CONTACT ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT IN THE STUDY: UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; ph. 392-0433.

AGREEMENT:

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant:____Date:___________

Principal Investigator:______________________________________Date:___________

APPENDIX G

QUALITY CONTROL CHECKLIST: TREATMENT GROUP

Mentor/Coach ______________________ Date ____________

Procedure	None	Part	Full	Score
CREATING A SUPPORTIVE ENVIRONMENT				
1. Reviews participants' exercise during previous week.	0	5	10	_____
2. Use of Open-Ended Questions ex.: "In what ways has exercise been helpful to you?"	0	5	10	_____
3. Use of Affirmations ex.: "You are a very conscientious person. That quality will help you to begin an exercise program."	0	5	10	_____
4. Use of Reflective Responses ex.: "It sounds like you are frustrated. How do you deal with that?"	0	5	10	_____
5. Use of Summary Statements	0	5	10	_____
6. Effective group management Keeps group on topic Manages time and pace of discussion Maintains leadership of discussion	0	5	10	_____
COMMUNICATION ROADBLOCKS				
7. Avoids Lecturing	0	10	20	_____
8. Avoids giving advice	0	10	20	_____
9. Avoids interpreting or analyzing	0	10	20	_____
10. Avoids questioning participant	0	10	20	_____
CONCLUSION				
11. Assures participant that all instructions are in the Workbook & reminds to bring all logs and complete any homework for next session.	0	5	10	_____
12. Makes appropriate referrals regarding questions participants may have about the study.	0	5	10	_____
13. Makes appropriate referrals regarding mental or physical health concerns observed during sessions.	0	5	10	_____

Total __________

Comments for Mentor:

Session Specific Evaluations

Procedure	None	Part	Full	Score
GOAL SETTING SESSION				
7. Use of OARS during discussions about goals	0	5	10	_____
8. Distinguishes between long- and short-term goals	0	5	10	_____
9. Clearly discusses SMART goals	0	5	10	_____
10. Encourages participants to set SMART goals in a non-judgmental manner.	0	5	10	_____
11. Gives examples of SMART goals	0	5	10	_____
	Total	__________		

Comments for Mentor:

Procedure	None	Part	Full	Score
Mental imagery SESSION				
12. Integrates mental imagery into discussions using OARS.	0	5	10	_____
13. Makes connections between fitness/health goals and mental imagery with open-ended questions.	0	5	10	_____
14. Gives examples of vivid images that evoke all five senses and feelings/emotions.	0	5	10	_____
	Total	__________		

Comments for Mentor:

APPENDIX H
QUALITY CONTROL CHECKLIST: CONTROL GROUP

Mentor/Coach ______________________ Date ____________

Procedure	None	Part	Full	Score
GROUP MANAGEMENT				
1. Begin sessions with discussion about last week's topic, including quiz.	0	5	10	_____
2. Keeps group on topic	0	5	10	_____
3. Manages time and pace of discussion	0	5	10	_____
4. Maintains leadership of discussion	0	5	10	_____
PRESENTATIONAL SKILLS				
5. Use of Open-ended questions	0	5	10	_____
6. Clearly presents topic to be discussed	0	5	10	_____
7. Promotes discussion by asking questions	0	5	10	_____
8. Actively makes efforts to include all members of the group into discussion.	0	5	10	_____
COMMUNICATION ROADBLOCKS				
9. Avoids Lecturing	0	10	20	_____
10. Avoids giving advice	0	10	20	_____
11. Avoids interpreting or analyzing	0	10	20	_____
12. Avoids questioning participant	0	10	20	_____
CONCLUSION				
13. Assures participant that all instructions are in the Workbook & reminds to bring all logs and complete any homework for next session.	0	5	10	_____
14. Makes appropriate referrals regarding questions participants may have about the study.	0	5	10	_____
15. Makes appropriate referrals regarding mental or physical health concerns observed during sessions.	0	5	10	_____

Comments for Mentor: Total __________

APPENDIX I
BARRIERS SELF-EFFICACY

The following items reflect situations that are listed as common reasons for preventing individuals from participating in exercise sessions or, in some cases, dropping out. Using the scales below please indicate how confident you are that you could exercise in the event that any of the following circumstances were to occur.

Please indicate the degree to which you are confident that you could exercise in the event that any of the following circumstances were to occur by circling the appropriate %. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

For example, in question #1 if you have complete confidence that you could exercise even if "the weather was very bad," you would **circle 100%.** If, however, you had no confidence at all that you could exercise, if you failed to make or continue making progress (that is, confidence you would not exercise), you would **circle 0%.**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
NOT AT ALL CONFIDENT				MODERATELY CONFIDENT						HIGHLY CONFIDENT

I BELIEVE THAT I COULD EXERCISE 3 TIMES PER WEEK FOR THE NEXT 3 MONTHS IF:

1. The weather was very bad (hot, humid, rainy, cold).

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. I was bored by the program or activity.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. I was on vacation.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. I was not interested in the activity.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. I felt pain or discomfort when exercising.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Mark your answer by circling a %.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
NOT AT ALL CONFIDENT				MODERATELY CONFIDENT						HIGHLY CONFIDENT

I BELIEVE THAT I COULD EXERCISE 3 TIMES PER WEEK FOR THE NEXT 3 MONTHS IF:

6. I had to exercise alone.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. It was not fun or enjoyable.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. It became difficult to get to the exercise location.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. I didn't like the particular activity program that I was involved in.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10. My schedule conflicted with my exercise session.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. I felt self-conscious about my appearance when I exercised.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12. An instructor does not offer me any encouragement.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

13. I was under personal stress of some kind.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

APPENDIX J
EXERCISE SELF-EFFICACY

The items listed below are designed to assess your beliefs in your ability to continue exercising on a three time per week basis at moderate intensities (upper end of your perceived exertion range), for **40+** minutes per session in the future. Using the scales listed below please indicate how confident you are that you will be able to continue to exercise in the future.

For example, if you have complete confidence that you could exercise three times per week at moderate intensity for **40+** minutes for the next four weeks without quitting, you would **circle 100%**. However, if you had no confidence at all that you could exercise at your exercise prescription for the next four weeks without quitting, (that is, confident you would not exercise), you would **circle 0%**.

Please remember to answer honestly and accurately. There are no right or wrong answers.
Mark your answer by circling a %:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
NOT AT ALL CONFIDENT				MODERATELY CONFIDENT						HIGHLY CONFIDENT

---

1. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT WEEK

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT TWO WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT THREE WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT FOUR WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT FIVE WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Please remember to answer honestly and accurately. There are no right or wrong answers.
Mark your answer by circling a %:

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
NOT AT ALL CONFIDENT				MODERATELY CONFIDENT						HIGHLY CONFIDENT

---

6. I am able to continue to exercise three times per week at moderate intensity, for <u>40+ minutes</u> without quitting for the <u>NEXT SIX WEEKS</u>

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. I am able to continue to exercise three times per week at moderate intensity, for <u>40+ minutes</u> without quitting for the <u>NEXT SEVEN WEEKS</u>

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. I am able to continue to exercise three times per week at moderate intensity, for <u>40+ minutes</u> without quitting for the <u>NEXT EIGHT WEEKS</u>

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%APPENDIX B

APPENDIX K
EXERCISE MOTIVATION SCALE

Why Are You Currently Participating In This Activity?

Direction: Please read each of the statements listed below and indicate how strongly you agree or disagree with each statement by circling the appropriate response to the right of the statement. Use the following response categories:

Strongly disagree (SD) 1	Disagree (D) 2	Moderately disagree (MD) 3	Moderately agree (MA) 4	Agree (A) 5	Strongly agree (SA) 6

		SD	D	MD	MA	A	SA
1.	For the pleasure it gives me to experience positive sensations from the activity.	1	2	3	4	5	6
2.	For the satisfaction it gives me to increase my knowledge about this activity.	1	2	3	4	5	6
3.	Because other people believe that it's a good idea for me to exercise.	1	2	3	4	5	6
4.	Because I must exercise to feel good about myself.	1	2	3	4	5	6
5.	Because I believe that regular exercise is a good way to enhance my overall development.	1	2	3	4	5	6
6.	Because it is consistent with what I value.	1	2	3	4	5	6
7.	I can't understand why I am doing this.	1	2	3	4	5	6
8.	Because I feel pressure from others to participate.	1	2	3	4	5	6
9.	Because I think that exercise allows me to feel better about myself.	1	2	3	4	5	6
10.	For the pleasure I experience while learning about this activity.	1	2	3	4	5	6
11.	For the satisfaction I feel when I get into the flow of this activity.	1	2	3	4	5	6
12.	Because I feel I have to do it.	1	2	3	4	5	6

Why Are You Currently Participating In This Activity?

		SD	D	MD	MA	A	SA
13.	To satisfy people who want me to exercise.	1	2	3	4	5	6
14.	Because exercising is an important aspect of how I perceive myself.	1	2	3	4	5	6
15.	For the pleasure of understanding this activity.	1	2	3	4	5	6
16.	I have no idea.	1	2	3	4	5	6
17.	For the pleasure of mastering this activity.	1	2	3	4	5	6
18.	Because I think it is a good thing for my personal growth.	1	2	3	4	5	6
19.	For the pleasure I experience when I feel completely absorbed in the activity.	1	2	3	4	5	6
20.	For the satisfaction I feel while I try to achieve my personal goals during the course of this activity.	1	2	3	4	5	6
21.	Because I would feel guilty if I did not take the time to do it.	1	2	3	4	5	6
22.	Because I value the way exercise allows me to make changes in my life.	1	2	3	4	5	6
23.	It is not clear to me anymore.	1	2	3	4	5	6
24.	Because I think exercise contributes to my health.	1	2	3	4	5	6
25.	To comply with expectations of others (e.g., friends).	1	2	3	4	5	6
26.	For the enjoyment that comes from how good it feels to do the activity.	1	2	3	4	5	6
27.	Because I enjoy the feelings of discovering more about this activity.	1	2	3	4	5	6
28.	Because I enjoy the feelings of improving through participating in this activity.	1	2	3	4	5	6

Why Are You Currently Participating In This Activity?

		SD	D	MD	MA	A	SA
29.	Because I feel that changes that are taking place through exercise are becoming part of me.	1	2	3	4	5	6
30.	For the pleasure I experience while trying to become the person I want to be.	1	2	3	4	5	6
31.	Because I would feel ashamed if I was not doing anything to improve my current situation.	1	2	3	4	5	6

Factor Scoring
Amotivation = Items of 7, 16, 23
External regulation = Items of 3, 8, 13, 25
Introjected regulation = Items of 4, 12, 21, 31
Identified regulation = Items of 5, 9, 18, 24
Integrated regulation = Items of 6, 14, 22, 29
IM to learn = Item of 2, 10, 15, 27
IM to accomplish things = Items of 17, 20, 28, 30
IM to experience sensations = items of 1, 11, 19, 26

APPENDIX L
PHYSICAL ACTIVITY DAILY RECORD

ID: ____________________

(Indicate Date mm/dd/yy) ____

Pedometer Reading: ____________

Please answer this questionnaire **WHEN YOU AWAKEN IN THE MORNING**. Please enter **yesterday's day and date above,** and provide the information requested below.

Instructions. This is a scale that measures your leisure – time exercise (i.e., exercise that was done during your free time). **During the past 24 hours**, please indicate **how many times** you have engaged in strenuous, moderate, and mild exercise **more than 20 minutes** during your free time.

Indicate **how many times** you did this activity **for 20 minutes or longer** in the **past 24 hours**:	**# times**
1. **Strenuous exercise**: heart beats rapidly (e.g., running, basketball, jogging, hockey, squash, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)	
2. **Moderate exercise**: not exhausting, light sweating (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, popular and folk dancing)	
3. **Mild exercise**: minimal effort, no sweating (e.g., easy walking, yoga, archery, fishing, bowling, lawn bowling, shuffleboard, horseshoes, golf)	
4. **Total Number of exercise:** add the number of strenuous, moderate, and mild exercise and write that number to the right.	

APPENDIX M
CARDIORESPIRATORY FITNESS

Participant Name: ______________________ Which test is this? (circle one)

Participant ID: _________ PRETEST POSTTEST

Patient Characteristics	Heart Rate Calculations	Interval Conditions
Age =	Max Age (220-age) =	Time (min.) =
Height (ft' in") =	85% Max HR =	Grade (%) =
Weight (lbs.) =	VO_2max =	Speed (mph) =

Variables:
Speed (m/min) = 26.8 x mph =
Final Grade = Grade at max =

VO_2max = (0.1 x speed) + (1.8 x Final Grade x Speed) + 3.5

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BIOGRAPHICAL SKETCH

I, Matthew Buman, was born in San Diego, California. I received my Bachelor of Science from the University of Utah in 2002 in exercise and sport science and psychology. I received my Master of Science in counseling psychology from Springfield College in 2004. Since then, I have been working toward my Ph.D. degree in exercise and sport psychology, focusing in the area of physical activity and aging. In August 2008 my wife, Christen Buman, and I, will be moving to Palo Alto, California where I will begin a postdoctoral fellowship at the Stanford University Prevention Research Center. Christen and I are thrilled to begin a new chapter in our lives, but are sad to be leaving the University of Florida and the city of Gainesville. The UF community has been very good to us, and we are proud to remain a part of the Gator Nation.