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ACTIVE INVOLVEMENT: DEVELOPING AN INTERVENTION THAT ACTIVELY
ENGAGES OLDER ADULTS IN FALL PREVENTION MESSAGE PLANNING

by

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ABSTRACT OF THE DISSERTATION

Active Involvement: Developing an Intervention that Actively Engages Older Adults in

Fall Prevention Message Planning

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Falls are a serious public health issue among adults age 65 and older. More than a third of older adults fall each year (Hausdorff, Rios, & Edelber, 2001). Strength and balance exercise interventions have been found to reduce the risk of falls (Rand Report, 2003). Yet, more than 50% of older adults reject fall-related interventions (Campbell et al., 1997; Robertson, Devlin, Gardner, & Campbell, 2001; Stevens, Holman, Bennett, & de Klerk, 2001). One possible but untested intervention strategy is to have older adults plan pro-strength and balance exercise messages for his/her peers. An active involvement intervention is promising because older adults learn better when activities are perceived as exciting and lively (Best, 2001; Pearson & Wessman, 1996). Guided by the theory of active involvement (TAI, Greene, 2013), this study examined components of active involvement interventions. To identify the key mechanism of change, intervention components were tested individually, combined, and compared to a standard care group yielding a total of four versions of an intervention: (1) idea generation, (2) message planning, (3) idea generation and message planning combined, and (4) standard care.

Seventy-two adults age 65 and older were randomly assigned to one of four versions. This project measured motivation to process information (perceived novelty, perceived involvement, perceived gain, and reflectiveness), cognitions (perceived benefits, perceptions of norms, and readiness for change), behavior (strength and balance exercise-related stage progression and fall status), and interpersonal communication (talk about strength and balance exercise and intervention condition) to assess the effects of version over time (pretest, immediate posttest, and 10 week delayed posttest). The results showed that the idea generation and message planning combined was more successful than the idea generation, message planning, and standard care in changing participants' perceived benefits, perceptions of norms, and strength and balance exercise-related stage progression over time. Participants' frequency of discussion about intervention topic and activity was greater for idea generation and message planning combined than the idea generation, message planning, and standard care. Implications from these findings can guide the development of future fall-prevention messages.

Keywords: theory of active involvement, participatory design, self-persuasion, fall prevention, older-adult health, aging

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DEDICATION

To my grandfather, Isadore Testa

Who is no longer with us and

Who always affectionately joked I inherited my brains from him

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CHAPTER 1

INTRODUCTION

More than one third of adults age 65 and older fall each year in the United States (Hausdorff, Rios, & Edelber, 2001; Hornbrook et al., 1994). Twenty to 30% of older adults who fall suffer moderate to severe injuries such as bruises, hip fractures, or head traumas, which can impair mobility, limit independent living, and increase the risk of early death (Alexander, Rivara, & Wolf, 1992; Sterling, O'Connor, & Bonadies, 2001). Despite mortality, morbidity, and premature nursing home placement associated with falls, few adults 65 and older engage in strength and balance exercise to prevent falls. Statistics published by the Centers for Disease Control and Prevention [CDC] (2009) indicate that 38.5% of men 65 to 74 years old exercised regularly and 31.1% of women in the same age range exercised regularly. The portions decrease for adults 75 and older where only 23% of men 75 and older exercised regularly and 14% of women 75 and older exercised regularly. This signals a need for fall prevention interventions in older adulthood when adults 65 and older are highly susceptible to falling.

The present study proposes the design and implementation of a theory-driven health intervention to promote strength and balance exercise-related stage progression in older adulthood. There have been a number of programs designed to prevent older adult falls (see Nyman, Hogarth, Ballinger, & Victor, 2011; Stevens, 2010; Stevens & Sogolow, 2008; Whitehead, Nyman, Broaders, Skelton, & Todd, 2012). Existing literature on fall prevention programs draws attention to critiques (see McMahon, Talley, & Wyman, 2011) and offers explanations why more than 50% of older adults offered the opportunity to take part in strength and balance exercise programs refuse (Campbell et al., 1997; Robertson et al., 2001; Stevens et al., 2001), and observed rates of uptake are

sometimes less than 10% (Day et al., 2002; Fabacher et al., 1994). For example, older adults report that fall prevention messages are not personally relevant (see Yardley, Donovan-Hall, Francis, & Todd, 2006). In addition, older adults view current fall prevention messages as overly negative because they highlight the physical risks associated with falls instead of the personal and social benefits associated with strength and balance exercise (see Ballinger & Payne, 2002; Yardley & Smith, 2002).

Based on limitations of previous programs, researchers have an interest in alternative intervention formats that can more effectively reach older adults. One increasingly popular approach is to actively involve older adults in prevention efforts (CDC, 2011; Blair & Minkler, 2009). This dissertation addresses one critique of “participatory research” where older adults complete a survey or interview (Fudge, Wolf, & McKevitt, 2007) and proposes to actively involve older adults to test four versions of an intervention (idea generation, message planning, idea generation and message planning combined, and standard care). The intention of the active involvement intervention conditions is to generate persuasive messages that resonate with older adults, come across as personally relevant, and emphasize key social and health benefits of strength and balance exercise.

The present study discusses how the theory of active involvement (TAI, Greene, 2013) may affect strength and balance exercise-related stage progression. The TAI guides intervention development (creating a novel experience that initiates a process of cognitive steps including engagement, perspective taking, and reflection) and assesses intervention effectiveness (focusing on cognitive and behavioral outcomes such as perceived benefits, perceptions of norms, as well as strength and balance exercise-related stage progression,

respectively). The present study extends current research because: (1) it examines the process through which active involvement interventions influence target audience cognitions and behaviors (previous research has not tested active involvement components separately, in combination, or compared to standard care), (2) it applies components of the TAI in older adulthood and explores whether the TAI is an appropriate theory across the lifespan (previous research has only applied the TAI in adolescence), (3) it involves older adults in four versions of an intervention (idea generation, message planning, idea generation and message planning combined, and standard care) and contributes to the growing literature of participatory research with older adults, and (4) it generates older adult designed messages. This work is important because of the under utilization of existing strength and balance exercise interventions and need for more age-appropriate, theory-driven interventions. The next chapter reviews prevalence of falls and consequences in older adults, strength and balance exercise programs designed to reduce falls among older adults, older adult participation rates in existing fall prevention programs, older adult cognitive changes and intervention recommendations, active involvement interventions, and the present study's hypotheses and research questions.

CHAPTER 2

REVIEW OF LITERATURE

This chapter introduces the focus of this dissertation, which is to examine the role of active involvement components on motivating older adults to participate in strength and balance exercise, ultimately reducing falls. More specifically, the chapter reviews the literature on older adult falls and fall prevention which provides a summary of existing fall prevention programs at the individual, health care provider, and community levels. Next, it describes older adult participation rates in existing programs and identifies potential barriers to participation. Then, the chapter reviews age-related cognitive changes to information processing and provides intervention recommendations to address older adult needs. Finally, the chapter describes the theoretical framework TAI (Greene, 2013) and presents a theory-driven intervention to promote strength and balance exercise-related stage progression as a means of reducing falls among older adults.

Older Adult Falls and Fall Prevention

The United States is an aging society. By 2030, the number of Americans 65 and older is expected to reach 71 million. This age segment will represent nearly 20% of the United States population, with the most dramatic growth expected among the persons 85 and older (Federal Interagency Forum on Aging-Related Statistics, 2008). The chances of falling and of being seriously injured in a fall increase with age (CDC, 2010). As the United States population ages, the number of falls and fall-related injuries are likely to increase. The burden of falls among older adults is such a significant health issue that it resulted in the ratification of the Safety of Seniors Act of 2007, declaration of September 22nd as National Fall Prevention Day, as well as receiving two separate Healthy People 2020 Objectives.

Unintentional injuries are the fifth leading cause of mortality in older adults (after cardiovascular disease, cancer, stroke, and pulmonary disorders). Falls constitute two-thirds of these deaths (Rubenstein, 2006). Falls are also the most common cause of non-fatal injuries and hospital admissions for trauma among older adults (CDC, 2010). These non-fatal injuries are major contributors to immobility and premature nursing home placement (Alexander et al., 1992; Sterling et al., 2001).

Falls with or without injury also carry a heavy quality of life impact. Many older adults who fall, even if they are not injured, develop a fear of falling (Scott, 1990). The fear of falling may cause older adults to restrict activities and social engagements such as shopping or meeting friends. This social restriction can result in further physical decline, depression, isolation, and feelings of helplessness (Bruce, Devine, & Prince, 2002; Cumming, Salkeld, Thomas, & Szonyi, 2000; Delbaere, Crombez, Vanderstareten, Willems, & Cambier, 2004; Howland et al., 1998; Murphy, Williams, & Gill, 2002; Yardley & Smith, 2002).

In addition to mortality, non-fatal injuries, and decreased quality of life, falls are financial burdens on the health care system accounting for 6% of all medical expenditures for adults age 65 and older (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001). In 2000, the estimated direct medical care cost for fall-related injuries among older adults in the United States was \$19 billion per year (Stevens & Sogolow, 2008). With the rapid growth of the older adult population this number is projected to reach over \$32 billion by 2020 (American Geriatrics Society et al., 2001). The good news in this public health problem is that many falls are preventable.

The CDC recommends four key strategies for older adults to remain independent and reduce their chances of falling. These recommendations include exercising regularly, reviewing medications to identify side effects or drug interactions, having eyes examined, and making the home safer by reducing tripping hazards and adding grip devices.

Although all four strategies have proven to be effective at significantly reducing fall risk, the single most effective intervention is strength and balance exercise (American Geriatrics Society et al., 2001; Chang et al., 2004; Gillespie et al., 2001; Liu-Ambrose, Khan, Eng, Lord, & McKay, 2004; Sattin, Easley, Wolf, Chen, & Kutner, 2005).

Performing exercises that increase leg strength and improve balance have been found to reduce the risk of falls by 12% and the number of falls by 19% (Rand Report, 2003). As a result, strength and balance-related behavior change is the focus of this dissertation.

In summary, fall-related injuries among older adults are associated with physical, social, and economic costs. Developing and implementing effective fall-prevention messages that promote participation in strength and balance exercise programs can decrease the incidence of fall related injuries, improve the health and quality of life of older adults, and significantly reduce healthcare costs. The next section describes existing strength and balance exercise programs.

Existing Fall Prevention Programs

There are a number of existing evidence-based fall prevention programs for older adults worldwide (see Stevens, 2010; Stevens & Sogolow, 2008). This project focuses on fall prevention programs that have been designed and implemented in the United States. Each featured fall prevention program is described in detail in the following paragraphs.

Programs are organized based on the agent of change, starting with the individual, then health care provider, and finally community.

Individual level. When considering all the agents of change in fall prevention programs for older adults, some approaches target the older adults themselves. Individual level programs focus on intrapersonal factors (those existing or occurring within the individual self or mind). Intrapersonal factors include knowledge, attitudes, beliefs, motivation, self-concept, and skills. In terms of strength and balance exercise as a means of fall prevention, it is important for individuals to (1) increase awareness of the different types of and benefits of strength and balance exercise, (2) incorporate strength and balance exercise into daily routines, (3) build skills to perform strength and balance exercise, and (4) make the behavior changes required to prevent falls. One exemplar individual-focused program, *Go4Life*, is described in more detail below including program sponsor, program goal, target population, and program components and activities.

Go4Life. *Go4Life* is an exercise and physical activity campaign from the National Institute on Aging (NIA) implemented in 2011 targeting sedentary adults 50 and older. It includes an evidence-based exercise guide, an exercise DVD, an interactive website (<http://go4life.nia.nih.gov/>), and a national outreach campaign. The goal of *Go4Life* is to motivate adults 50 and older to become physically active for the first time, return to exercise after a break in their routine, or build exercise and physical activity into everyday routines. *Go4Life* offers specific exercises, motivational tips, success stories, and free materials to help older adults prepare to, start to, and continue to exercise. The exercise guide and interactive website are self-directed (Cire, 2011). Although not

explicitly described as based on the stages of change model (Prochaska, DiClemente, & Norcross, 1992), *Go4Life* messages and materials appear to be designed and adapted according to various stages of individual readiness (preparation, action, and maintenance) to engage in exercise and physical activity.

As the *Go4Life* campaign gains more recognition, the NIA is actively seeking participation of the public and organizations interested in improved health for older adults. Potential collaborators might include federal, state, and local government agencies, aging organizations, fitness organizations, health organizations, and corporations. Collaborators can assist *Go4Life* efforts by distributing *Go4Life* messages and materials, linking to the *Go4Life* website, hosting *Go4Life* events, and co-branding and printing *Go4Life* materials (Cire, 2011). Presently, there is no published, formal evaluation of campaign effectiveness in increasing exercise and physical activity rates among adults 50 and older. The goal of individual-focused interventions such as *Go4Life* is to provide information tailored to an individual's readiness to change in order to move the individual from forms of inaction to action. Besides websites and printed health materials, health care providers can adapt recommendations based on the individual.

Health care provider level. In addition to the individual-focused programs, health care providers can play an instrumental role in fall prevention. Older adults are more likely to take action when the health message is from a trusted source such as a health care provider (CDC, 2011). A review of studies aimed at examining views and preferences of older adults in fall prevention programs reveals that advice and encouragement from health care providers had a significant influence on older adult's participation in fall prevention programs (Yardley et al., 2006; Yardley, Donovan-Hall,

Francis, & Todd, 2007; Dickinson et al., 2011). Health care providers include the interdisciplinary team of physicians, nurses, pharmacists, and physical and occupational therapists. According to best practice guidelines (Drootin, 2010; Michael et al., 2010), the ideal role of a health care provider is to initiate a fall history discussion and conduct a formal fall risk assessment for older adults who have fallen, who have gait and balance problems, or who report difficulties with gait or balance. Following the fall risk assessment, health care providers should customize interventions to the identified risk factors. The exemplar health care provider program, *Stopping Elderly Accidents, Deaths, and Injuries (STEADI)*, is described in more detail below including program sponsor, program goal, target population, and program components and activities.

STEADI. *STEADI* is a fall prevention tool kit from the CDC's Injury Center that was piloted in 2012. It contains a variety of health care provider resources for assessing and addressing fall risk in clinical settings. The goal of *STEADI* is to help health care providers incorporate fall risk assessment, treatment, and referral into clinical practice and to facilitate patient referrals to community-based fall prevention programs. *STEADI* includes fact sheets about falls (statistics about falls and fall risk factors), three case studies across varying levels of patient fall risk, standardized gait and balance assessment tests with instructional videos (the 30 second chair stand test, the 4 stage balance test, and the timed up and go test), conversation starters for talking with patients about fall prevention titled *Talking about Fall Prevention with Your Patient*, and treatment referrals (individualized fall intervention plan and/or recommendation to community-based program) (Stevens & Phelan, 2012).

Talking about Fall Prevention with Your Patient provides guidelines and examples of conversations with patients based on four of the five stages of change: precontemplation, contemplation, preparation, and action (Prochaska et al., 1992). Utilization of the stages of change model helps providers match their initial conversation about fall prevention, as well as treatment referral, to the patient's readiness to change. For each stage, *Talking about Fall Prevention with Your Patient* provides a brief statement about how to move the patient to the next stage (i.e., "To move the patient to the preparation stage, make specific suggestions, be encouraging, and enlist support from the family"). *Talking about Fall Prevention with Your Patient* also provides real-world examples of patient-provider conversations for each of the stages and offers possible responses to frequently heard patient responses.

Presently, there is no published, formal evaluation of campaign effectiveness in increasing rates of health care provider utilization of fall risk assessments and individualized treatment referrals. *STEADI* is in its pilot implementation phase. There are three CDC grantee states: Oregon (one county), Colorado (two counties), and New York (three counties). Each state health department is funded through CDC's Violence and Injury Prevention Program grants. Strategies to encourage the use of *STEADI* in clinical practice include: (1) Medicare reimbursements (use of fall risk codes for Physician Quality Reporting System); (2) Continuing Medical Education credits, American Medical Association performance improvement, and American Board of Internal Medicine recertification; and (3) media attention to clinical practices as community leaders and awarding a "Certificate of Appreciation" for participating clinical practices. The goal of health care provider interventions such as *STEADI* is to update and train health care

providers on the best practices in fall prevention including validated risk factor assessments and evidence-based fall prevention programs. Beyond health care provider interventions, collaboration with community-based organizations can enhance health care providers' efforts and ensure more comprehensive fall prevention services.

Community-based level. The role of the community in fall prevention is to support fall prevention beyond the individual and health care provider levels. Community includes older adult service providers and organizations that can create important connections with various groups of older adults and support provision of education and fall prevention programs. Delivery of fall prevention programs in the community has been successful in sites where older adults participate in activities such as churches/temples, senior centers, or senior housing sites (Ory et al., 2010). Community stakeholders have the potential to influence the implementation of programs and can facilitate community efforts.

A number of evidence-based fall prevention programs have been developed for dissemination in the community, most often for groups of older adults. Participants gain from sharing with others who have similar problems and develop a network of supportive peers. Community organizations and groups may provide evidence-based fall prevention programs in addition to other activities for older adults. Typically, these programs must be purchased and require that leaders or facilitators attend specific training so that programs are delivered as designed to maintain intervention fidelity and achieve expected outcomes (Stevens, Baldwin, Ballesteros, Noonan, & Sleet, 2010). As a result, the cost of providing programs may result in for-fee activities. Some programs can be offered via

paid or volunteer peer leaders, which can increase capacity to deliver programs, lower costs, and may increase the uptake of information (Peel & Warburton, 2009).

There are more fall prevention programs at the community-level than at the individual or health care provider levels. As a result, this review includes three of the most commonly implemented community-based fall prevention programs that have been formally evaluated and have evidence of effectiveness: *Healthy Moves for Aging Well* (*Healthy Moves*), *A Matter of Balance* (*MOB*), and *Tai Chi: Moving for Better Balance* (*MBB*). Each program is described in more detail in the following paragraphs including program sponsor, program goal, target population, program components and activities, and evaluation of effectiveness.

Healthy Moves for Aging Well. The first featured community-based fall prevention intervention is *Healthy Moves*. *Healthy Moves* is an evidence-based physical activity program designed to enhance health outcomes for frail, high-risk, and diverse older adults receiving services in the home. It was developed by Partners in Care Foundation and first implemented in a community setting in 2002. The program utilizes care managers from community-based care management agencies to teach the program's exercises to older adult clients in their home. At regularly scheduled visits, care managers enroll clients into the program by assessing their ability and readiness to participate safely and by using motivational interviewing techniques to engage each client in setting a goal.

Healthy Moves is based on an integrated model consisting of physical activity and behavior change components. The physical activity component is modeled and adapted from the Senior Fitness Test work of Rikli and Jones (1999) which includes five seated

and standing in-home exercises. The behavior change component utilizes the lifestyle change counseling method called Brief Negotiation developed by Prochaska and DiClemente (1983) based on the stages of change model. Brief Negotiation involves goal setting techniques and a readiness ruler with scores from 0 to 10 (higher numbers indicate greater readiness to change) for assessing a client's readiness to change. For care managers, only a 15 minute session is needed with each client to encourage identification of personal goals and creation of an action plan to incorporate the movements into their daily routines. Motivational phone coaches contact the clients weekly or bi-weekly for a three month period to reinforce new behavior change.

In the 2004-2008 evaluation of *Healthy Moves* ($N = 338$), participants 65 and older demonstrated a significant reduction in number of falls at six months ($M = 0.17$, $SD = 0.15$, $p < .05$) when compared to baseline ($M = 0.28$, $SD = 0.15$). Participants also reported a significant decrease in pain at six months ($M = 5.70$, $SD = 0.55$, $p < .05$) when compared to baseline ($M = 6.05$, $SD = 0.55$) (Yan, Wilber, Wieckowski, & Simmons, 2009).

A Matter of Balance. *MOB* is another influential community-based fall prevention program. *MOB* was sponsored by Boston University and first implemented in the community setting in 2004. *MOB* acknowledges the risk of falling among adults 60 and older but emphasizes practical coping strategies to reduce this fear. These coping strategies include: promoting a view of falls and fear of falling as controllable, setting realistic goals for increasing activity, changing the environment to reduce fall risk factors, and promoting exercise to increase strength and balance. The workshop is conducted over eight sessions, meeting weekly or twice weekly for two hours per session. Meetings are

led by volunteer lay leaders called coaches. A Master Trainer is responsible for teaching the *MOB* curriculum to the coaches and providing them with guidance and support as they lead the *MOB* classes of 10 to 12 older adults.

A randomized, controlled trial was conducted to test the efficacy of a community-based group intervention to reduce fear of falling and associated restrictions in activity levels among older adults. A sample of 434 adults 60 and older who reported fear of falling and associated activity restriction, was recruited from 40 senior housing sites in the Boston metropolitan area. Data were collected at baseline, and at six-week, six-month, and 12-month follow-up. Participants in the intervention group received the *MOB* program described above. Participants in the control group received a single 2-hour group session that consisted of a didactic presentation regarding incidence and risk factors for falls, a video (produced by AARP) on home hazards that increase fall risk, and steps that can be taken to reduce risk. No training was provided in cognitive restructuring techniques, exercise, assertiveness, or behavioral self-management. Compared with control participants, intervention participants reported increased levels of intended activity (*Mean score change* = .09, $p < .05$) and greater mobility control (*Mean score change* = 3.55, $p < .05$) immediately after the intervention. Effects at 12 months included improved social function (*Mean score change* = -4.03, $p < .05$) and mobility range (*Mean score change* = -5.48, $p < .05$) (Tennstedt et al., 1998).

A subsequent study examined whether *MOB* could be translated into a community-based volunteer lay leader model and achieve outcomes comparable to those found in the randomized control trial (Tennstedt et al., 1998). A repeated measure design was employed. Of those who started and completed baseline data ($N = 335$), 75%

completed follow-up questionnaires at 6 weeks ($n = 243$), 68% at 6 months ($n = 226$), and 58% at 12 months ($n = 129$). Participants experienced significant increases in falls efficacy (*Mean score change* = .22, .20, .20, $p < .05$), falls management (*Mean score change* = .35, .27, .34, $p < .05$), and falls (*Mean score change* = .11, .10, .11, $p < .05$) compared to control at six weeks, six months, and 12 months, thus achieving comparable outcomes with those of participants in the previous randomized control trial (Healy et al., 2008).

Tai Chi: Moving for Better Balance. The final community-based fall prevention program is *MBB*. *MBB* was developed by the Oregon Research Institute and first implemented in community settings in 2004. *MBB* includes eight Tai Chi forms that emphasize weight shifting, postural alignment, and coordinated movements, as well as synchronized breathing aligned with Tai Chi movements. This program is intended for community-dwelling adults 65 and older. One-hour classes (with a recommended class size of 15 students) are held three times a week for 24-26 weeks. For this program to be effective, participants are advised to attend Tai Chi classes at least two times a week and participate actively in class.

A randomized, controlled trial involved a sample of 256 physically inactive, community-dwelling adults aged 70 to 92 ($M = 77.48$ years, $SD = 4.95$ years) recruited through a patient database in Portland, Oregon. Participants were randomized to participate in a three-times-per-week Tai Chi group or to a stretching control group for six months. The primary outcome measure was the number of falls; the secondary outcome measures included functional balance (Berg Balance Scale, Dynamic Gait Index, Functional Reach, and single-leg standing), physical performance (50-foot speed

walk, Up & Go), and fear of falling, assessed at baseline, three months, six months (intervention termination), and at a six-month post intervention follow-up. Six months post intervention, there were significantly fewer falls ($n = 38$ vs. 73 ; $p = .007$), lower proportions of fallers (28% vs. 46% ; $p = .01$), and fewer injurious falls (7% vs. 18% ; $p = .03$) in the Tai Chi group compared with the stretching control group. After adjusting for baseline covariates, the risk for multiple falls in the Tai Chi group was 55% lower than that of the stretching control group (risk ratio, .45; 95% confidence). Compared with the stretching control participants, the Tai Chi participants showed significant improvements ($p < .001$) in all measures of functional balance, physical performance, and reduced fear of falling. Intervention gains in these measures were maintained at a six-month post intervention follow-up in the Tai Chi group (Fuzhong, Harmer, Fisher, & McAuley, 2004).

Summary. This section provided a detailed description of individual-, health care provider-, and community-based levels of fall prevention programs. Individual-focused programs such as *Go4Life* tailor information to an individual's readiness to change in order to move the individual from inaction to action. Health care provider programs such as *STEADI* employ fall risk assessment and treatment materials for addressing falls in clinical settings. Community-based programs including *Healthy Moves*, *MOB*, and *MBB* have been developed for dissemination in sites where older adults participate in group activities such as churches/temples, senior centers, or housing sites and have evidence of effectiveness. The next section summarizes older adult participation rates in existing fall prevention programs.

Older Adult Participation Rates in Existing Programs

Despite the proven efficacy of existing strength and balance exercise interventions, fall prevention programs can only be effective at a population level if participation rates are moderate to high (van Haastregt, Diederiks, van Rossum, de Witte, & Crebolder, 2000). Currently, older adults often enter fall prevention programs only after they have incurred a fall-related injury, by which time it may be too late to avoid serious consequences such as prolonged or permanent loss of function (Todd et al., 1995). Over half of individuals offered the opportunity to take part in strength and balance exercise programs refuse (Campbell et al., 1997; Robertson et al., 2001; Stevens et al., 2001), and observed rates of uptake fail to exceed 10% (Day et al., 2002; Fabacher et al., 1994). This suggests that there may be considerable reluctance on the part of older adults to take part in fall prevention programs. Thus, what is needed is not simply to study the effectiveness of existing programs but an understanding of older adults' views of messages promoting these programs. Analysis of older adult perceptions of fall prevention messages may establish what message features are perceived as helpful and acceptable and what features may be ignored or provoke negative reactions. The next section summarizes older adult cognitive changes and motivation to process information that may provide insight into the under utilization of existing strength and balance exercise programs as well as provide recommendations for designing age-appropriate interventions for older adults.

Older Adult Cognitive Changes and Motivation to Process Information

This section provides an overview of older adult developmental progression in deliberative and affective information processing. First, this section reviews age

differences in dual information processes, followed by compensation for age-related changes, and finally intervention recommendations tailored to information processing needs (see Carstensen & Mikels, 2005; Peters, Hess, Vastfjall, & Auman, 2007, for comprehensive reviews).

Cognitive Changes

Information is processed using two different modes of thinking: affective and deliberative (modes are also called System 1 and 2, respectively see Kahneman, 2003; Stanovich & West, 2002). The affective mode produces thoughts and feelings in a relatively effortless and spontaneous manner. The operations of this mode are implicit, automatic, and fast. In contrast, the deliberative mode is conscious, analytical, reason-based, verbal, and relatively slow. Affective and deliberative modes of thinking correspond to the two basic routes for persuasion proposed by the elaboration likelihood model: peripheral and central, respectively (Petty & Cacioppo, 1986). The peripheral route processes the message without any active thinking about the attributes of the issue or the object of consideration. The central route involves message elaboration, described as the extent to which a person carefully thinks about issue-relevant arguments contained in a persuasive communication.

As people age there are declines in the controlled processes of the deliberative system including memory, speed of processing, and reasoning. For instance, Salthouse (2004) suggests that inefficient information processing in older adults may result in the products of early processing being lost by the time later processing occurs and/or lengthy early processing might mean that later processing does not occur. Other evidence suggests age-related deficits in explicit memory and learning such as recalling a specific

event or learning new information (Salthouse, McGuthry, & Hambrick, 1999; Salthouse, 2001; Salthouse & Ferrer-Caja, 2003). Pesce, Guidetti, Baldari, Tessitore, and Capranica (2005) argue that aging is associated with reduced attention to messages as compared to younger adults. This difference in attention may be caused by cognitive changes such as a decrease in the efficiency of the cognitive processes that help filter irrelevant stimuli and focus attention on target information (Hasher & Zacks, 1988; Persad, Abeles, Zacks, & Denburg, 2002). To compensate for increasing deliberative inefficiencies, older adults may rely on peripheral processing by paying selective attention and focusing on affective information (Reyna, 2004; Peters et al., 2007).

Compensation for Cognitive Changes

This section describes two methods of compensation for age-related declines in deliberative processing: selective attention and affective processing. Each alternative is described in detail in the following paragraphs. In addition, this section provides specific intervention recommendations to maximize older adult information processing.

Selective attention. Older adults tend to favor peripheral processing and rely less on careful central processing of information. Hess, Rosenberg, and Waters (2001) proposed a resource allocation hypothesis, which states that because older adults have limited cognitive resources, they tend to employ peripheral information processing strategies in order to conserve their mental energy for important tasks. However, this hypothesis also suggests that older adults can when necessary (interested/more personally relevant) employ deliberative information-processing. For example, if the issue is of low relevance or meaningfulness to the individual, it makes sense to conserve cognitive resources and to be selective about where effort is spent (Hess, 2000). Hess, Germain,

Rosenberg, Leclerc, and Hodges (2005) showed how older, but not younger, adults' attitudes toward proposed legislation were influenced by irrelevant affective information (the likeability of the lawmaker proposing the legislation) when the personal relevance of the legislation was low. In contrast, the irrelevant affective information did not influence older or younger adults' attitudes when the legislation was rated high in personal relevance. In situations where emotional information is important to consider (e.g., selecting a social partner), focusing on emotional information is critical for constructing an optimal environment (Charles & Carstensen, 1999). Based on this line of research, information must be perceived as personally relevant in order to motivate older adults to process and expend cognitive resources.

Intervention recommendation. Based on the resource allocation hypothesis, older adults can when necessary employ deliberative information-processing. In order to activate this more central processing the intervention should contain information that relates to older adults' background, knowledge, and values (CDC, 2011). The TAI (Greene, 2013) provides a description of intervention features that increase involvement in message processing, specifically personal relevance of intervention content. This framework may be useful for designing programs for older adults who desire more meaningful interventions. For example, older adults identified personal relevance as both a barrier and facilitator to participating in fall prevention programs. If programs were not seen as personally relevant or practical, older adults would not engage in the recommended activities (McMahon et al., 2011).

Older adults have been found to have an overly positive perception of their state of health and underestimate their risk of falling compared to their peers (Braun, 1998).

This phenomenon is known as optimistic bias (Weinstein, 1980). Optimistic bias is more likely to emerge for events that are controllable (e.g., falls) (Klein & Helweg-Larsen, 2002) and for which people have stereotypes of the typical person who experiences the event (e.g., “someone older”) (Weinstein, 1980). Motivational causes such as a need to protect self-esteem may result in an optimistic bias (e.g., Boney-McCoy, Gibbons, & Gerrard, 1999). In fact, older adults actively disassociate themselves from the “old” label and associated ageist stereotypes (Ballinger & Payne, 2002). For example, Braun (1998) found that although community-dwelling older adults considered falls to be an important health issue and understood the significance of risk factors for older adults, their personal susceptibility was minimized. Similarly, Yardley et al. (2006) found that older adults often supported fall-prevention advice for others but not for themselves personally.

Consequently, traditional fall prevention-messages may not be effective. If older adults underestimate their risk of falling and view falls as irrelevant, then they will be less motivated to process interventions promoting fall prevention. Furthermore, previous fall prevention interventions emphasized falls in terms of physical risk management. This approach is inappropriate because older adults are often more concerned about the personal and social risks associated with falling than physical risks (Ballinger & Payne, 2002). Although older adults fear the functional limitations that result from falling, they are also concerned about social embarrassment, indignity, and damage to their confidence (Yardley & Smith, 2002). These negative perceptions of being labeled “old” or “at risk of falling” have been recognized as major factors in older adults’ reluctance to admit both susceptibility to falls and the need for preventive behavior (Ballinger & Payne, 2002).

Older adults with good physical and mental health and no history of falls are most likely to reject the personal risk of falling (Yardley & Smith, 2002).

Older adults may resist advice to undertake fall prevention because the idea that they are at an increased risk of falling is incompatible with their self-image as capable and independent (Yardley et al., 2006). It has, therefore, been suggested that older people may respond more positively to empowering health promotion interventions about healthy aging and independence than to warnings about falling risk and injury (Minichiello, Browne, & Kendig, 2000; Yardley et al., 2006). The TAI (Greene, 2013) proposes intervention features to increase personal relevance that may be useful for designing age appropriate interventions for older adults. In summary, older adult fall prevention interventions may be viewed as more personally relevant by highlighting personal and social benefits and evoking positive emotion as described in the next section.

Affective processing. Increasing age may accompany increasing reliance on affective information. For example, Carstensen and Turk-Charles (1994) demonstrated that aging is associated with a decline in recall of neutral information, but stability in recall of emotional content, suggesting a shift toward disproportionate retention of emotional information in memory representation. In a related study, Fung and Carstensen (2003) found that older adults showed greater preference and superior memory than younger adults for emotional versus non-emotional advertisements.

In addition to affective information processing, aging research suggests that older adults are motivated to focus more on positive information and/or decrease their focus on negative information in some situations (Charles, Mather, & Carstensen, 2003). For

example, Mather and Carstensen (2003) found that, relative to younger adults, older adults show disproportionate attention and memory biases for faces depicting positive (versus negative) emotions. Mather and Johnson (2000) found better memory in older adults than younger adults for positive over negative features of selected options in a decision task such as choosing between houses, even after controlling for recognition accuracy. Socio-emotional selectivity theory (Carstensen, 2006) posits that changes in time perspective result in emotional goals becoming more important as the end of life nears, which in turn results in greater monitoring of affective information and either greater attention to positive information or reduced attention to negative information. Due to their age, older adults are nearer to the end of life and this comes with a tendency to focus on socio-emotional goals that optimize emotional experience and well being (Blanchard-Fields, Jahnke, & Camp, 1995; Carstensen & Fredrickson, 1998; Mather & Carstensen, 2003). Based on this line of research, information targeting this group should focus on the positive or reduce negative emphases (e.g., fear appeals) in order to motivate older adults to process the intervention.

Intervention recommendation. Findings of older adults' preference for positive information indicate that fear-inducing campaigns designed to attract attention may, in fact, be ignored by older adults (Lockenhoff & Carstensen, 2007). Risk messages are likely to be better remembered by older adults when they are framed to help them realize emotionally meaningful goals (Fung & Carstensen, 2003). Message framing refers to the emphasis in the message on the positive or negative consequences of adopting or failing to adopt a particular health-relevant behavior (Rothman & Salovey, 1997). Gain-framed messages present the desirable outcome being obtained or undesirable outcome being

avoided by adopting the recommended behavior (Salovey, Schneider, & Apanovitch, 2002). Loss-framed messages present the costs of not adopting the recommended behavior (Salovey et al., 2002). Thus a gain-framed appeal might take the form, “If you perform strength and balance exercise, you will maintain independence” or the form, “If you perform strength and balance exercise, you reduce your likelihood of falling.” A loss-framed appeal might take the form, “If you do not perform strength and balance exercise, you risk not being able to play with your grandchildren” or the form, “If you do not perform strength and balance exercise, you are at increased risk of falling.”

Message framing is grounded in prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Prospect theory suggests that when the potential outcomes are risky, individuals prefer loss-framed messages, but when the potential outcomes are less risky individuals prefer gain-framed messages (Salovey et al., 2002). Thus, the appropriateness of gain- or loss-framed messages depends on the type of behavior targeted for change. For example, loss-framed messages have been found to be effective for detection behaviors such as promoting HIV screening (Kalichman & Coley, 1995) and mammography use (Banks et al., 1995; Schneider et al., 2001).

Gain-framed messages, rather than loss framed, have found to be effective for prevention behaviors such as regular exercise (Robberson & Rogers, 1988), smoking cessation (Schneider et al., 2001), and using sunscreen to prevent to skin cancer (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman, Salovey, Antone, Keough, & Martin, 1993). Two meta-analyses confirm that gain-framed messages are more effective in promoting prevention behaviors (particularly for skin cancer prevention, smoking cessation, and physical activity) (Gallagher & Updegraff, 2012)

while loss-framed messages are more persuasive when aimed at encouraging disease detection (O’Keefe & Jensen, 2009). Based on the “prevention-detection distinction,” (Salovey et al., 2002, p. 394) gain-framed messages are likely to be more effective for older adult fall prevention (e.g., promoting older adult participation in strength and balance exercise).

Coupled with the depth-of processing findings from persuasion research, avoidance of negative emotional experiences may also mean that older adults are less likely to thoroughly deliberate on threat information. However, there is a paucity of studies examining message framing across the adult lifespan. Only five studies have included adults over 65 (Banks et al., 1995; Detweiler et al., 1999; Finney & Iannotti, 2002; Schneider et al., 2001; Williams, Clarke, & Borland, 2001), and no study examined adults over 65 as a unique group. Borrowing from gain- and loss-framed findings in the general population, gain-framed messages elicit greater engagement. A meta-analytic review (based on 42 effect sizes, $N = 6,378$) found that gain-framed messages produced slightly but significantly greater message engagement than did loss-framed messages (O’Keefe & Jensen, 2008). Gain-framed messages produced significantly greater message engagement than did loss-framed messages for messages advocating disease prevention behaviors such as strength and balance exercise as a fall prevention intervention (mean $r = .08$, $p < .001$) but not for messages advocating disease-detection behaviors (mean $r = .02$, $p = .56$). Gain-framed messages prompted greater engagement than loss-framed messages with measures of memory for message material (mean $r = .11$, $p < .001$). Gain- and loss-framed findings coupled with older adult cognitive changes literature suggest older adults are more likely to engage in message processing and

remember gain-framed messages promoting strength and balance exercise as a fall prevention behavior.

Learning for the Latter Stages of Life

In addition to the persuasion literature, educational gerontology may provide insight into developing age-appropriate health education materials and interventions. Geragogy (Battersby, 1987) is a term used to describe the teaching of older adults and reflects the need to accommodate the physical, cognitive, and psychosocial changes that occur in the later years of life (Best, 2001; Pearson & Wessman, 1996). Many age-related changes described above can become educational barriers that affect the older adult's ability and motivation to learn. In order to develop and implement effective health education materials, educators must recognize age-related changes and modify existing teaching techniques accordingly. Two recommended teaching techniques include creating hands-on activities and providing information that is relevant to everyday life (Nevins, 2013), each teaching technique is described in more detail below.

Older adult learning is enhanced when it is immediately applicable to real life contexts. Older adults want to be able to apply whatever knowledge they gain today to living more effectively tomorrow (e.g., learning how to videochat in order to maintain relationships with long-distance family members). Older adults view learning from a different time perspective than children. As learners get older, time becomes more limited and, in many ways, more precious (Draves, 1984). As a result, older adults view learning as most desirable when it is relevant and can be used currently rather than as something to be accessed in the distant future. Older adults do not want to waste valuable time in educational pursuits that they view as pointless.

The majority of older adults prefer teaching methods other than the lecture format. They attach more meaning to learning gained from experience than when they are passive recipients of “canned” educational content (e.g., being allowed to practice videochatting versus reading a program manual). Eighty three percent of older adults are primarily visual learners; only 11% learn primarily by listening (Nevins, 2013). This is one of the reasons why retention from lectures is so poor. Still, other older adults learn by doing something immediately with or applying new knowledge. Therefore, educational programming should incorporate a variety of teaching methods, alternating passive and active such as small group problem solving and discussion, auditory, visual, tactile and participatory teaching methods. Older adults better retain what they have learned when the delivery of content is exciting and lively.

Related to educational strategies for late-life learning, older adults have unique health literacy needs. Data from the 2003 National Assessment of Adult Literacy demonstrate the importance of focusing on older adults and their health literacy challenges. Among adult age groups, those aged 65 and older have the smallest proportion of people with proficient health literacy skills (Kutner, Greenberg, Jin, & Paulsen, 2006). This group also has the highest proportion of people with health literacy defined as “below basic” (Kutner et al., 2006). Eighty % had difficulty using documents such as forms or charts, and 68% had difficulty with interpreting numbers and doing calculations (Kutner et al., 2006). These findings further emphasize the importance of interventions to consider age-related changes and better meet the health communication needs of older adults.

Summary. This section summarized two compensations due to age-related changes in deliberative cognitive abilities and central processing. Compared with younger adults, older adults may be more selective in their use of cognitive resources and may focus more on affective information (especially positive content) as a way of optimizing their emotional well being. One alternate but untested intervention recommendation that addresses selective attention, preference for positive information, immediate application, and hands-on activities is having older adults plan their own pro-strength and balance message. The next section provides a description of active involvement intervention components.

Active Involvement Intervention Overview

This section describes active involvement interventions and provides a summary of participatory action research with older adults. Next, it reviews four versions of an intervention (i.e., idea generation, message planning, idea generation and message planning combined, and standard care) in relation to adult learning and information processing needs and cognitive, behavioral, and interpersonal outcomes of interest. Finally, it discusses intervention condition feasibility that should lead to utilization by informal caregivers, health care providers, and community workers.

Background of Active Involvement Interventions

This study explores the health communication prevention strategy of engaging participants in message creation. This strategy is labeled an “active involvement intervention” (Greene & Hecht, 2013) because the key underlying common component is having participants actively plan and/or produce prevention messages. Some of these message design opportunities include participants through production of videos or radio

ads (e.g., Hecht, Corman, & Miller-Rassulo, 1993), while others focus on more preliminary planning activities where participants generate ideas for messages such as posters (e.g., Banerjee & Greene, 2006, 2007). Active involvement interventions are grounded in principles of participatory action research (Blair & Minkler, 2009) that include involving participants in meaningful ways. These “hands on” interventions have gained popularity as an intervention strategy for adolescent media literacy interventions (e.g., Banerjee & Greene, 2006, 2007; Greene, 2012; Greene et al., 2012) and *keepin’ it REAL*, a school-based substance use prevention intervention (Hecht & Miller-Day, 2009). The present study is the first known active involvement intervention proposed for older adults.

The proposed intervention engages older adults in activities designed to target fall prevention, specifically generating reasons for and against strength and balance exercise (idea generation) and actively planning pro-strength and balance exercise messages (message planning). Analyses of participants’ message recommendations are beyond the scope of the dissertation. As detailed in the directions for future section, forthcoming studies will content analyze participant responses and provide older-adult generated recommendations for actual health promotion messages. Idea generation enables participants to compare gains and losses associated with action and inaction, as well as compare and rank the importance of the multiple gains and losses discussed. Message planning instructs participants to identify the most significant consequence associated with participation in strength and balance exercise to include a persuasive message (poster) for peers. The combined active involvement intervention (opportunity to generate multiple reasons for change followed by selection of the most important reason

for change) is expected to elicit the greatest levels of motivation to process information, changes in cognitions and behaviors, and interpersonal communication.

With the lack of prior literature on active involvement interventions with older adults, this study turns to the burgeoning literature on participatory action research with older adults (Fudge et al., 2007). These approaches are similar, yet distinct. Active involvement interventions engage participants in a novel intervention activity so that the intervention has a positive effect on the outcome(s) of interest. Participatory action research involves participants in the research process such as developing a research protocol, recruiting participants, and collecting data. Participatory action research with older adults may hold promise for helping to understand and address some of the complex health issues of importance to them, as well as empowering and contributing to overall quality of life of older adults (Walker, 2007).

The empowering potential of participatory action research is illustrated by use of photovoice to gain insight into what is appealing about physical activity from the perspective of older adults (Sims-Gould, Hurd Clarke, Ashe, Naslund, & Liu-Ambrose, 2010). Photovoice provided participants with cameras and taught them how to take pictures capturing their realities, thus allowing older adults to express themselves both visually and textually using the photos as a metaphor for their feelings about aging, physical activity, and their changing bodies. They then were engaged in critical dialogue about their photographs and accompanying narratives for education or action to effect change (Wang & Burris, 1997). This study demonstrated the role of participatory action research in providing a means of self-expression for isolated, disempowered older adults, as well as insight into the lived realities of the target audience for researchers. In addition

to participatory action research, guidelines from the CDC (2011) recommend involving the intended target audience in the development and testing of interventions to make the information more interesting, relevant, and useable. This process is referred to as participatory design (CDC, 2011). Participatory design engages participants as co-creators of communication. Materials produced through a participatory process highlight the message creators as critical thinkers who can inspire similar others. Educational materials written by members of the intended audience can be powerful tools for sharing information and changing expectancies (Rudd & Comings, 1994).

Two decades of research on participatory design confirms that when participants are involved in development and evaluation of interventions, outcomes are more successful, including those for vulnerable groups (e.g., Hoy et al., 2004, Neuhauser et al., 2009, Rudd et al., 2000). Principles of participatory design have proven effective for active involvement interventions in the adolescent risk taking context (e.g., having adolescents plan and/or produce prevention messages such antismoking, anti-drinking/driving, or anti-texting and driving). As one example, the *keepin' it REAL curriculum*, a drug prevention curriculum implemented in 7th grade classrooms in more than 45 countries reaching more than 2 million youth each year (Hecht & Miller-Day, 2010), was founded on a “from kids-through kids-to kids approach” relying on the examination of youth narratives to inform the design of the intervention and message development. The stories adolescents tell about drugs reveal how they see drugs and drug use, the choices they make, and what can be done to influence them to make healthy choices (Miller-Day & Hecht, 2013). Adolescents gravitate toward the stories that resonate with their lived experiences (Miller-Day & Hecht, 2013). Thus, exposure to

health messages created from these narratives heightens youth identification with the program content and enhances the personal relevance of these messages to the message recipients (Hecht, Corman, & Miller-Rassulo, 1993; Hecht & Miller-Day, 2010; Miller, Alberts, Hecht, Trost, & Krizek, 2000; Miller-Rassulo & Hecht, 1988).

Participatory design has proven effective with a number of groups; however, this approach remains untested with older adults. This dissertation instructed participants to design messages that will be used to influence peers. The present study used this activity for the purpose of self-persuasion. As detailed in the directions for future section, forthcoming studies will translate participant generated messages into actual health promotion messages to be displayed in community-based settings. The opportunity for self-expression provided by participatory design may overcome age-related cognitive changes (selective attention, preference for positive information, immediate application, and hands-on activities) and be a promising strategy for changing cognitions and behaviors. The next section discusses active involvement intervention conditions grounded in participatory design principles.

Description of Intervention Conditions

As mentioned previously, active involvement interventions (Greene & Hecht, 2013) have gained popularity as an intervention strategy for adolescents (e.g., Banerjee & Greene, 2006; 2007; Greene et al., 2012; Hecht & Miller-Day, 2009). There are two theoretical perspectives that describe how active involvement interventions function: the TAI (Greene, 2013) and the Narrative Engagement Framework (Miller-Day & Hecht, 2013). The TAI (Greene, 2013) proposes that active involvement in planning and producing messages causes participants to reflect on the perspective advocated in the

messages and to compare these messages with their own perspectives/behavior and that of their peers, leading to reconsideration or reinforcement of participants' perspectives. The Narrative Engagement Framework argues that active involvement in narrative development is associated with increased identification, liking, and perceptions of realism that result in attitude, intention, proliferation, and behavior change. Both theoretical approaches posit that participating in a "hands on" activity (designing prevention message for peers or sharing a personal narrative that will be used by others) heightens engagement with the messages created producing changes in outcomes of interest (message processing, cognitions, behaviors, and interpersonal communication).

Evidence from previous research has shown that active involvement interventions can be successful in increasing engagement (Lee et al., 2011), reducing positive expectancies (Lee et al., 2011), and reducing intentions to engage in risk-taking behavior (Lee et al., 2011; Warren et al., 2006), particularly in the context of media literacy (Banerjee & Greene, 2006; 2007; Greene et al., 2012). Not all media literacy interventions have an active involvement component, but many do include what that area labels message production. Two components of active involvement interventions in the context of media literacy have included analysis of media messages and planning and/or production of media messages (e.g., Austin & Johnson, 1997; Pinkleton et al., 2007). The analysis component (idea generation) allows participants to critique media messages by describing message features and content in detail, which, in turn, activates reflective thinking (Pinkleton et al., 2007). If participants do not engage in risk-taking behaviors (substance use) then reflection will reinforce anti-risk cognitions and promote behavioral maintenance. Conversely, if participants engage in risk-taking behaviors then reflection

will create perceived discrepancy and result in behavior change. The goal, then, of analysis is to encourage participants to reflect on their own behavior in a meaningful way and consider anti-risk and/or pro-health behaviors. The production/planning component involves students in creating media messages, while providing an understanding of how media messages are constructed and how interactions among various production techniques produce specific effects (Austin & Johnson, 1997; Bergsma & Ingram, 2001; Pinkleton et al., 2007). The production/planning component (message planning) is highly audience-centered and is often credited for increasing youth self-esteem by engaging them and providing opportunities for self-expression (Tyner, 1992).

Banerjee and Greene (2006; 2007) reported the analysis of and then planning anti-tobacco messages superior to the analysis of tobacco ads in changing substance use expectancies and intentions. Greene et al. (2012) reported the analysis of and then planning anti-alcohol messages superior to the analysis of alcohol ads in decreasing alcohol use intentions and positive expectations about the effects of alcohol use. While the studies described above provide support for active involvement as a promising intervention strategy neither address the specific components of active involvement interventions and the processes that influence outcomes of interest.

As these active involvement interventions become a more common strategy for campaign design, understanding and explaining the mechanisms underlying intervention effects become more important. Thus, the present study utilizes the TAI as its theoretical framework and in an attempt to identify the mechanisms of change by testing active involvement components individually, combined, and compared to standard care yielding

a total of four versions of an intervention: (1) idea generation, (2) message planning, (3) idea generation and message planning combined, and (4) standard care.

The idea generation condition (similar conceptually to media literacy analysis) evaluates reasons why peers do or do not engage in strength and balance exercise. Instead of describing message features and content (media literacy analysis activities), participant's compare current behavior with the behavior they recommend for similar others and the gains and/or losses afforded by his/her current behavior. Similar to reflective thinking activated in analysis, this comparison is likely to lead to perceived discrepancy between recommendations for similar others and personal standards, resulting in change, or it could reinforce internal standards for preventive behavior leading to behavioral maintenance. The message planning condition (based on media literacy production/planning activities) instructs participants to plan a message (text, people, and setting) designed to motivate peers to participate in strength and balance exercise. Similar to production/planning, message planning is highly participant-centered and expected to engage older adults by providing an opportunity for self-expression. Participants in the idea generation and message planning combined condition evaluate reasons for and against strength and balance exercise, select the most significant consequence associated with strength and balance exercise (text), and generate the number of and type of people, as well as setting of the pro-health message. The following paragraphs describe each intervention version in more detail, starting with idea generation and message planning combined based on active involvement intervention design.

Idea generation and message planning combined. Idea generation and message planning instruct participants to discuss reasons for and against strength and balance exercise and plan a message to motivate peers to participate in strength and balance exercise. This condition includes activity components of both idea generation and message planning that are predicted to cause participants to reflect on the perspective advocated in their messages (pro-strength and balance exercise) and to compare this message with their own perspectives/behavior (current strength and balance exercise behavior), leading to reconsideration or reinforcement of participants' perspectives (see Appendix D). Idea generation and message planning combined takes between ten to fifteen minutes to complete. Each active involvement intervention component is described in detail next.

Idea generation. Idea generation instructs participants to think about how his/her peers view strength and balance exercise. Participants estimate the number of older adults who participate in strength and balance exercise, as well as reasons for and against strength and balance exercise participation. Probes specifically focus on benefits/gains (perceived benefits) associated with strength and balance exercise and why older adults should do strength and balance exercise (injunctive norm) (see Appendix E). Idea generation takes between five to seven minutes to complete.

The main objective of the idea generation condition is to help participants recognize or amplify the discrepancy between their current behavior and the behavior they recommend for peers (Miller & Rollnick, 2002). To develop discrepancy, the activity asks participants about gains associated with peers' participation in strength and balance exercise such as health/independence, social, and self-concept benefits as well as

losses associated with non-participation in strength and balance exercise (limited mobility, restricted activities, increased risk of falling, physical deterioration). Idea generation raises participant awareness of the conflict between current behavior and opportunities for achieving benefits discussed (due to participating in recommended behavior). Discrepancy emerges from reflecting back and examining the gains and losses between participation and non-participation. Ultimately, participants may modify their current behavior to match internal standards activated through gain/loss comparison (Greene, 2013).

While grounded in the spirit of motivational interviewing (individual activity that develops discrepancy), this study is distinct in that it focuses on reasons for others to change. When identifying relevant reasons for a peer, the explicitness of the persuasive intent is relatively low. Prior research suggests that when persuasive intent is direct, people often raise their defenses and ultimately show more resistance to change than when persuasive intent is indirect (e.g., Petty & Cacioppo, 1979). If people are more resistant when they are the explicit target of persuasion (speaking one-on-one about changing individual behavior), then generating reasons for others may promote greater change in cognitions without increasing resistance. Thus, the current study adopted a strategy of having participants think through how to persuade peers to change or maintain behavior.

Message planning. Another component of active involvement, message planning, instructs participants to plan a persuasive, pro-health message designed to motivate peers to participate in strength and balance exercise. Participants identify a significant consequence associated with strength and balance exercise (perceived benefit, the text or

reason for participation to be highlighted in the message). In addition, participants generate the number of and type of people, as well as setting of the health message (the images to be highlighted in the message). Probes specifically focus on adapting message content to older adult preferences (see Appendix F). Message planning takes between five to seven minutes to complete.

The main objective of the message planning condition is for participation in the planning process to build commitment and ownership of conclusions expressed in the pro-strength and balance exercise message. This logic is based on the narrative engagement framework (Miller-Day & Hecht, 2013) and self-persuasion (Bem, 1972; Linder, Cooper, & Wicklund, 1968). The Narrative Engagement Framework (Miller-Day & Hecht, 2013) posits that narratives are central to prevention efforts because they enhance narrative knowledge, promote engagement, and provide mental and behavioral models. Engaging narratives created by members of the target audience (“from kids-through kids-to kids approach”) have the ability connect with hard-to-reach audiences and strengthen existing pro-health beliefs and behaviors.

Messages that people generate themselves can be quite effective in producing change in cognitions that may ultimately lead to behavior change (Bem, 1972; Linder et al., 1968). This process is known as self-persuasion where people end up persuading themselves as a function of generating arguments for some issue. To promote self-persuasion, the activity instructs participants to develop a message to motivate peers to participate in strength and balance exercise. Participants are prompted to select the most persuasive reason for engaging in strength and balance exercise.

Research on role playing demonstrated the persuasive effect of completely self-generated messages (Janis & King, 1954; King & Janis, 1956). For example, in one study, individuals who were assigned to play the role of a person trying to convince a friend to stop smoking were more turned off to cigarettes than were those who received the same information passively (Elms, 1966; Huesmann, Eron, Klein, Brice, & Fischer, 1983; Watts, 1967). When people generate arguments, they tend to come up with reasons that they find the most compelling (Greenwald & Albert, 1968; Slamecka & Graf, 1978). That is, people are effective in tailoring the message for themselves, even if the goal is to persuade another person.

Additionally, when trying to convince another person (such as a peer), the explicitness of the persuasive intent is relatively low. Prior research on forewarning shows that when persuasive intent is direct, people often raise their defenses and ultimately show more resistance to change than when persuasive intent is indirect (e.g., Petty & Cacioppo, 1979). If people are more resistant when they are the explicit target of persuasion, then generating messages for others may promote greater change in cognitions without increasing resistance.

Beyond the forewarning literature, work on perceived accountability (Tetlock, Skitka, & Boettger, 1989) points to another reason for why generating messages for others may result in change in cognitions. If people anticipate that their arguments will be scrutinized by others, then they will exert more effort in generating high-quality messages. Participants in the message planning condition are instructed to create a persuasive, pro-strength and balance exercise message for similar others. Based on these instructions, participants are led to believe that the messages they design will be viewed

by peers and used in future health campaigns. Therefore, participants will be motivated to generate well reasoned arguments for future use with peers.

Standard care. Standard care refers to the current recommended treatment guideline for a given health condition, in this case intervention delivery format for older adult fall prevention and strength and balance exercise promotion. The standard care condition serves as a comparison group for the other intervention conditions. Standard care instructs participants to read an information packet from the National Institutes of Health [NIH]. Participants receive a 6 page typed, 14 point font information packet. The formatting of the information packet is consistent with the NIA's recommendations for making print materials senior friendly (appropriate font, font size, white space, and headings). The information packet focuses on the health and everyday benefits of strength and balance exercise. The information packet was downloaded from <http://nihseniorhealth.gov/exerciseforolderadults/healthbenefits/01.html> (see Appendices G and H). The standard care condition takes five to seven minutes to complete.

Summary of conditions. This study examines if active involvement components individually or in combination have a significantly greater effect on motivation to process information, cognitive and behavioral outcomes, and interpersonal communication outcomes than standard care. This section discussed active involvement interventions and provided a summary of participatory action research with older adults. Then, it reviewed active involvement intervention components (idea generation and message planning) individually, combined, and compared to standard care. The next section provides a description of active involvement intervention feasibility.

Feasibility

One question related to many community-oriented interventions is whether they are feasible or not. Feasibility refers to the degree to which an intervention is easy or convenient to implement in real-world settings based on constraints of the situation (Glanz et al., 2008). The brevity of each intervention condition increases the likelihood of adoption in health settings. Intervention implementation is premised on the success of brief motivational interviewing (BMI) interventions that have proven to be effective (e.g., meta-analysis, Lundahl et al., 2010). BMI consists of a single or multiple sessions (ranging from a few minutes to one hour) of motivational engaging discussion for eliciting behavior change by helping individuals explore and resolve ambivalence about reasons for and against changing a behavior (Miller & Rollnick, 2002). Although substantial literature exists supporting the utility of this approach with young and middle-aged adults (Lundahl et al., 2010), little of the literature focuses on the efficacy of BMI for promoting lifestyle changes and improved functioning among older adults.

Findings from a systematic review of 15 studies investigating the effect of BMI among older adults indicate BMI is a promising health behavior change strategy (Cummings, Cooper, & Cassie, 2009). For example, in the area of diet, weight control, and exercise, BMIs produced significant changes among older adults including short-term weight loss, decreased health distress, decreased sodium intake, improved glucose control, decreased blood pressure, and improved adherence to weight control programs, and increased frequency and duration of physical activity (e.g., Bennett, Lyons, Winters-Stone, Nail, & Scherer, 2007; Jackson, Asimakopoulou, & Scammell, 2007).

Two BMI studies focused on physical activity as the outcome of interest. Kolt, Schofield, Kerse, Garrett, and Oliver (2007) examined the effect of a telephone-based BMI program on physical activity among 186 older adults over the age of 65 recruited from New Zealand primary care offices. Participants were randomly assigned to a treatment or control group. The treatment group received eight scripted BMI phone calls, lasting 10-16.5 minutes each, with an exercise counselor over 3 months. The control group received no intervention. At the conclusion of the intervention, the treatment group reported a significant increase in physical activity (odds ratio = 2.90, 95% confidence interval = 1.33–6.32, $p = .007$) and a significant higher level of physical functioning (Mean difference = 4.44, $SE = 2.16$, $p = .04$) than the control group.

Brodie and Inoue (2005) compared the effectiveness of a physical activity BMI intervention to standard care in a group of older adults with chronic heart failure. The BMI group received eight one hour, home-based sessions concentrating on exploring ambivalence to physical activity. The standard care group received information to increase physical activity including options available locally. Participants were recruited from a general medical ward in one of two United Kingdom hospitals. Sixty of 92 enrollees completed the 5-month study, a 35% drop out rate. The study evaluated groups that received standard care, standard care with BMI, and BMI alone. Participants in the BMI-alone group and the BMI plus standard care both increased self-reported physical activity when compared to baseline. The two studies' findings suggest that BMIs may be an effective health intervention strategy for promoting health behavior change among older adults.

Considering that health care providers and care managers from community-based organizations operate in settings constrained by limited time and resources, there is an emphasis on more efficient and less costly methods to promote health behavior change among older adults (Schutzer, 2004). Thus, ease of use is an important consideration for intervention implementation, with brevity of the intervention significantly increasing its likelihood of being adopted and utilized in these settings. The CDC (2011) also recommends collaboration with health care providers to engage older adults in fall prevention activities. Older adults are more likely to take action when the health message is from a trusted source such as a health care provider (CDC, 2011). For example, research indicates that more than 70% of older adults report that they rely on their health care provider for health information to guide them through medical or health matters (United States Census Bureau, 2007). A review of studies aimed at examining the views and preferences of older adults in fall prevention programs reveals that advice and encouragement from health care providers had a significant influence on older adults' participation in fall prevention programs (Yardley et al., 2006; Yardley et al., 2007; Dickinson et al., 2011).

This dissertation proposes an active involvement intervention that includes three main features. The first feature is a novel activity designed to engage older adults in perspective taking and analysis of motivations or reasons for engaging in strength and balance exercise (e.g., idea generation and message planning of preventive health messages). Second, a brief intervention format (less than 15 minutes) to encourage attention and maximize dissemination in health care and community settings. The final feature is consideration of age-appropriateness, taking into account target abilities

(selective attention and preference for positive information). The next section provides a description of the TAI (Greene, 2013), a theoretical framework that guides development of these active involvement intervention conditions.

Theoretical Framework

The TAI (Greene, 2013) describes the processes through which active involvement interventions influence older adults' cognitions and strength and balance exercise-related stage progression. Phases one through three of the TAI account for the initial stages of the process including engagement with the intervention (arousal and involvement) that leads to perspective taking and eventually to reflection (perceived discrepancy). Phases four and five of the TAI explain the cognitive and behavioral outcomes associated with active involvement interventions including perceived benefits, perceptions of norms, as well as strength and balance exercise-related stage progression, respectively. The TAI is described in more detail next.

Theory of Active Involvement

The TAI (Greene, 2013) is a cognitive theory grounded in experiential learning principles (Rogers & Freiberg, 1994) that incorporates reflection and perspective taking from the self-regulation component of social cognitive theory (Bandura, 1986). The TAI posits there are four phases prior to behavior change. First, an active involvement intervention must *engage* the participant in order to be processed, occurring through engagement components of *arousal* and *involvement* (see Greene et al., 2012). Second, an active involvement intervention (after engagement) enables the participant to increase comprehension and knowledge, as well as to acquire perspective taking and critical thinking skills. Third, the perspective taking skills gained from exposure to multiple

perspectives generates *reflection* where participants compare their own perspective with perspectives shared by others. Fourth, this reflection leads to changes in cognitions. The fifth and final stage is behavior change (see Figure 1). The TAI and active involvement interventions are appropriate for contexts designed to initiate change or reinforce an existing behavior. The theory and theory-drive interventions are unlikely to sustain change such as long-term or habitual behavior, and such contexts may require boosters as an additional approach.

Although, the TAI has been tested previously with group-based activities, the present study proposes an individual activity and modifications to conceptualizations of perspective taking and reflection. For this study, *perspective taking skills* will be gained by discussing reasons why peers do or do not participate in strength and balance exercise and planning a prevention message for similar others. Thinking about the benefits peers gain because of participation in strength and balance exercise or negative consequences peers experience due to non-participation will generate *reflection*. Participants will compare their current behavior with the behavior they recommend for similar others and the gains and/or losses afforded by his/her current behavior. Each phase is described in detail in the following sections and provides older adult strength and balance exercise examples, starting with engagement.

Engagement. In order for information to be processed it must first engage the audience or create conditions where individuals process the information. TAI proposes there are two components of engagement, arousal followed by involvement (Greene et al., 2012). Arousal and involvement are described in detail next.

Arousal. Arousal (such as that accompanying fear or excitement) is defined as a reaction to a stimulus and promotes information processing because people are motivated to respond to this arousing stimulus (Bryant & Zillmann, 1984). Arousal to a stimulus has been linked to physiological arousal (Bryant & Zillmann, 1984; Christ & Biggers, 1984) and measured using both heart rate and skin conductance measures (Globisch et al., 1999; Levy et al., 2000). However, physiological indicators are beyond the scope of the present research. Because perceived novelty can be clearly operationalized, it acts as a proxy of arousal in the present study. In the context of health communication interventions (and this study) arousal is determined by the novelty of the method of delivery of information. For example, geragogy principles (Battersby, 1987) suggest active involvement interventions are especially promising for older adults who learn better when activities are perceived as exciting and lively (Best, 2001; Pearson & Wessman, 1996). As a drawback, if the intervention effect relies on novelty of the method of delivery, then it may be difficult to repeatedly transfer effects across contexts or expose older adults multiple times using the same or similar mechanisms.

Novelty in active involvement interventions is generated from idea generation and message planning combined activity. The idea generation and message planning combined activity is perceived as novel to the extent to which it is viewed as different from traditional lecture-based or written health materials (standard care information packet). The idea generation component engages older adults in a dialogue about why peers do/do not participate in strength and balance exercise. The message planning component involves older adults in generating text and images to be highlighted in persuasive message for peers. Idea generation and message planning incorporates both of

these activities. The effect of participating in two unique activities (engaging in a dialogue during idea generation and generating text and images from message planning) should make the idea generation and message planning combined condition the most novel. Therefore, it was hypothesized:

Hypothesis 1a: Participants in the idea generation, message planning, idea generation and planning combined conditions will report higher levels of perceived novelty than participants in the standard care condition.

Hypothesis 2a: Participants in the idea generation and message planning combined condition will report higher levels of perceived novelty than participants in idea generation or message planning conditions.

Due to lack of previous research comparing idea generation versus message planning, it is unclear which active involvement component will be perceived as more novel, the idea generation or message planning. Participants in idea generation may find identifying reasons for and against strength and balance exercise to be novel. Yet participants in message planning may find designing a message for peers as different from traditional lecture-based or written health materials and thus novel. Therefore, the following research question was proposed:

Research Question 1a: How do participants in the idea generation and message planning conditions differ in terms of their reports of perceived novelty?

Involvement. Ego involvement, or personal relevance, is another component of engagement (Petty, Cacioppo, & Goldman, 1981). The more people view the content of interventions as being personally relevant, the more motivated participants are to process

messages and the greater depth at which they process the intervention (Petty & Cacioppo, 1986).

Increasing involvement in message processing is an issue of concern for developing interventions for older adults. As described previously, aging-related selective attention is most apparent in situations of low relevance or meaningfulness to the older adult. However, there are fewer age differences as relevance and meaningfulness of the information increases (Hess, 2000). Idea generation engages older adults in a dialogue about why peers do/do not participate in strength and balance exercise. Reasons generated for/against participation in strength and balance exercise may reveal participants' relevant perceived benefits. Selection of text and images to be used in pro-strength and balance exercise messages may make the messages more relevant for the intended target audience (other older adults) (CDC, 2011). The combination of participants identifying personally held perceived benefits of strength and balance exercise and designing messages to be used in the future for peers should make the idea generation and message planning combined condition the most involving. Therefore, it was hypothesized:

Hypothesis 1b: Participants in the idea generation, message planning, idea generation and message planning combined conditions will report higher levels of perceived involvement than participants in the standard care condition.

Hypothesis 2b: Participants in the idea generation and message planning combined condition will report higher levels of perceived involvement than participants in idea generation or message planning conditions.

Because no previous published active involvement intervention compared idea generation versus message planning, it is unknown which active involvement component will be perceived as more involving, the idea generation or message planning.

Participants in idea generation may perceive the opportunity to identify multiple relevant/personal reasons for or against strength and balance exercise as involving because it simulates interaction as participation. In contrast, participants in message planning may view designing a message that someone like them would respond to/find persuasive as involving. Thus, the following research question was proposed:

Research Question 1b: How do participants in the idea generation and message planning conditions differ in terms of their reports of perceived involvement?

Perceived gain. Engagement alone with the content of active involvement interventions may not be sufficient to stimulate individual behavior change unless participants are also motivated to learn from and critically reflect on the information obtained. Perceived gain refers to the extent that participants value what they learned from the active involvement (e.g., new information, motivation for own behavior, motivation for other behavior).

As described previously, older adult learning is enhanced when it is immediately applicable to real life contexts and is gained through “first-hand” experience (Nevins, 2013). Previous research suggests older adults enjoy receiving new information about how to increase their current physical activity (Hutton et al., 2009). Active involvement interventions elicit perceived gain from the idea generation, message planning, or idea generation and message planning combined activities. Participants may perceive utility in evaluating reasons why peers do/do not participate in strength and balance exercise and

identifying the most persuasive reason to change/maintain behavior. Incorporation of both activities should make the idea generation and message planning combined condition elicit the greatest levels of perceived gain. Therefore, it was hypothesized:

Hypothesis 1c: Participants in the idea generation, message planning, idea generation and planning combined conditions will report higher levels of perceived gain than participants in the standard care condition.

Hypothesis 2c: Participants in the idea generation and message planning combined condition will report higher levels of perceived gain than participants in idea generation or message planning conditions.

Participants in idea generation may value generating reasons for and against participation in strength and balance exercise and rate the activity higher in perceived gain. On the other hand, participants in message planning may perceive value in creating persuasive message content for peers and score the activity higher in perceived gain. With no test comparing idea generation versus message planning in terms of eliciting greater levels of perceived gain the following research question was proposed:

Research Question 1c: How do participants in the idea generation and message planning conditions differ in terms of their reports of perceived gain?

Perspective taking. After engagement with the intervention activities, the TAI proposes that individuals can begin to activate internal evaluations known as perspective taking. Perspective taking refers to the ability to perceive someone else's thoughts, feelings, and motivations (Feffer, 1959). Perspective taking in individual-based active involvement interventions is jointly influenced by planning a prevention message for similar others and being asked to think about similar others' positions toward the target

behavior. For this study, idea generation instructs participants to identify reasons why peers do or do not participate in strength and balance exercise. Message planning involves older adults in generating pro-strength and balance exercise messages for other older adults. Idea generation and message planning combined incorporates both of these activities. Perspective taking is predicted to lead to older adults comparing their internal standards to the reasons for and against exercising generated in the idea generation, message planning, and idea generation and message planning combined activities.

The TAI does not have a proposition for perspective taking and it is not tested in the present study; rather perspective taking is a proxy for reflection. The idea generation, message planning, and idea generation and message planning combined conditions instruct participants to think like and/or create messages for his/her peers. This perspective taking leads to reflection (the proposed mechanism of change).

Reflection. Perspective taking leads to self-reflection where individuals carefully evaluate their own cognitions and behavior. Self-reflection in individual-based active involvement interventions is determined by comparing current behavior with the behavior recommended for similar others and the gains and/or losses afforded by his/her current behavior. This comparison is likely to lead to perceived discrepancy between recommendations for similar others and personal standards, resulting in change, or it could reinforce internal standards for preventive behavior leading to behavioral maintenance.

For this study, older adults are predicted to compare their current behavior (participation versus non participation in strength and balance exercise) with reasons why peers should engage in strength and balance exercise (gains afforded by or missing out on

due to participation or lack of participation). Thus, if older adults participate in strength and balance exercise then reflection will reinforce pro-exercise cognitions and promote behavioral maintenance. Conversely, if older adults do not participate in strength and balance exercise then reflection will create perceived discrepancy and result in behavior change. The goal, then, of the active involvement intervention activities is to encourage participants to reflect on their own behavior in a meaningful way and consider pro-health behaviors. Idea generation asks participants to generate reasons for and against strength and balance exercise participation. This activity enables participants to compare gains and losses associated with action and inaction, as well as compare and rank the importance of the multiple gains and losses discussed. Message planning instructs participants to identify the most significant consequence associated with participation in strength and balance exercise. The opportunity to generate multiple reasons for change followed by selection of the most important reason for change should make the idea generation and message planning combined condition elicit the greatest levels of reflectiveness. Therefore, it was hypothesized:

Hypothesis 1d: Participants in the idea generation, message planning, idea generation and planning combined conditions will report higher levels of reflectiveness than participants in the standard care condition.

Hypothesis 2d: Participants in the idea generation and message planning combined condition will report higher levels of reflectiveness than participants in idea generation or message planning conditions.

Without prior research, it is unclear whether idea generation or message planning will elicit greater levels of reflectiveness, the idea generation or message planning.

Participants in idea generation may reflect by comparing gains and losses associated with action and inaction, as well as comparing and ranking the importance of the multiple gains and losses discussed. In contrast, it is possible participants in message planning may reflect to some extent when identifying the most significant consequence associated with participation in strength and balance exercise. Thus, the following research question was proposed:

Research Question 1d: How do participants in the idea generation and message planning conditions differ in terms of their reports of reflectiveness?

Phases one through three of the TAI describe how engagement leads to perspective taking that generates reflection which in turn leads to cognitive and behavioral changes. The next section describes phases four and five (cognitive and behavioral changes).

Cognitive and Behavioral Outcomes

This section moves beyond reflection and intervention perceptions and identifies how participants apply information obtained from active involvement intervention conditions, initially to cognitions. Relevant cognitive outcomes included perceived benefits, perceptions of norms, and readiness for change. Each cognitive outcome is described in detail in the following paragraphs.

Perceived benefits. Tracking the processing of active involvement interventions requires extending beyond initial effects (the four dimensions of motivation to process information) to include how they affect cognitions including perceived benefits. Perceived benefits are defined as beliefs about the positive outcomes associated with a behavior in response to a real or perceived threat (Rosenstock, 1974). Perceived benefits

are specific to an individual's perception of the gains that will accrue by engaging in a specific health action. In the context of older adult strength and balance exercise, perceived benefits include beliefs about the likelihood and types of benefits associated with doing strength and balance exercise. For example, "Doing strength and balance exercise will reduce my chances of falling." Yardley et al. (2006) found that older adults were motivated to participate in strength and balance exercise when they perceived a wide range of benefits such as enjoyment, improved health, mood, independence, and not just reduction of falling risk. This same study identified a number of barriers to participation in strength and balance exercise including optimistic bias/denial of falling risk, transportation, cost, and effort (Yardley et al., 2006). Older adults most frequently list poor health and pain as leading barriers to exercise (Cohen-Mansfield, Marx, & Guralnik, 2003). The physical environment can also present as a potential barrier to exercise. Environments with available and convenient resources used for exercise such as sidewalks, parks, recreation centers, and fitness facilities, make it easier for older adults to exercise (Schutzer & Graves, 2004). Lack of knowledge and understanding of the relationship between moderate exercise activity and health is an especially relevant barrier, as many older adults lived through a time period when exercise was not valued or deemed necessary. Many older adults feel they already receive enough exercise in their activities of daily living (O'Neill & Reid, 1991). The present study does not focus specifically on perceived barriers due to the literature on age-related cognitive changes that recommends highlighting benefits and including and/or evoking positive emotional content in order to motivate older adults to process the intervention (Charles et al., 2003).

Participants in idea generation create reasons for and against strength and balance

exercise participation, thereby discussing multiple gains and losses associated with action/inaction and reinforcing a range of positive health, social, and self-concept consequences of the pro-health behavior. Participants in message planning select the most important reason for engaging in strength and balance exercise. It can be expected, therefore, that the combination of idea generation and message planning will create or reinforce the highest levels of perceived positive outcomes of strength and balance exercise. Thus, it was hypothesized:

Hypothesis 3: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared to participants in the standard care condition over time.

Hypothesis 4: Participants in the idea generation and message planning combined condition will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared with participants in the idea generation or message planning conditions over time.

Due to lack of previous research on idea generation versus message planning, it is unclear which active involvement component will elicit greater levels of change in perceived benefits over time, the idea generation or message planning. Participants in idea generation may experience change in perceived benefits based on the opportunity to generate a number of and different types of benefits for strength and balance exercise. On the other hand, participants in message planning may experience change in perceived benefits because they are instructed to select the most persuasive type of benefit. Thus, the following research question was proposed:

Research Question 2: How do participants in the idea generation and message planning conditions differ in terms of their reports of changes in perceived a) health benefits, b) social benefits, and c) self-concept benefits over time?

Norms. Besides perceived benefits, active involvement interventions may influence perceptions of subjective, descriptive, and injunctive norms. Subjective norms are defined as individuals' beliefs about whether referent others approve or disapprove of a particular behavior and the related motivation to behave in a way that gains the others' approval (Ajzen, 1991). Descriptive norms refer to individuals' beliefs about the prevalence of a particular behavior (Cialdini et al., 1990). Injunctive norms specify what ought to be done in relation to a particular behavior (Cialdini et al., 1990). Of the three types of norms, only subjective norms have been evaluated in the prior literature on older adult physical activity. Older adults whose family and friends were enthusiastic about strength and balance exercise (Yardley et al., 2007) or whose health care provider recommended strength and balance exercise (Snodgrass & Rivett, 2005; Yardley et al., 2007; Berlin Hallrup et al., 2009; Hutton et al., 2009) were more likely to participate in strength and balance exercise. Thus, motivation improved when family, friends, and professionals encouraged strength and balance exercise (Hutton et al., 2009).

Participants' perceptions of norms are influenced by active involvement intervention components. Participants in idea generation identify why peers do or do not engage in strength and balance exercise (e.g., asking participants to describe approval or disapproval of participation in strength and balance exercise). Participants in message planning generate text (the most important reason for participation) and images (people that approve and/support strength and balance exercise). It can be expected, therefore,

that the combination of idea generation and message planning will create or reinforce highest levels of perceived approval of participation in strength and balance exercise.

Thus, it was hypothesized:

Hypothesis 5: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared to participants in the standard care condition over time.

Hypothesis 6: Participants in the idea generation and planning combined condition will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared with participants in the idea generation or message planning conditions over time.

Because no previous published active involvement intervention compared idea generation versus message planning, it is unknown which active involvement component will elicit greater levels of change in perceptions of norms over time, the idea generation or message planning. Participants in idea generation may experience greater levels of change in perceptions of norms if they identify social reasons (peer pressure/social approval) for or against strength and balance exercise. In contrast, participants in message planning may experience greater levels of change in perceptions of norms based on selecting message text and/or people that portray strength and balance exercise as a social activity. Thus, the following research question was proposed:

Research Question 3: How do participants in the idea generation and message planning conditions differ in terms of their perceptions of a) subjective norms, b) descriptive norms, and c) injunctive norms?

Readiness for change and stage progression. Due to the type of active involvement focus that initially targets engagement and reflection and duration of the proposed intervention (15 minute maximum with no booster and short delayed posttest 10 weeks later), the current intervention may not change actual strength and balance exercise behavior or reduce number of falls. Rather, an active involvement intervention is expected to elicit changes in cognitions (perceived benefits, perceptions of norms, readiness for change), and perceived information processing (perceived novelty, perceived involvement, perceived gain, and reflectiveness). This study refocuses outcome attention on stage progression based on the stages of change model (Prochaska et al., 1992), described next.

Stages of change model. The stages of change model (Prochaska et al., 1992) posits that behavior change is a process and individuals exist at varying levels of motivation, or readiness to change. As an individual attempts to change a behavior, he or she moves through five stages: precontemplation, contemplation, preparation, action, and maintenance. A person in *precontemplation* has no intention of taking action within the next six months. Individuals in this stage are uninformed about the long-term effects of their present behavior, demoralized about their ability to change, and may be defensive due in part to social pressures to change. A person in *contemplation* is aware that a problem exists and is seriously thinking about overcoming it, but has not yet made a commitment to take action. Individuals in this stage seriously consider problem resolution by weighing the pros and cons of action and inaction, and intend to take action in the next six months. *Preparation* combines the criteria of intention and behavior. Individuals in this stage have made some small behavioral changes and intend to take

action within the next thirty days. *Action* is defined by the adoption of behavior for less than six months. Individuals in the stage modify their behavior, experiences, or environment in order to overcome their problems. *Maintenance* is the stage where the individual has changed behavior for more than six months. An individual in this stage has adopted the behavior as a routine part of life and works to prevent relapse (Prochaska et al., 1992).

Positive stage progression is not always accompanied by increased activity levels. This is true for progression from precontemplation to contemplation and action to maintenance. Behavior change is a process that unfolds over time through a sequence of stages. In addition, movement through these stages may not occur in a linear fashion. Often individuals move through the stages repeatedly, in a cyclical manner, before action or maintenance is reached. In addition, individuals at different points along this continuum have different informational needs and benefit from interventions designed for their stage (Prochaska et al., 1992). The proposed mechanism of change for each active involvement component may be most appropriate for different participants with specific levels of readiness for change. Thus, it was hypothesized:

Hypothesis 7: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of a) strength-related exercise stage progression and b) balance-related exercise stage progression compared to participants in the standard care condition over time.

Hypothesis 8: Participants in the idea generation and message planning combined condition will report increased levels of a) strength-related exercise stage progression and

b) balance-related exercise stage progression compared to participants in the idea generation or message planning conditions over time.

Participants in idea generation may experience greater levels of exercise-related stage progression due to identifying multiple relevant reasons that may motivate behavior change or reinforce behavior maintenance. On the other hand, participants in message planning may experience greater levels of exercise-related stage progression because they are asked to identify and focus on the most important/persuasive reason to change or maintain exercise behavior. With no test comparing idea generation versus message planning in terms of eliciting greater levels of exercise-related stage progression the following research question was proposed:

Research Question 4: How do participants in the idea generation and message planning conditions differ in terms of their reports of a) strength-related exercise and b) balance-related exercise stage progression?

Stages of change model and older adults. The stages of change model (Prochaska et al., 1992) has been successfully applied to exercise interventions in older adults. Barke and Nicholas (1990) demonstrated that the stages of change are applicable to an older adult population. This study revealed older adults are not “set in their ways.” Rather, those sampled were thinking about and changing their levels of physical activity. In addition, the stages of change model served as a means of differentiating between active and inactive older adults.

Rich and Rogers (2001) examined perceived benefits toward exercise held by older adults at different stages of change. Those in the action and maintenance stages hold more perceived benefits regarding exercise while those in precontemplation,

contemplation, and preparation stages hold more perceived barriers. The active older adults reported more perceived benefits toward exercising for health benefits, social interaction, and tension release with health benefits as the most important.

Marcus and colleagues (1992) found that a 6 week intervention program with 610 participants age 60 and over using written materials based on the stages of change model and tailored to the participant's stage of change increased the stage of exercise adoption for most participants. Messages tailored for individuals in earlier stages focused on increasing consciousness and awareness of the need for change. In contrast, messages tailored for individuals ready to change behavior focused on overt behavioral change. Consistent with stages of change model studies, different factors were found to be important at the different stages (Prochaska et al., 1992). Intervention strategies to move individuals from precontemplation to contemplation included increasing awareness of the need for change and personalizing information about risks and benefits (Maibach & Cotton, 1995). Intervention strategies to move individuals from contemplation to preparation included providing positive social and self-evaluative consequences of taking action. This enables individuals to see themselves as capable of behavior change (Maibach & Cotton, 1995). Intervention strategies to move individuals from preparation to action included assisting with developing and implementing concrete action plans, helping set gradual goals, providing messages to increase self-efficacy, and reinforcing appropriate behaviors (Maibach & Cotton, 1995). Intervention strategies to move individuals from action to maintenance included assisting with feedback, problem solving, social support, reinforcement, and including the long-term positive consequences of behavior change (Maibach & Cotton, 1995).

The review of literature described above focused on cognitive and behavioral outcomes. However, one set of outcomes not discussed or measured in most prior research on older adult physical activity are interpersonal communication outcomes that result from active involvement interventions. The next section describes these understudied outcomes in more detail.

Interpersonal Communication Outcomes

Interpersonal communication outcomes may focus on communication (or talk) about the intervention (e.g., idea generation and message planning combined) or about the salience of issue or topic (e.g., older adult strength and balance exercise, older adult falls, etc.). Based on literature concerning the role of interpersonal communication in mass media campaigns (Southwell & Yzer, 2007), interpersonal communication outcomes may be intended intervention outcomes. For example, interpersonal communication is important for stimulating conversations and influencing social norms via social networks (see Gest, Osgood, Feinberg, Bierman, & Moody, 2011; Valente, Gallaher, & Mouttapa, 2004). For example, Kam and Lee (2013) reported that higher levels of anti-drug mass media campaign message exposure led to more talk to friends about the negative consequences of drugs, how to avoid drugs, and anti-drug ads. Choi, Smith, and Hecht (2012) revealed that youth who talked positively about *keepin' it REAL* tended to report anti-substance personal norms. On the other hand, those who engaged in negative social talk appeared to have pro-substance personal norms. Banerjee et al. (2013) found that adolescent participants who engaged in interpersonal communication after a media literacy intervention later reported higher frequency of critical thinking about advertising as compared to participants who did not talk to others. Similarly,

Rogers and Storey (1987) proposed that successful campaigns promote interpersonal communication about the campaign topic, which further influences behavioral outcomes.

Intervention message features such as specific content or format components have been linked to increased interpersonal communication with others. Hafstad and Aaro (1997) found that provocative, emotional messages led the audience to talk about the campaign and the topic with others. Campo et al. (2013) reported that humor-based appeals were significant predictors of talking with and/or showing the campaign to others. The use of tropes (e.g., metaphors) and emotionally engaging narratives in the intervention promoted related conversations (Dunlop, Kashima, & Wakefield, 2010; Hoeken, Swanepoel, Saal, & Jansen, 2009). In addition, it was reported that, if the intervention topic was important, relevant, complex, and new the audience was more likely to converse about the topic (Southwell & Yzer, 2007).

As described previously, perceived novelty and involvement in active involvement interventions is generated from the idea generation, message planning, or idea generation and message planning combined activities. Idea generation engages older adults in a dialogue about why peers do/do not participate in strength and balance exercise and may reveal participants' relevant perceived beliefs. Message planning involves older adults in generating text and images to be highlighted in persuasive message for peers and may make the messages most relevant for other older adults. Idea generation and message planning incorporates both of these activities. The effect of participating in two unique activities that identify personally relevant perceived benefits should make the idea generation and message planning combined condition the most novel and involving. Based on message features findings, the extent to which the

intervention is perceived as novel and the intervention topic is perceived as personally relevant, interpersonal communication with others is expected to increase. Therefore, it was hypothesized:

Hypothesis 9: Participants in the idea generation, message planning, idea generation and planning combined conditions will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the standard care condition at delayed posttest.

Hypothesis 10: Participants in the idea generation and message planning combined condition will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the idea generation or message planning conditions at delayed posttest.

Without prior research, it is unclear whether idea generation or message planning will elicit greater levels of interpersonal communication. Thinking about multiple reasons for or against strength and balance exercise during a one-on-one dialogue may encourage participants in idea generation to discuss the topic and/or activity with others. On the other hand, the opportunity to design message text, people, and setting may prompt discussion about the message content and/or the opportunity to create something for peers. Thus, the following research question was proposed:

Research Question 5: How do participants in the idea generation and message planning conditions differ in terms of their reports of interpersonal communication a) about strength and balance exercise and b) the intervention activity?

In addition to being an intervention outcome, interpersonal communication may serve two roles: mediator of intervention effects or moderator of intervention effects

(Southwell & Yzer, 2007). Hwang (2012) argued that interpersonal communication functions as a mediator. The mediator model suggests that interpersonal talk after intervention participation may be a direct effect of intervention participation and influence social norms and strengthen attitudes, further leading to behavior change. Talk with others about the intervention, for instance, may lead to discovery of normative support for intervention-relevant behaviors (Hornik & Yanovitzky, 2003). For instance, an intervention participant may discuss the benefits of strength and balance exercise with others who did not participate in the intervention and learn that relevant others also agree or hold similar attitudes about participating in strength and balance exercise, thereby strengthening pro-strength and balance exercise behavior or encouraging behavior change.

Southwell and Yzer (2007) also acknowledged that other possible relationships exist, such as moderation instead of mediation. Interpersonal communication about the intervention may amplify or attenuate intervention effect outcomes (Druckman, 2004; Southwell, 2005). Talking about an intervention after participation may strengthen one's memory for the content and reinforce health behavior maintenance or facilitate behavior change. For instance, when compared with an intervention participant who does not engage in talk about the intervention, an intervention participant who engages in interpersonal talk about the benefits of strength and balance exercise may remember the intervention message longer.

In short, a number of researchers have set forth the possibility that interpersonal communication functions as a moderator, yet other sources suggest mediation. Future research should examine whether interpersonal communication mediates or moderates

the influence of the intervention on strength and balance exercise-related stage progression. The current study is not designed to explore this question. In addition to cognitive and behavioral outcomes, the novelty of the content and format of the active involvement intervention was predicted to increase interpersonal communication about the intervention with others.

Summary

This chapter provided an overview of older adult falls and existing fall prevention programs at the individual, health care provider, and community levels. Next, it described barriers to participation in existing fall prevention programs, reviewed age-related cognitive changes to information processing, and provided specific intervention recommendations to address older adult information processing needs. Then, it described the TAI (Greene, 2013) as a framework for designing a novel, feasible, and age-appropriate intervention followed by an overview of intervention conditions testing the active involvement components individually, combined, and compared to standard care. Based on the review of literature presented, it proposed 10 hypotheses and 5 research questions grouped according to motivation to process information, cognitive and behavioral outcomes, and interpersonal communication outcomes.

Hypotheses and Research Questions

Motivation to Process Information

Hypothesis 1: Participants in the idea generation, message planning, idea generation and planning combined conditions will report higher levels of a) perceived novelty, b) perceived involvement, c) perceived gain, d) reflectiveness compared with participants in the standard care condition.

Hypothesis 2: Participants in the idea generation and message planning combined condition will report higher levels of a) perceived novelty, b) perceived involvement, c) perceived gain, d) reflectiveness compared with participants in the idea generation or message planning conditions.

Research Question 1: How do participants in the idea generation and message planning conditions differ in terms of their reports of a) perceived novelty, b) perceived involvement, c) perceived gain, d) reflectiveness?

Cognitive and Behavioral Outcomes

Hypothesis 3: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared to participants in the standard care condition over time.

Hypothesis 4: Participants in the idea generation and message planning combined condition will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared with participants in the idea generation or message planning conditions over time.

Research Question 2: How do participants in the idea generation and message planning conditions differ in terms of their reports of changes in perceived a) health benefits, b) social benefits, and c) self-concept benefits over time?

Hypothesis 5: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared to participants in the standard care condition over time.

Hypothesis 6: Participants in the idea generation and planning combined condition will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared with participants in the idea generation or message planning conditions over time.

Research Question 3: How do participants in the idea generation and message planning conditions differ in terms of their perceptions of a) subjective norms, b) descriptive norms, and c) injunctive norms?

Hypothesis 7: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of a) strength-related exercise stage progression and b) balance-related exercise stage progression compared to participants in the standard care condition over time.

Hypothesis 8: Participants in the idea generation and message planning combined condition will report increased levels of a) strength-related exercise stage progression and b) balance-related exercise stage progression compared to participants in the idea generation or message planning conditions over time.

Research Question 4: How do participants in the idea generation and message planning conditions differ in terms of their reports of a) strength-related exercise and b) balance-related exercise stage progression?

Interpersonal Communication Outcomes

Hypothesis 9: Participants in the idea generation, message planning, idea generation and planning combined conditions will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the standard care condition at delayed posttest.

Hypothesis 10: Participants in the idea generation and message planning combined condition will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the idea generation or message planning conditions at delayed posttest.

Research Question 5: How do participants in the idea generation and message planning conditions differ in terms of their reports of interpersonal communication a) about strength and balance exercise and b) the intervention activity?

The present study was designed to test the previously described hypotheses and research questions. The next chapter will discuss the method including recruitment, participants, experimental procedures, conditions, and measurement instruments used for the study.

CHAPTER 3

METHOD

This study evaluates the efficacy of forms of an active involvement intervention using a quasi-experimental design ($N = 72$ older adults) with pretest, immediate posttest, and delayed posttest. Based on the intervention rationale, the project compares components of active involvement interventions. To identify the key mechanism of change, intervention components were tested individually, combined, and compared to a standard care group yielding a total of four versions of an intervention: (1) idea generation, (2) message planning, (3) idea generation and message planning combined, and (4) standard care. A pretest occurred for all groups. Cognitive, interpersonal, and behavioral outcomes were assessed at immediate posttest and 10 weeks post intervention (delayed posttest) to estimate the potential impact of the active involvement intervention. A 10 week delayed posttest was chosen to allow sufficient time for effects to occur. All procedures were approved by a University Institutional Review Board.

Recruitment

Older adults were recruited to participate in this study through both mass media and interpersonal channels. Mass media approaches included posting flyers on listservs and in relevant organizations (see Appendix A). Flyers were distributed at local physical therapy offices, senior centers, and adult education classes. Interpersonal approaches included talking with the directors of local physical therapy offices, senior centers, and adult education classes who introduced the researcher to the older adults they believed might be eligible for the study. In addition, the researcher used snowball sampling and asked participants at the end of the interview to distribute flyers to eligible others in their social networks. The majority (58.4%) of participants were recruited from senior citizen

centers, followed by 20.8% from listservs, 16.7% from adult education classes, and 4.2% from physical therapy offices. When prospective participants called or emailed, the researcher verified that they met the following criteria: over the age of 65, English speaking, and with no cognitive impairment.

The researcher informed eligible participants that the research study was part of a doctoral dissertation, gave them an overview of the purpose of the research (i.e., “improve communication about strength and balance exercise”), and described what the study involved (i.e., completing a two-part interview). Finally, the researcher informed potential participants that they would be compensated \$10 Visa gift card for their time at the first interview and entered into a raffle for one of two \$50 gift cards at Time 2 for participation. Several participants declined the gift card and were offered opportunities to donate to local groups (10 participants chose this option). Participants received a reminder phone call or emailed (based on participant preferred mode of contact) from the researcher the evening before their scheduled appointment.

Participants

Seventy-two adults age 65 and older participated in the study. The mean age of participants was 74.69 years ($SD = 7.21$), with a range of 65 to 89 years. Eighteen (25%) males and 54 (75%) females took part in the study. The majority of participants were Caucasian (89%), followed by Asian (8%), and African American (3%). Ten participants (13.89%) had fallen during the three months prior to the Time 1 pretest. The majority of participants lived with a spouse/partner (50%), followed by lived alone (41.7%), and with family (8.3%).

Experimental Procedure

This project included a face-to-face guided interview with a 10 week follow-up phone interview. The Time 1 guided interview was 15 minutes in duration, with the idea generation only group receiving an additional 5 to 7 minute intervention, the message planning only group receiving an additional 5 to 7 minute intervention, and the idea generation and message planning combined group receiving an additional 10 to 15 minute intervention (total 30 minutes). The Time 2 follow-up structured interview was 10 minutes in duration. Participants were assigned to the idea generation only ($n = 18$), message planning only ($n = 18$), idea generation and message planning combined ($n = 18$), or to the standard care group ($n = 20$). Of the 74 individuals who participated at Time 1, 72 returned at Time 2 (97%). Length of time between Time 1 and Time 2 interviews ranged from 10 to 12 weeks ($M = 10.82$ weeks, $SD = .79$).

The interview schedule was pretested (including the intervention conditions) with 10 older adults. Pilot test findings led to the researcher making four changes: 1) modifying prior 7-point and 4-point formats to a 1-5 point scale response for ease of use with the population and oral administration; 2) creating a chart that displayed numeral response alternatives with corresponding strongly disagree to strongly agree labels; 3) asking about strength-related and balance-related exercises separately during the pre- and immediate posttest; and 4) adding three open-ended questions for activity debriefing.

Interviews were conducted in private rooms at local physical therapy offices, senior centers, libraries, and coffee shops. Interviews were conducted by the researcher, a Caucasian woman in her late 20s. After obtaining consent (see Appendices B and C), the interviewer asked for permission to audio record the interview. Time 1 interviews ranged

from 17 to 65 minutes ($M = 55.15$, $SD = 10.84$), generating 9-33 pages of transcribed text ($M = 17.86$, $SD = 5.40$). Undergraduate students blind to study hypotheses and condition transcribed interviews, with transcripts verified by a second undergraduate student and reread by the researcher who also removed identifying information. Time 2 interviews ranged from 5 to 7 minutes ($M = 5.37$, $SD = 1.64$).

Conditions

Interview schedules were identical, with the exception of intervention condition (idea generation, message planning, or idea generation and message planning combined, and standard care). There were three active involvement conditions plus a fourth standard care. The condition was randomized, with intervention perceptions collected after intervention exposure (immediate posttest). Intervention conditions were created based on prior literature on active involvement interventions (Banerjee & Greene, 2006; 2007; Greene, 2013; Greene & Hecht, 2013). The *idea generation* condition evaluates reasons why peers do or do not engage in strength and balance exercise (see Appendix E). The *message planning* condition instructs participants to plan a message (text, people, and setting) designed to motivate peers to participate in strength and balance exercise (see Appendix F). The *idea generation and message planning combined* condition evaluates reasons for and against strength and balance exercise, selects the most significant consequence associated with strength and balance exercise (text), and generates the number of and type of people, as well as setting of the health message (see Appendix D). Participants in the *standard care* condition received an information packet focused on the health and everyday benefits of strength and balance exercise from the National Institutes of Health (see Appendices G and H).

Measurement Instruments

To establish initial effects of the active involvement intervention as a fall prevention intervention strategy, this study employed mixed methods measures. The structured interview consisted of closed-ended items from prior fall prevention and health communication literature and the opportunity for participants to elaborate and provide examples if necessary. The quantitative measures are described in detail below.

Quantitative measures. A number of close-ended, fixed-response questions assessed group equivalence at Time 1 at the beginning of the structured interview (pretest). In addition, several quantitative indicators estimated active involvement intervention effects, and these measures were used at Time 1 at the end of the intervention (immediate posttest) and at Time 2 (delayed posttest) (see Table 1 for variables and number of items). Principal component analyses (PCA) with varimax rotation were used to evaluate the dimensionality of the measures. After confirming the dimensionality of the factors, composite scores were created by averaging responses to the individual items. Reliability was estimated by Cronbach's alpha with acceptable cut-offs (an adequate alpha level was .70, good .80; Cronbach, 1970). Data were screened for outliers at the univariate level including examination of skewness and kurtosis; no skewed or kurtosed variables were detected during analyses and thus no transformations used.

The present study's pretest consisted of scales to measure various demographics, prior strength and balance exercise behavior, cumulative risk factor assessment, perceived susceptibility (falls efficacy), consequences of falling (independence and identity), perceived benefits (health, social, and self-concept), norms (subjective,

descriptive, and injunctive), and intention to do exercise (strength and balance). Variables measured at immediate posttest included: motivation to process information in the intervention (perceived involvement, perceived novelty, perceived gain, and reflectiveness), perceived benefits (health, social, and self-concept), norms (subjective, descriptive, and injunctive), and intention to do exercise (strength and balance). Variables measured at delayed posttest included: perceived benefits (health, social, and self-concept), norms (subjective, descriptive, and injunctive), intention to do exercise (strength and balance), and interpersonal communication (about strength and balance exercise and the intervention activity). The specific measures are described next.

Risk factor assessment. The risk factor assessment measure was developed by the author based on common vulnerability indicators in the older adult fall prevention literature (Rubenstein, 2006). Participants were asked to indicate the frequency of occurrence of the following risk factors during the past three months: the presence of self-defined chronic condition, difficulty walking or standing, usage of a mobility device, the presence of dizziness or unsteadiness, the number of prescribed medications daily, and the number of falls. Responses were summed to produce a cumulative estimate of number of self-reported risk factors present (see Appendix I). Scores ranged from 0 to 28 ($M = 3.50$, $SD = 4.13$), with a higher score indicating greater risk for falling.

Fear of falling scale. The first and most widely used scale to assess fear of falling was the ten item Falls Efficacy Scale (FES) (Tinetti, Mendes de Leon, Doucette, & Baker, 1994). The original FES version measured fall-related self-efficacy (“how confident are you that you can do . . . without falling”), but later versions referred to fear aspects of falling (“how concerned are you that you might fall if you do . . .”). Although

the FES has been shown to be reliable and valid, several researchers have suggested that the FES could be improved as a measure of fear of falling (e.g., Jorstad, Hauer, Becker & Lamb, 2004). First, the FES referred almost exclusively to very basic activities of daily living that only frail or disabled people would be likely to have difficulty with because of their fear of falling. The FES did not include more demanding or complex activities that may be relevant for older people with higher functioning such as walking up or down a slope. Second, the FES did not directly evaluate the impact of fear of falling in social circumstances such as going out to a social event. Third, the FES was not appropriate for use in different languages and cultures. To remedy these problems, members of the Prevention of Falls Network Europe developed the Falls Efficacy Scale - International (FES-I)(Yardley et al., 2005), which has been proven to be as reliable and more sensitive to between group differences than the original FES developed by Tinetti (Tinetti et al., 1994; Hauer et al., 2010). The FES-I has been validated in four European countries (Kempen et al., 2007) and is feasible in clinical practice (Helbostad et al., 2010) suggesting appropriateness of use with different cultures and in fast-paced settings with limited resources.

The FES-I consists of 16 Likert-type items with four-point responses ranging from 1 (*not concerned at all*) to 4 (*very concerned*). A study of 673 participants age 60 and older was conducted to assess the FES-I's psychometric properties (Yardley et al., 2005). Principal component analysis with varimax rotation revealed a one factor solution explaining 61.7% of the variance. Factor loadings ranged from .66 to .87. The alpha for this scale was .96 indicating good reliability ($M = 1.97$, $SD = .96$). Due to limited interview time and face-to-face oral administration, a shortened version of the FES-I

(Yardley et al., 2005) was used for the present study. The most relevant items were selected based on factor loadings. Fear of falling when performing everyday activities was measured at the pretest by a series of eight Likert-type items with five-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The principal component analysis indicated a single factor solution (eigenvalue = 4.72, 58.94% variance) with all items loading above .5 on the single factor ($M = 1.56$, $SD = .54$). An example item included “I feel worried about falling when taking a bath or shower.” The scores were averaged with a higher score indicating greater fear of falling (see Appendix J). Reliability was satisfactory ($\alpha = .77$).

Consequences of falling scale. The Consequences of Falling Scale (Yardley & Smith, 2002) consists of 12 Likert-type items examining older adults’ perceived consequences of falling with four-point responses ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Two data collections with participants 75 and older were conducted to assess the Consequences of Falling Scale’s psychometric properties (Study 1 and 2, Yardley & Smith, 2002). For study 1 ($N = 244$), principal component analysis of the consequences of falling items revealed two factors explaining a total of 69% of the variance. The first factor, *loss of functional independence*, consisted of six items with the highest loadings that reflected beliefs about the immediate and long-term physical and functional consequences of falling, and in particular the loss of control and incapacity that might result. The second factor, *damage to identity*, consisted of six items with the highest loadings that measured concern about the possible social consequences of falling, such as feeling embarrassed and a nuisance to others. Good levels of internal consistency were achieved ($\alpha = .94$, $M = 12.20$, $SD = 4.10$) for loss of functional independence and (α

= .86, $M = 14.30$, $SD = 3.70$) for damage to identity (Yardley & Smith, 2002). The same two factors emerged for study 2 ($N = 166$), explaining a total of 71% of the variance. Good levels of internal consistency were achieved ($\alpha = .94$, $M = 12.40$, $SD = 4.00$) for loss of functional independence and ($\alpha = .87$, $M = 14.40$, $SD = 3.80$) for damage to identity (Yardley & Smith, 2002).

Due to limited interview time and face-to-face oral administration, a shortened version of the Consequences of Falling Scale (Yardley & Smith, 2002) was used for the present study. The most relevant items were selected based on factor loadings. Perceived consequences of falling were measured at the pretest by a series of seven Likert-type items with five-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The principal component analysis, reliabilities and scree plot indicated the presence of two factors (primary loading all above .5 with no secondary loadings above .3) parallel to the Consequences of Falling Scale's two factors. The first factor (eigenvalue = 3.89, 55.59% variance) was labeled *loss of functional independence* ($M = 2.66$, $SD = .91$) and consisted of five items such as "I will lose my independence." The second factor (eigenvalue = 1.90, 27.17% variance) was labeled *damage to identity* ($M = 1.40$, $SD = .66$) and consisted of two items "I will be embarrassed" and "I will feel foolish." The scores were averaged separately for the two factors, with higher scores indicating greater perceived severity of consequences of falling (see Appendix K). The reliabilities were good ($\alpha = .92$, $r = .94$, respectively).

Perceived benefits scale. The measure of perceived benefits was developed by the author based on determinants of physical activity among older adults (vanStralen et al., 2009). Perceived benefits of strength and balance exercise were measured at the pretest

by a series of eight Likert-type items with five-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The principal component analysis, reliabilities and scree plot indicated the presence of three factors (primary loading all above .5 with no secondary loadings above .3). The first factor (eigenvalue = 4.10, 45.50% variance) was labeled *health/independence benefits* ($M = 3.21$, $SD = .69$) and consisted of three items such as “Strength and balance exercise helps me maintain my independence.” The second factor (eigenvalue = 2.34, 26.03% variance) was labeled *social benefits* ($M = 2.26$, $SD = .98$) and consisted of three items such as “Strength and balance exercise is a good way for me to meet new people.” The third factor (eigenvalue = 1.06, 83.27% variance) was labeled *self concept benefits* ($M = 2.31$, $SD = 1.03$) and consisted of two items including “Strength and balance exercise gives me a sense of personal accomplishment” and “Strength and balance exercise improves how I see myself.” The scores were averaged separately for the three factors, with higher scores indicating greater perceived benefits of strength and balance exercise (see Appendix L). The reliabilities were good ($\alpha = .91$, $.94$, $r = .93$ respectively).

A shortened version of the perceived health benefits scale was used at immediate and delayed posttests because of telephone administration and limited interview time. Participants used a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) to answer three Likert-type items addressing three types of strength and balance exercise-related benefits. One item represented *health/independence benefits*, “Strength and balance exercise is good for my health” immediate posttest ($M = 3.81$, $SD = .70$) and delayed posttest ($M = 4.10$, $SD = .75$). The second factor, *social benefits*, included one item, “Strength and balance exercise is a good for my social life” immediate posttest (M

= 3.04, $SD = .90$) and delayed posttest ($M = 3.65$, $SD = 1.05$). One item measured *self-concept benefits*, “Strength and balance exercise gives me a sense of personal accomplishment” immediate posttest ($M = 3.06$, $SD = .95$) and delayed posttest ($M = 3.51$, $SD = 1.09$). Scores were averaged separately for each type of benefit with three higher scores indicating greater levels of perceived benefits of strength and balance exercise (see Appendix L).

Perceptions of norms scale. The measure of perceived norms was developed by the author based on prior research on determinants of physical activity among older adults (vanStralen et al., 2009). Perceived norms regarding strength and balance exercise were measured at the pretest by a series of five Likert-type items with five-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) addressing three types of norms: *subjective*, *descriptive*, and *injunctive*. Three items represented *subjective norm* or perceptions of relevant others such as “My doctor encourages me to do strength and balance exercise” ($\alpha = .77$, $M = 2.25$, $SD = .82$). The second type of norm, *descriptive norm*, consisted of one item, “Most other people my age are doing strength and balance exercise” ($M = 2.50$, $SD = .86$). One item comprised *injunctive norm*, “People my age are expected to do strength and balance exercise” ($M = 3.83$, $SD = .67$). Scores were averaged separately for each type of norm with higher scores indicating greater levels of normative influence about strength and balance exercise (see Appendix M).

A shortened version of the perceived norms regarding strength and balance exercise scale was used at immediate and delayed posttests because of telephone administration and limited interview time. Participants used a five-point scale ranging

from 1 (*strongly disagree*) to 5 (*strongly agree*) to answer three Likert-type items addressing types of norms: subjective, descriptive, and injunctive. One item represented *subjective norm*, “Other people whose opinions matter to me (e.g. family, friends, doctor) would encourage me to do strength and balance exercise” immediate posttest ($M = 2.49$, $SD = .89$) and delayed posttest ($M = 3.01$, $SD = 1.07$). The second component, *descriptive norm*, was composed of one item, “Most other people my age are doing strength and balance exercise” ($M = 2.38$, $SD = .81$) and delayed posttest ($M = 2.94$, $SD = 1.01$). One item measured *injunctive norm*, “People my age are expected to do strength and balance exercise” ($M = 4.36$, $SD = .79$) and delayed posttest ($M = 4.57$, $SD = .65$). Scores were averaged separately for each type of norm with higher scores indicating greater levels of normative influence toward strength and balance exercise (see Appendix M).

Base stage of change. Participants were categorized by base stage of change at the pretest with two questions. Items included, “Please describe what, if anything, you have done for strength exercise in the past three months” ($M = 2.08$, $SD = 1.45$) and “Please describe what, if anything, you have done for balance exercise in the past three months” ($M = 2.88$, $SD = 1.46$). All five stages of change were included to assess current readiness to engage in strength and balance exercise (Marcus, Selby, Niaura, & Rossi, 1992) ranging from 1 (*precontemplation*) to 5 (*maintenance*).

The *precontemplation stage* (1) was operationalized as not performing strength and balance exercise and not intending to in the next 6 months, “I am not interested in doing strength exercise.” Not engaging in strength and balance exercise but intending to within the next 6 months represented the *contemplation stage* (2), “I do not currently do balance exercise, but know I should sometime in the near future.” Not participating in

strength and balance exercise but intending to within the next 30 days defined the *preparation stage* (3), “I do not currently do strength exercise, but am looking into joining a class at the senior center this month.” Doing strength and balance exercise for less than 6 months represented the *action stage* (4), “I recently joined a balance exercise class at the senior center.” The *maintenance stage* (5) was categorized as regularly performing strength and balance exercise for 6 months or longer, “I have been regularly attending the strength class at the senior center two times a week for the past year.” Scores were averaged separately for strength and balance exercise with two higher scores indicating greater levels of participation in strength and balance exercise (see Appendix N).

Readiness to change. Participants described readiness to perform strength and balance exercise at the immediate and delayed posttest with two questions. Items included, “Please describe what, if anything, you plan on doing for strength exercise in the next 3 months” immediate posttest ($M = 2.65$, $SD = 1.15$) and delayed posttest $M = 3.26$, $SD = 1.21$) and “Please describe what, if anything, you plan on doing for balance exercise in the next 3 months” immediate posttest ($M = 3.32$, $SD = 1.00$) and delayed posttest ($M = 4.04$, $SD = 1.12$). All five stages of change were included as responses ranging from 1 (*precontemplation*) to 5 (*maintenance*).

The *precontemplation stage* (1) was operationalized as not planning to start doing strength and balance exercise and not intending to in the next 3 months, “I do not intend to do strength exercise in the next three months.” Planning to start doing strength and balance exercise within the next 3 months represented the *contemplation stage* (2), “I will look into joining a balance class offered at the senior center in the next three months.”

Planning to start doing strength and balance exercise within the next month defined the *preparation stage* (3), “I plan on getting an activities calendar and signing up for the weekly strength class this month.” Planning to start doing strength and balance exercise today represented the *action stage* (4), “I am going to integrate at home balance exercises into my daily morning routine.” The *maintenance stage* (5) was categorized as planning to continue to do strength and balance exercise, “I plan on continuing to regularly attend my biweekly strength class at the senior center.” Scores were averaged separately for strength and balance exercise with two higher scores indicating greater levels of participation in strength and balance exercise (see Appendix N).

Stage progression. Strength and balance-related stage progression was measured in two ways. First, a measure subtracted each participant’s base stage of change in the three months prior to the pretest from their readiness for change expressed during the immediate posttest. Second, a measure subtracted each participant’s initial stage of change in the three months prior to the pretest from their stage of change at the delayed posttest. A positive score for readiness for change indicated strength and balance exercise-related stage progression, a zero score indicated no change, and a negative score indicated strength and balance exercise-related stage regression between the pre- and immediate posttest and/or pre- and delayed posttests.

Average strength-related stage progression at both immediate ($M = .57$, $SD = .69$) and delayed ($M = 1.18$, $SD = 1.01$) posttests was positive. Similarly, average balance-related stage progression at both immediate ($M = .44$, $SD = .75$) and delayed ($M = 1.17$, $SD = 1.05$) posttests was positive. For both, more change is evident at delayed than immediate posttest.

Motivation to process information scale. The Motivation to Process Information Scale is based on the TAI (Greene, 2013) and examines target audiences' degree of engagement with and reflection on the content of active involvement interventions. The scale was developed based on prior adolescent, media literacy, and other intervention research (e.g., Banerjee & Greene, 2007; Banerjee, Greene, Bagdasarov, & Campo, 2009; Greene & Brinn, 2003; Greene, Campo, & Banerjee, 2010; Lee et al., 2011). The scale was validated with two different samples of 10th grade high school students from across Pennsylvania (Study I $N = 294$; Study II $N = 171$) who participated in tests of a brief media literacy curriculum while attending a leadership institute. Study I (14 items) reported an exploratory factor analysis (EFA) and Study II (16 items) a confirmatory factor analysis (CFA) (Greene et al., 2012).

The EFA retained four factors from the 14 items based on examination of the scree plot and the best conceptual fit. The first factor, labeled *involvement* (eigenvalue = 5.26), was composed of 4 items and accounted for 35.6% of the variance with good internal consistency ($\alpha = .85$). The second factor, labeled *perceived gain* (eigenvalue = 2.05), was composed of 4 items and accounted for 14.6% of the variance with acceptable internal consistency ($\alpha = .75$). The third, labeled *novelty* (eigenvalue = 1.16), was composed of 3 items and accounted for 8.4% of the variance with acceptable reliability ($\alpha = .75$). The last (fourth) factor extracted from the data, labeled *reflectiveness* (eigenvalue = 1.04), was also composed of 3 items and accounted for 7.4% of the variance with acceptable reliability ($\alpha = .76$). Scales were created by averaging items to create four composite subscales.

A second-order CFA procedure was employed to confirm the factor structure from Sample I for the four subscales in Study II. The model fit statistics for the second-order factor analysis on all four scales confirmed good fit for the four-factor structure [$\chi^2(97) = 202.98$, *relative* $\chi^2 = 2.09$, $p < .001$; CFI = .91, RMSEA = .08] as subscales of the same latent variable (motivation to process the information provided in the media literacy workshop). Scales were created by averaging items to create four composite subscales, and reliabilities were good or adequate. Previous studies show acceptable internal consistency (ranging from .92 to .94 for involvement .85 to .87, perceived gain .69 to .75, novelty .75 to .77, and .76 to .83 for reflectiveness, Greene et al., 2012).

Due to limited interview time and face-to-face oral administration, a shortened modified version of the Motivation to Process Information Scale was used for the present study. The most relevant items were selected based on factor loadings for perceived novelty, perceived involvement, and perceived gain subscales. Five new items were created for the reflectiveness subscale in order to assess how much the activity made participants think about preparing to change, changing, or maintaining a pro-health behavior.

Motivation to process information was measured at the immediate posttest by a series of eleven items Likert-type items with five-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The principal component analysis, reliabilities and scree plot indicated the presence of four factors (primary loading all above .5 with no secondary loadings above .3). The first factor (eigenvalue = 3.64, 26.82% variance) was labeled *perceived involvement* ($M = 3.34$, $SD = 1.10$) and consisted of three items such as “The interview was interesting to me.” The second factor (eigenvalue = 5.27, 37.65%

variance) was labeled *perceived novelty* ($M = 3.27$, $SD = 1.18$) and consisted of three items such as “I have never done anything like what I did in the activity today.” The third factor (eigenvalue = 1.63, 16.82% variance) was labeled *perceived gain* ($M = 3.00$, $SD = .96$) and consisted of three items such as “The activity provided new information about strength and balance exercise.” The fourth factor (eigenvalue = 1.44, 10.3 % variance) was labeled *reflectiveness* ($M = 3.10$, $SD = 1.14$) and consisted of five items such as “The activity made me think about the importance of strength and balance exercise.” The scores were averaged separately to form the four factors, with higher scores indicating greater motivation to process information (see Appendix O). The reliabilities were good ($\alpha = .93, .93, .80, .96$ respectively).

Interpersonal communication. Interpersonal communication-related intervention outcomes were assessed at delayed posttest (see Appendix P). Participants answered two questions about interpersonal communication including, “Have you talked to anyone about strength and balance exercise in the last few months?” (follow-up questions: “If yes, who?” and “What did you discuss?”) and “Have you talked to anyone about the activity we did a few months ago?” (follow-up questions: “If yes, who?” “What did you discuss?”). The majority of participants in idea generation (61%), message planning (56%), and idea generation and message planning combined (89%) reported talking with others about strength and balance exercise. Only 28% of participants in standard care reported talking with others about the intervention activity. Similarly, the majority of participants in idea generation (44%), message planning (56%), and idea generation and message planning combined (83%) reported talking with others about the intervention

activity. Only 11% of participants in standard care reported talking with others about the intervention activity.

Summary

This study examined the role of active involvement intervention conditions on strength and balance exercise-related stage progression. Seventy-two adults age 65 and older were randomly assigned to one of four conditions: (1) idea generation, (2) message planning, (3) idea generation and message planning combined, or (4) standard care. Participants completed a guided in-person interview (Time 1 pre- and immediate posttest) with a 10 week telephone follow-up (Time 2 delayed posttest).

This chapter reviewed details of the recruitment, participants, experimental procedure, and measures. The next chapter will describe the analyses used to test the hypotheses and research questions and presents results.

CHAPTER 4

RESULTS

SPSS 22 was used to test the hypotheses and research questions. Hypotheses 1 and 2 and Research Question 1 were analyzed using one-way analyses of variance (ANOVA) utilizing Tukey's Honestly Significant Difference (HSD) test for post hoc. Analyses for Hypotheses 3 through 8 and Research Questions 2 through 4 involved testing both within-subject (paired-samples t tests) and between-subject (mixed model ANOVAs utilizing Tukey's HSD test for post hoc) differences. Hypotheses 9 and 10 and Research Question 5 were evaluated using chi-square tests. The level of significance was set at $p < .05$ for all tests except for correlations, where .01 was utilized to protect against Type 1 error based on the number of tests. The zero order correlation matrix for all variables is presented in Table 2. The following sections organize results based on pretest, immediate posttest, and delayed posttest findings.

Preliminary Analyses for Time 1 Pretest

A series of one-way ANOVAs were conducted to determine whether there were any significant differences between the four condition groups at pretest on prior strength and balance exercise behavior, perceived susceptibility of falls, perceived consequences of falling (independence and identity), perceived benefits of strength and balance exercise (health, social, and self-concept), and perceptions of norms (subjective, descriptive, and injunctive). Additionally, a series of chi-square tests were conducted to determine whether there were any significant differences between the four condition groups at pretest on demographics (gender, age grouping, and residential status) and prior fall status. Results indicated no significant differences between condition groups at pretest on

any variables measured (see Table 3 and 4). Thus, randomization was effective and yielded four condition groups appropriate for subsequent comparison.

Hypothesis Testing and Research Questions for Time 1 Immediate Posttest

Hypotheses and Research Questions predicted differences in intervention groups at immediate posttest. Specific outcomes of interest included: motivation to process information in the intervention (perceived involvement, perceived novelty, perceived gain, and reflectiveness), perceived benefits (health, social, and self-concept), perceptions of norms (subjective, descriptive, and injunctive), and stage progression (strength and balance). The following sections organize results based on type of outcome, starting with motivation to process information.

Motivation to Process Information

Hypotheses 1 and 2 predicted that participants' motivation to process information would depend on intervention condition exposure. Specifically, it predicted that motivation to process information would be higher for idea generation, message planning, and idea generation and message planning combined conditions compared to standard care, with the highest reported levels for the idea generation and message planning combined condition. Research Question 1 examined differences in motivation to process information between idea generation and message planning conditions. Data were analyzed by a series of one-way ANOVAs (utilizing Tukey's HSD test for post hoc) to examine the effect of intervention condition on the four dimensions of motivation to process information. Results for each dimension of motivation to process information are presented next.

Perceived novelty. Hypothesis 1a proposed that participants in the idea generation, message planning, idea generation and planning combined conditions would report higher levels of perceived novelty than participants in the standard care condition. Hypothesis 2a proposed that participants in the idea generation and message planning combined condition would report higher levels of perceived novelty than participants in idea generation or message planning conditions. Research Question 1a examined differences in reports of perceived novelty between participants in the idea generation and message planning conditions. A one-way ANOVA indicated a significant effect of condition on participants' perceived novelty of the intervention as predicted, $F(3, 68) = 242.03, p < .001$, partial $\eta^2 = .91$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of perceived novelty ($M = 4.57, SD = .44$) than those in the idea generation condition ($M = 3.20, SD = .17$), message planning condition ($M = 3.80, SD = .38$), or standard care condition ($M = 1.52, SD = .37$). Participants' perceptions of the novelty of idea generation and message planning, were also significantly different from perceptions of the novelty of standard care. In addition, participants in message planning reported significantly higher levels of perceived novelty than those in idea generation (see Table 5). Intervention conditions perceived as most to least novel include: idea generation and message planning combined, message planning, idea generation, and standard care. Thus, Hypotheses 1a and 2a were supported for the immediate posttest. For Research Question 1a, participants perceived message planning as more novel than idea generation.

Involvement. Hypothesis 1b proposed that participants in the idea generation, message planning, idea generation and planning combined conditions would report higher levels of perceived involvement than those in the standard care condition. Hypothesis 2b proposed that participants in the participants in idea generation or message planning combined condition would report higher levels of perceived involvement than idea generation and message planning conditions. Research Question 1b examined differences in reports of perceived involvement between participants in the idea generation and message planning conditions. A one-way ANOVA indicated a significant effect of condition on participants' perceptions of intervention involvement, $F(3, 68) = 243.16, p < .001$, partial $\eta^2 = .92$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of involvement ($M = 4.56, SD = .30$) than those in the idea generation ($M = 3.76, SD = .36$), message planning ($M = 3.37, SD = .31$), or standard care condition ($M = 1.68, SD = .35$). Participants' involvement perceptions of idea generation and message planning were significantly different from those in standard care. In addition, participants in idea generation reported significantly higher levels of involvement than those in message planning (see Table 6). Intervention conditions perceived as most to least involving include: idea generation and message planning combined, idea generation, message planning, and standard care. Thus, Hypotheses 1b and 2b were supported for the immediate posttest. For Research Question 1b, participants perceived idea generation as more involving than message planning.

Perceived gain. Hypothesis 1c proposed that participants in the idea generation, message planning, idea generation and planning combined conditions would report

higher levels of perceived gain than participants in the standard care condition.

Hypothesis 2c proposed that participants in the idea generation and message planning combined condition would report higher levels of perceived gain than those in idea generation or message planning conditions. Research Question 1c examined differences in reports of perceived gain between participants in the idea generation and message planning conditions. A one-way ANOVA indicated a significant effect of condition on participants' perceptions of the perceived gain of the intervention, $F(3, 68) = 77.47, p < .001$, partial $\eta^2 = .77$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of perceived gain ($M = 4.28, SD = .53$) than those in the idea generation ($M = 3.06, SD = .55$), message planning ($M = 2.72, SD = .38$), or standard care condition ($M = 1.94, SD = .38$). Participants' perceptions of gain of idea generation and message planning were significantly different from those in standard care. No significant differences in participants' perceptions of gain were detected between those in idea generation and message planning conditions (see Table 7). Participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived gain, respectively. Thus, Hypotheses 1c and 2c were supported for the immediate posttest. For Research Question 1c, there was no statistically significant difference in participants' perceptions of gain in idea generation and message planning conditions.

Reflectiveness. Hypothesis 1d proposed that participants in the idea generation, message planning, idea generation and planning combined conditions would report higher levels of reflectiveness than those in the standard care condition. Hypothesis 2d

proposed that participants in the idea generation and message planning combined condition would report higher levels of reflectiveness than participants in idea generation or message planning conditions. Research Question 1d examined differences in reports of reflectiveness between participants in the idea generation and message planning conditions. A one-way ANOVA indicated a significant effect of condition on participants' perceptions of the reflectiveness of the intervention, $F(3, 68) = 95.51, p < .001$, partial $\eta^2 = .81$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of reflectiveness ($M = 4.43, SD = .51$) than those in the idea generation ($M = 3.53, SD = .60$), message planning ($M = 2.77, SD = .48$), or standard care condition ($M = 1.66, SD = .44$). Participants' perceptions of reflectiveness of idea generation and message planning were significantly different from participants in standard care. In addition, participants in idea generation reported significantly higher levels of reflectiveness than those in message planning (see Table 8). Intervention conditions perceived as eliciting highest to lowest levels of reflectiveness include: idea generation and message planning combined, idea generation, message planning, and standard care. Thus, Hypotheses 1d and 2d were supported for the immediate posttest. For Research Question 1d, participants perceived idea generation as eliciting greater levels of reflectiveness than message planning.

In summary, participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness respectively. Specifically, Hypotheses 1abcd and 2abcd were supported at the immediate posttest. Participants in

idea generation and message planning combined reported significantly higher levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness compared to participants in idea generation, message planning, or standard care. Similarly, participants in idea generation and message planning reported significantly higher levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness compared to participants in standard care. For Research Question 1bd, idea generation elicited higher levels of perceived involvement and reflectiveness compared to message planning. For Research Question 1a, message planning elicited higher levels of perceived novelty compared to idea generation. Thus, the idea generation and message planning combined condition was superior to both individual active involvement components and standard care in eliciting greater levels of motivation to process information.

Cognitive and Behavioral Outcomes

Hypotheses 3 through 8 predicted differences in participants' perceived benefits (health, social, self-concept), perceptions of norms (subjective, descriptive, and injunctive), and strength and balance exercise-related stage progression based on intervention condition exposure. Specifically, the rationale argued that differences in cognitive and behavioral outcomes would be higher for idea generation, message planning, and idea generation and message planning combined conditions compared to standard care, with the highest reported changes for the idea generation and message planning combined condition. Research Questions 2 through 4 examined cognitive and behavioral outcomes between idea generation and message planning conditions. Data collected at immediate posttest were initially analyzed utilizing within-subject tests. These analyses did not test all aspects of Hypotheses and Research questions; instead

within-subject tests (paired t tests) established differences within intervention condition from pretest to immediate posttest. Between-subject tests (mixed model ANOVAs using Tukey HSD test for post hoc) tested Hypotheses and Research Questions and examined differences as a function of intervention condition across pretest, immediate posttest, and delayed posttest (see Hypothesis Testing and Research Question including Time 2 Delayed Posttest for between-subject tests results). The next section presents within-subject tests at immediate post-test.

Within-subject tests. A series of paired-samples t tests were conducted to assess participants' differences in perceived benefits (health, social, self-concept), perceptions of norms (subjective, descriptive, and injunctive), and strength and balance exercise-related stage progression over time (from pretest to immediate posttest). Participants' changes were initially analyzed based on condition assignment (changes within idea generation, message planning, idea generation and message planning combined, and standard care groups). The following sections organize results based on type of outcome, starting with changes in perceived health benefits

Health benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceived health benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 9. The mean health benefits for idea generation at immediate posttest ($M = 3.56$, $SD = .62$) significantly increased $t(17) = 2.92$, $p < .01$, $d_r = .26$ from pretest ($M = 3.22$, $SD = .65$). Similarly, the mean health benefits for message planning at immediate posttest ($M = 3.61$, $SD = .61$) significantly increased $t(17) = 3.30$, $p < .01$, $d_r = .33$ from pretest ($M = 3.22$, $SD = .55$). Likewise, the mean health benefits for idea generation and

message planning combined at immediate posttest ($M = 4.44$, $SD = .51$) significantly increased $t(17) = 7.38$, $p < .001$, $d_r = .69$ from pretest ($M = 3.11$, $SD = .83$). In contrast, the mean health benefits for standard care at immediate posttest ($M = 3.61$, $SD = .70$) did not increase $t(17) = 1.29$, $p = .22$, $d_r = .14$. from pretest ($M = 3.39$, $SD = .85$).

As seen in Table 9, perceived health benefits increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Social benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceived social benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 10. The mean social benefits for idea generation at immediate posttest ($M = 2.89$, $SD = .83$) significantly increased $t(17) = 5.33$, $p < .001$, $d_r = .36$ from pretest ($M = 2.17$, $SD = 1.04$). Similarly, the mean social benefits for message planning at immediate posttest ($M = 3.17$, $SD = .79$) significantly increased $t(17) = 3.30$, $p < .001$, $d_r = .36$ from pretest ($M = 2.44$, $SD = 1.10$). Likewise, the mean social benefits for idea generation and message planning combined at immediate posttest ($M = 3.50$, $SD = .99$) significantly increased $t(17) = 10.29$, $p < .001$, $d_r = .59$ from pretest ($M = 2.00$, $SD = 1.08$). In contrast, the mean social benefits for standard care at immediate posttest ($M = 2.61$, $SD = .78$) did not increase $t(17) = 1.46$, $p = .16$, $d_r = .06$ from pretest ($M = 2.50$, $SD = .92$).

As seen in Table 10, perceived social benefits increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning,

and idea generation and message planning combined. This change was not significant for standard care.

Self-concepts benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceived self-concept benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 11. The mean self-concept benefits for idea generation at immediate posttest ($M = 2.67$, $SD = .91$) significantly increased $t(17) = 5.83$, $p < .001$, $d_r = .32$ from pretest ($M = 2.00$, $SD = 1.08$). Similarly, the mean self-concept benefits for message planning at immediate posttest ($M = 2.89$, $SD = .76$) significantly increased $t(17) = 6.65$, $p < .001$, $d_r = .39$ from pretest ($M = 2.17$, $SD = .92$). Likewise, the mean self-concepts benefits for idea generation and message planning combined at immediate posttest ($M = 3.83$, $SD = .79$) significantly increased $t(17) = 9.52$, $p < .001$, $d_r = .60$ from pretest ($M = 2.50$, $SD = .99$). In contrast, the mean self-concept benefits for standard care at immediate posttest ($M = 2.83$, $SD = .92$) did not increase $t(17) = 1.46$, $p = .16$, $d_r = .06$ from pretest ($M = 2.72$, $SD = .96$).

As seen in Table 11, perceived self-concept benefits increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Subjective norms. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceptions of subjective norms. A summary of results by intervention condition is presented in Table 12. The mean perceptions of subjective norms for idea generation at immediate posttest ($M =$

2.17, $SD = 1.04$) significantly increased $t(17) = 2.56, p < .05, d_r = .10$ from pretest ($M = 1.98, SD = .90$). Similarly, the mean perceptions of subjective norms for message planning at immediate posttest ($M = 2.39, SD = .61$) significantly increased $t(17) = 2.37, p < .05, d_r = .16$ from pretest ($M = 2.19, SD = .63$). Likewise, the mean perceptions of subjective norms for idea generation and message planning combined at immediate posttest ($M = 2.83, SD = .98$) significantly increased $t(17) = 3.49, p < .01, d_r = .27$ from pretest ($M = 2.33, SD = .78$). In contrast, the mean perceptions of subjective norms for standard care at immediate posttest ($M = 2.56, SD = .78$) did not increase $t(17) = .52, p = .61, d_r = .02$ from pretest ($M = 2.52, SD = .89$).

As seen in Table 12, perceptions of subjective norms increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Descriptive norms. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceptions of descriptive norms. A summary of results by intervention condition is presented in Table 13. The mean perceptions of descriptive norms for idea generation at immediate posttest ($M = 3.11, SD = .76$) significantly increased $t(17) = 2.36, p < .05, d_r = .23$ from pretest ($M = 2.72, SD = .89$). Similarly, the mean perceptions of descriptive norms for idea generation and message planning combined at immediate posttest ($M = 2.94, SD = .94$) significantly increased $t(17) = 3.05, p < .01, d_r = .31$ from pretest ($M = 2.33, SD = .91$). In contrast, the mean perceptions of descriptive norms for message planning at immediate posttest ($M = 2.78, SD = .81$) did not increase $t(17) = 2.06, p = .06, d_r = .20$ from pretest ($M = 2.44, SD$

= .86). The mean perceptions of descriptive norms for standard care at immediate posttest ($M = 2.61$, $SD = .77$) did not increase $t(17) = 1.46$, $p = .16$, $d_r = .07$ from pretest ($M = 2.50$, $SD = .79$).

As seen in Table 13, perceptions of descriptive norms increased from pretest to immediate posttest for two of the four conditions as predicted: idea generation and idea generation and message planning combined. This change was not significant for message planning or standard care

Injunctive norms. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in perceptions of injunctive norms. A summary of results by intervention condition is presented in Table 14. The mean perceptions of injunctive norms for idea generation at immediate posttest ($M = 4.33$, $SD = .97$) significantly increased $t(17) = 4.27$, $p < .001$, $d_r = .32$ from pretest ($M = 3.72$, $SD = .83$). Similarly, the mean perceptions of injunctive norms for message planning at immediate posttest ($M = 4.33$, $SD = .77$) significantly increased $t(17) = 5.17$, $p < .001$, $d_r = .43$ from pretest ($M = 3.72$, $SD = .46$). Likewise, the mean perceptions of injunctive norms for idea generation and message planning combined at immediate posttest ($M = 4.72$, $SD = .46$) significantly increased $t(17) = 3.01$, $p < .01$, $d_r = .45$ from pretest ($M = 4.17$, $SD = .62$). The mean perceptions of injunctive norms for standard care at immediate posttest ($M = 4.06$, $SD = .80$) significantly increased $t(17) = 2.92$, $p < .01$, $d_r = .22$ from the mean for pretest ($M = 3.72$, $SD = .67$).

As seen in Table 14, perceptions of injunctive norms increased from pretest to immediate posttest for all of the conditions contrary to predictions.

Strength-related exercise stage progression. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in strength-related exercise. A summary of results by intervention condition is presented in Table 15. The mean strength-related exercise stage progression for idea generation at immediate posttest ($M = 2.39$, $SD = 1.09$) significantly increased $t(17) = 4.61$, $p < .001$, $d_r = .22$ from pretest ($M = 1.83$, $SD = 1.38$). Similarly, the mean strength-related exercise stage progression for message planning at immediate posttest ($M = 2.17$, $SD = .92$) significantly increased $t(17) = 5.83$, $p < .001$, $d_r = .31$ from pretest ($M = 1.50$, $SD = 1.15$). Likewise, the mean strength-related exercise stage progression for idea generation and message planning combined at immediate posttest ($M = 3.44$, $SD = .62$) significantly increased $t(17) = 4.01$, $p < .001$, $d_r = .37$ from pretest ($M = 2.50$, $SD = 1.54$). In contrast, the mean strength-related exercise stage progression for standard care at immediate posttest ($M = 2.61$, $SD = 1.46$) did not increase $t(17) = 1.46$, $p = .16$, $d_r = .04$ from pretest ($M = 2.50$, $SD = 1.54$).

As seen in Table 15, strength-related exercise stage progression increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Balance-related exercise stage progression. A total of four paired-sample t tests (one for each condition) were conducted to explore immediate posttest differences in balance-related exercise stage progression. A summary of results by intervention condition is presented in Table 16. The mean balance-related exercise stage progression for idea generation at immediate posttest ($M = 3.44$, $SD = .92$) significantly increased

$t(17) = 2.56, p < .05, d_r = .11$ from pretest ($M = 3.17, SD = 1.38$). Similarly, the mean balance-related exercise stage progression for message planning at immediate posttest ($M = 3.56, SD = .86$) significantly increased $t(17) = 2.20, p < .05, d_r = .10$ from pretest ($M = 3.33, SD = 1.28$). Likewise, the mean balance-related exercise stage progression for idea generation and message planning combined at immediate posttest ($M = 3.39, SD = .50$) significantly increased $t(17) = 5.17, p < .001, d_r = .48$ from pretest ($M = 2.17, SD = 1.50$). In contrast, the mean balance-related exercise stage progression for standard care at immediate posttest ($M = 2.89, SD = 1.45$) did not increase $t(17) = 1.00, p = .33, d_r = .02$ from pretest ($M = 2.83, SD = 1.50$).

As seen in Table 16, balance-related exercise stage progression increased from pretest to immediate posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Summary of cognitive and behavioral findings. In summary, participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived benefits (health, social, self-concept), perceptions of norms (subjective, descriptive, injunctive), and strength and balance exercise-related stage progression, respectively. Specifically, participants in idea generation, message planning, and idea generation and message planning combined (but not standard care) reported significant increases in perceived health, perceived social, and perceived self-concept benefits from pretest to immediate posttest. Similarly, participants in idea generation, message planning, and idea generation and message planning combined but not standard care reported significant increases in strength and balance exercise-related

stage progression from pretest to immediate posttest. For perceptions of norms, participants in idea generation, message planning, and idea generation and message planning combined but not standard care reported significant increases in perceived subjective norms from pretest to immediate posttest. Participants in idea generation, message planning, and idea generation and message planning combined reported significant increases in perceived descriptive norms from pretest to immediate posttest. There was no significant change in perceived descriptive norms for participants in message planning and standard care. Reports of perceived injunctive norms significantly increased for participants in all four conditions from pretest to immediate posttest.

Hypothesis Testing and Research Questions including Time 2 Delayed

Posttest

Hypotheses 3 through 10 and Research Questions 2 through 5 were also assessed at delayed posttest. Specific outcomes of interest included perceived benefits (health, social, and self-concept), perceptions of norms (subjective, descriptive, and injunctive), stage progression (strength and balance), and interpersonal communication (about strength and balance exercise and the intervention activity). Within-subject tests (paired *t* tests) were conducted initially for each condition to determine differences in outcomes of interest from pretest to delayed posttest. Once differences were established, between-subjects tests (mixed model ANOVAs using Tukey HSD test for post hoc) were conducted to examine differences as a function of intervention condition over time. The following sections organize results based on type of test, starting with within-subject tests.

Within-subject tests. A series of paired-samples t tests were conducted to assess participants' changes in perceived benefits (health, social, self-concept), perceptions of norms (subjective, descriptive, and injunctive), and strength and balance exercise-related stage progression from immediate to delayed posttest. Participants' changes were initially analyzed based on condition assignment (changes within idea generation, message planning, idea generation and message planning combined, and standard care groups). The following sections organize results based on type of outcome, starting with changes in perceived health benefits.

Health benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceived health benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 9. The mean health benefits for idea generation at delayed posttest ($M = 3.83$, $SD = .71$) significantly increased $t(17) = 4.27$, $p < .001$, $d_r = .41$ from pretest ($M = 3.22$, $SD = .65$). Similarly, the mean health benefits for message planning at delayed posttest ($M = 4.00$, $SD = .69$) significantly increased $t(17) = 5.10$, $p < .001$, $d_r = .53$ from pretest ($M = 3.22$, $SD = .55$). Likewise, the mean health benefits for idea generation and message planning combined at delayed posttest ($M = 4.83$, $SD = .38$) significantly increased $t(17) = 8.17$, $p < .001$, $d_r = .83$ from pretest ($M = 3.11$, $SD = .83$). In contrast, the mean health benefits for standard care at delayed posttest ($M = 3.72$, $SD = .67$) did not increase $t(17) = 1.68$, $p = .11$, $d_r = .21$ from pretest ($M = 3.39$, $SD = .85$).

As seen in Table 9, perceived health benefits increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning,

and idea generation and message planning combined. This change was not significant for standard care.

Social benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceived social benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 10. The mean social benefits for idea generation at delayed posttest ($M = 3.56$, $SD = .86$) significantly increased $t(17) = 8.44$, $p < .001$, $d_r = .59$ from pretest ($M = 2.17$, $SD = 1.04$). Similarly, the mean social benefits for message planning at delayed posttest ($M = 3.67$, $SD = .97$) significantly increased $t(17) = 7.08$, $p < .001$, $d_r = .51$ from pretest ($M = 2.44$, $SD = 1.10$). Likewise, the mean social benefits for idea generation and message planning combined at delayed posttest ($M = 4.67$, $SD = .49$) significantly increased $t(17) = 12.47$, $p < .001$, $d_r = .85$ from pretest ($M = 2.00$, $SD = 1.08$). In contrast, the mean social benefits for standard care at delayed posttest ($M = 2.72$, $SD = .83$) did not increase $t(17) = 1.72$, $p = .10$, $d_r = .12$ from pretest ($M = 2.50$, $SD = .92$).

As seen in Table 10, perceived social benefits increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Self-concepts benefits. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceived self-concept benefits of strength and balance exercise. A summary of results by intervention condition is presented in Table 11. The mean self-concept benefits for idea generation at delayed posttest ($M = 3.11$, $SD = 1.08$) significantly increased $t(17) = 6.22$, $p < .001$, $d_r =$

.46 from pretest ($M = 2.00$, $SD = 1.08$). Similarly, the mean self-concept benefits for message planning at delayed posttest ($M = 3.33$, $SD = .69$) significantly increased $t(17) = 6.30$, $p < .001$, $d_r = .58$ from pretest ($M = 2.17$, $SD = .92$). Likewise, the mean self-concepts benefits for idea generation and message planning combined at delayed posttest ($M = 4.72$, $SD = .46$) significantly increased $t(17) = 11.66$, $p < .001$, $d_r = .82$ from pretest ($M = 2.50$, $SD = .99$). In contrast, the mean self-concept benefits for standard care at delayed posttest ($M = 2.89$, $SD = .96$) did not increase $t(17) = 1.84$, $p = .08$, $d_r = .09$ from pretest ($M = 2.72$, $SD = .96$).

As seen in Table 11, perceived self-concept benefits increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Subjective norms. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceptions of subjective norms. A summary of results by intervention condition is presented in Table 12. The mean perceptions of subjective norms for idea generation at delayed posttest ($M = 2.83$, $SD = 1.04$) significantly increased $t(17) = 5.85$, $p < .001$, $d_r = .40$ from pretest ($M = 1.98$, $SD = .90$). Similarly, the mean perceptions of subjective norms for message planning at delayed posttest ($M = 2.67$, $SD = .69$) significantly increased $t(17) = 3.49$, $p < .01$, $d_r = .34$ from pretest ($M = 2.19$, $SD = .63$). Likewise, the mean perceptions of subjective norms for idea generation and message planning combined at delayed posttest ($M = 3.89$, $SD = 1.23$) significantly increased $t(17) = 7.78$, $p < .001$, $d_r = .60$ from pretest ($M = 2.33$, $SD = .78$). In contrast, the mean perceptions of subjective norms for standard care at

delayed posttest ($M = 2.67$, $SD = .77$) did not significantly increase $t(17) = 1.46$, $p = .16$, $d_r = .09$ from pretest ($M = 2.52$, $SD = .89$).

As seen in Table 12, perceptions of subjective norms increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Descriptive norms. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceptions of descriptive norms. A summary of results by intervention condition is presented in Table 13. The mean perceptions of descriptive norms for idea generation at delayed posttest ($M = 3.44$, $SD = .78$) significantly increased $t(17) = 3.42$, $p < .01$, $d_r = .40$ from pretest ($M = 2.72$, $SD = .89$). Similarly, the mean perceptions of descriptive norms for message planning at delayed posttest ($M = 2.78$, $SD = .88$) significantly increased $t(17) = 4.08$, $p < .001$, $d_r = .37$ from pretest ($M = 2.44$, $SD = .86$). Likewise, the mean perceptions of descriptive norms for idea generation and message planning combined at delayed posttest ($M = 3.50$, $SD = 1.04$) significantly increased $t(17) = 4.75$, $p < .001$, $d_r = .51$ from pretest ($M = 2.33$, $SD = .91$). The mean perceptions of descriptive norms for standard care at delayed posttest ($M = 2.72$, $SD = .75$) significantly increased $t(17) = 2.20$, $p < .05$, $d_r = .14$ from pretest ($M = 2.50$, $SD = .79$).

As seen in Table 13, perceptions of descriptive norms increased from pretest to delayed posttest for all of the conditions contrary to predictions.

Injunctive norms. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in perceptions of injunctive

norms. A summary of results by intervention condition is presented in Table 14. The mean perceptions of injunctive norms for idea generation at delayed posttest ($M = 4.56$, $SD = .62$) significantly increased $t(17) = 6.87$, $p < .001$, $d_r = .50$ from pretest ($M = 3.72$, $SD = .83$). Similarly, the mean perceptions of injunctive norms for message planning at delayed posttest ($M = 4.67$, $SD = .59$) significantly increased $t(17) = 9.63$, $p < .001$, $d_r = .67$ from pretest ($M = 3.72$, $SD = .46$). Likewise, the mean perceptions of injunctive norms for idea generation and message planning combined at delayed posttest ($M = 4.94$, $SD = .24$) significantly increased $t(17) = 5.10$, $p < .001$, $d_r = .63$ from pretest ($M = 4.17$, $SD = .62$). The mean perceptions of injunctive norms for standard care at delayed posttest ($M = 4.11$, $SD = .76$) significantly increased $t(17) = 3.29$, $p < .01$, $d_r = .26$ from pretest ($M = 3.72$, $SD = .67$).

As seen in Table 14, perceptions of injunctive norms increased from pretest to delayed posttest for all of the four conditions contrary to predictions.

Strength-related exercise stage progression. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in strength-related exercise. A summary of results by intervention condition is presented in Table 15. The mean strength-related exercise stage progression for idea generation at delayed posttest ($M = 3.11$, $SD = 1.02$) significantly increased $t(17) = 6.56$, $p < .001$, $d_r = .47$ from pretest ($M = 1.83$, $SD = 1.38$). Similarly, the mean strength-related exercise stage progression for message planning at delayed posttest ($M = 2.78$, $SD = .94$) significantly increased $t(17) = 7.21$, $p < .001$, $d_r = .52$ from pretest ($M = 1.50$, $SD = 1.15$). Likewise, the mean strength-related exercise stage progression for idea generation and message planning combined at delayed posttest ($M = 4.44$, $SD = .51$) significantly

increased $t(17) = 7.43, p < .001, d_r = .65$ from pretest ($M = 2.50, SD = 1.54$). In contrast, the mean strength-related exercise stage progression for standard care at delayed posttest ($M = 2.72, SD = 1.36$) did not increase $t(17) = 2.20, p = .08, d_r = .08$ from pretest ($M = 2.50, SD = 1.54$).

As seen in Table 15, strength-related exercise stage progression increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Balance-related exercise stage progression. A total of four paired-sample t tests (one for each condition) were conducted to explore delayed posttest differences in balance-related exercise stage progression. A summary of results by intervention condition is presented in Table 16. The mean balance-related exercise stage progression for idea generation at delayed posttest ($M = 4.33, SD = .91$) significantly increased $t(17) = 8.01, p < .001, d_r = .44$ from pretest ($M = 3.17, SD = 1.38$). Similarly, the mean balance-related exercise stage progression for message planning at delayed posttest ($M = 4.33, SD = .84$) significantly increased $t(17) = 6.19, p < .001, d_r = .42$ from pretest ($M = 3.33, SD = 1.28$). Likewise, the mean balance-related exercise stage progression for idea generation and message planning combined at delayed posttest ($M = 4.44, SD = .51$) significantly increased $t(17) = 9.00, p < .001, d_r = .71$ from pretest ($M = 2.17, SD = 1.50$). In contrast, the mean balance-related exercise stage progression for standard care at delayed posttest ($M = 3.06, SD = 1.43$) did not increase $t(17) = 1.72, p = .10, d_r = .08$ from pretest ($M = 2.83, SD = 1.50$).

As seen in Table 16, balance-related exercise stage progression increased from pretest to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. This change was not significant for standard care.

Summary of cognitive and behavioral findings. In summary, participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived benefits, perceptions of norms, and strength and balance exercise-related stage progression, respectively. Specifically, participants in idea generation, message planning, and idea generation and message planning combined but not standard care reported significant increases in perceived health, perceived social, and perceived self-concept benefits from pretest to delayed posttest. Similarly, participants in idea generation, message planning, and idea generation and message planning combined but not standard care reported significant increases in strength and balance exercise-related stage progression from pretest to delayed posttest. For perceptions of norms, participants in idea generation, message planning, and idea generation and message planning combined but not standard care reported significant increases in perceived subjective norms from pretest to delayed posttest. However, reports of perceived descriptive and injunctive norms significantly increased for participants in all four conditions from pretest to delayed posttest.

Mixed models. A series of mixed models utilizing Tukey's HSD test for post hoc were conducted to assess participants' changes in perceived benefits (health, social, self-concept), perceptions of norms (subjective, descriptive, and injunctive), and strength and balance exercise-related stage progression over time (pretest, immediate posttest, and

delayed posttest) and by condition. The within-subjects factor, time, had three points: pretest, immediate posttest, and delayed posttest. The between-subjects factor, condition, had four levels: idea generation, message planning, idea generation and message planning combined, and standard care. Participants' changes in cognitive and behavioral outcomes were compared based on condition assignment to identify active involvement component(s) as mechanism(s) of change. The following sections organize results based on type of outcome, starting with changes in perceived health benefits.

Health benefits. Hypothesis 3a proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of perceived health benefits compared to participants in the standard care condition over time. Hypothesis 4a proposed that participants in the idea generation and message combined condition would report increased levels of perceived health benefits compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 2a examined differences in reports of perceived health benefits between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in perceived health benefits from pretest, immediate posttest, to delayed posttest. The means and standard deviations for perceived health benefits across time are presented in Table 17. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 9.58, p < .001$, partial $\eta^2 = .30$, as well as significant main effects for time $F(2, 136) = 68.44, p < .001$, partial $\eta^2 = .50$, and condition $F(3, 68) =$

4.71, $p < .01$, partial $\eta^2 = .17$ (see Table 18). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in perceived health benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in Table 19. There was a significant difference in perceived health benefits between intervention conditions at immediate posttest, $F(3, 68) = 8.76$, $p < .001$, partial $\eta^2 = .28$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of perceived health benefits of strength and balance exercise at immediate posttest ($M = 4.44$, $SD = .51$) than those in the idea generation condition ($M = 3.56$, $SD = .62$), message planning condition ($M = 3.61$, $SD = .61$), or standard care condition ($M = 3.61$, $SD = .70$). Participants' perceptions of health benefits in idea generation and message planning conditions were not significantly different from standard care. In addition, there was no significant difference in levels of perceived health benefits between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceived health benefits of strength and balance exercise at the immediate posttest. Thus, Hypothesis 3a was partially supported and Hypothesis 4a was supported at the immediate posttest. For Research Question 2a, there was no

significant difference in participants' change in perceived health benefits between those in idea generation and message planning conditions.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in perceived health benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in Table 19. There was a significant difference in perceived health benefits between intervention conditions at delayed posttest, $F(3, 68) = 11.68, p < .001$, partial $\eta^2 = .34$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported significantly higher levels of perceived health benefits of strength and balance exercise at delayed posttest ($M = 4.83, SD = .38$) than those in the idea generation condition ($M = 3.83, SD = .71$), message planning condition ($M = 4.00, SD = .69$), or standard care condition ($M = 3.72, SD = .67$). Participants' perceptions of health benefits in idea generation and message planning conditions were not significantly different from standard care. In addition, there was no significant difference in levels of perceived health benefits between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceived health benefits of strength and balance exercise at the delayed posttest. Thus, Hypothesis 3a was partially supported and Hypothesis 4a was supported at the delayed posttest. For Research Question 2a, there was no significant difference in participants' change in perceived health benefits between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in perceived health benefits of strength and balance exercise from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on perceived health benefits for participants in the idea generation group, $F(2, 34) = 12.38, p < .001$, partial $\eta^2 = .42$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation group. Changes in perceived health benefits were significantly different between pretest and immediate posttest ($M = .33, SE = .11, p < .01$), pretest and delayed posttest ($M = .61, SE = .14, p < .001$), and immediate posttest and delayed posttest ($M = .28, SE = .11, p < .05$).

Similarly, there was a significant effect of time on perceived health benefits for participants in the message planning group, $F(2, 34) = 17.72, p < .001$, partial $\eta^2 = .51$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in perceived health benefits were significantly different between pretest and immediate posttest ($M = .39, SE = .12, p < .01$), pretest and delayed posttest ($M = .78, SE = .15, p < .001$), and immediate posttest and delayed posttest ($M = .39, SE = .12, p < .01$).

Likewise, there was a significant effect of time on perceived health benefits for participants in the idea generation and message planning combined group, $F(2, 34) = 50.12, p < .001$, partial $\eta^2 = .75$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in perceived health benefits were significantly different between pretest and immediate posttest ($M = 1.33, SE = .18, p < .001$), pretest and

delayed posttest ($M = 1.72$, $SE = .21$, $p < .001$), and immediate posttest and delayed posttest ($M = .39$, $SE = .14$, $p < .05$).

In contrast, there was not a significant effect of time on perceived health benefits for participants in the standard care group, $F(2, 34) = 2.31$, $p = .12$, partial $\eta^2 = .12$.

Changes in perceived health benefits were not different between pretest and immediate posttest ($M = .22$, $SE = .17$, $p = .22$), pretest and delayed posttest ($M = .33$, $SE = .20$, $p = .11$), and immediate posttest and delayed posttest ($M = .11$, $SE = .08$, $p = .16$).

Summary of results for health benefits. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived health benefits at immediate and delayed posttests. Specifically, participants in idea generation and message planning combined reported higher levels of perceived health benefits than those in the idea generation, message planning, or standard care conditions. In contrast, participants' perceptions of health benefits in idea generation and message planning conditions were not different from those in standard care at immediate and delayed posttests. There were no differences in perceptions of health benefits between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated perceived health benefits increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. These changes were not significant for standard care.

Social benefits. Hypothesis 3b proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of perceived social benefits compared to participants in the standard care condition over time. Hypothesis 4b proposed that participants in the idea generation and message combined condition would report increased levels of perceived social benefits compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 2b examined differences in reports of perceived social benefits between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in perceived social benefits from pretest, immediate posttest, to delayed posttest. The means and standard deviations for perceived social benefits across time are presented in Table 20. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 24.27, p < .001$, partial $\eta^2 = .52$, as well as significant main effects for time $F(2, 136) = 181.59, p < .001$, partial $\eta^2 = .73$, and condition $F(3, 68) = 2.74, p < .05$, partial $\eta^2 = .11$ (see Table 21). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in perceived social benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in

Table 22. There was a significant difference in perceived social benefits between intervention conditions at immediate posttest, $F(3, 68) = 3.61, p < .05$, partial $\eta^2 = .14$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of perceived social benefits of strength and balance exercise at immediate posttest ($M = 3.50, SD = .99$) than those in the standard care condition ($M = 2.61, SD = .78$). Participants' perceptions of social benefits in idea generation and message planning combined condition were not different from those in idea generation condition ($M = 2.89, SD = .83$) or message planning condition ($M = 3.16, SD = .79$). Participants' perceptions of social benefits in idea generation and message planning conditions were not different from those in standard care. In addition, there was no significant difference in levels of perceived social benefits between idea generation and message planning.

The idea generation and message planning combined and standard care conditions yielded the highest and lowest levels of change in perceived social benefits of strength and balance exercise at the immediate posttest, respectively. Thus, Hypothesis 3b was partially supported and Hypothesis 4b was not supported at the immediate posttest. For Research Question 2b, there was no significant difference in participants' change in perceived social benefits between those in idea generation and message planning conditions.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in perceived social benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in Table 22. There was a significant difference in perceived social benefits between

intervention conditions at delayed posttest, $F(3, 68) = 17.63, p < .001$, partial $\eta^2 = .44$.

Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of perceived social benefits of strength and balance exercise at delayed posttest ($M = 4.67, SD = .49$) than those in the idea generation condition ($M = 3.56, SD = .86$), message planning condition ($M = 3.67, SD = .97$), or standard care condition ($M = 2.72, SD = .83$).

Participants' perceptions of social benefits in idea generation and message planning conditions were different from those in standard care. In addition, there was no difference in levels of perceived social benefits between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceived social benefits of strength and balance exercise over time. Thus, Hypothesis 3b and Hypothesis 4b were supported at delayed posttest. For Research Question 2b, there was no difference in participants' change in perceived social benefits between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in perceived social benefits of strength and balance exercise from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on perceived social benefits for participants in the idea generation group, $F(2, 34) = 49.52, p < .001$, partial $\eta^2 = .74$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation only group. Changes in perceived social benefits were different between pretest and immediate posttest ($M = .72, SE = .14, p < .001$), pretest and delayed posttest

($M = 1.39$, $SE = .16$, $p < .001$), and immediate posttest and delayed posttest ($M = .67$, $SE = .11$, $p < .001$).

Similarly, there was a significant effect of time on perceived social benefits for participants in the message planning group, $F(2, 34) = 36.06$, $p < .001$, partial $\eta^2 = .68$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in perceived social benefits were different between pretest and immediate posttest ($M = .72$, $SE = .14$, $p < .001$), pretest and delayed posttest ($M = 1.22$, $SE = .17$, $p < .001$), and immediate posttest and delayed posttest ($M = .50$, $SE = .12$, $p < .01$).

Likewise, there was a significant effect of time on perceived social benefits for participants in the idea generation and message planning combined group, $F(2, 34) = 105.84$, $p < .001$, partial $\eta^2 = .86$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in perceived social benefits were different between pretest and immediate posttest ($M = 1.50$, $SE = .15$, $p < .001$), pretest and delayed posttest ($M = 2.67$, $SE = .21$, $p < .001$), and immediate posttest and delayed posttest ($M = 1.17$, $SE = .19$, $p < .001$).

In contrast, there was not an effect of time on perceived social benefits for participants in the standard care group, $F(2, 34) = 2.62$, $p = .09$, partial $\eta^2 = .13$. Changes in perceived social benefits were not different between pretest and immediate posttest ($M = .11$, $SE = .08$, $p = .16$), pretest and delayed posttest ($M = .22$, $SE = .13$, $p = .10$), and immediate posttest and delayed posttest ($M = .11$, $SE = .08$, $p = .16$).

Summary of results for social benefits. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived social benefits at immediate and delayed posttests. Specifically, participants in idea generation and message planning combined reported higher levels of perceived social benefits at delayed posttest than those in the idea generation, message planning, or standard care conditions. In addition, participants' perceptions of social benefits in idea generation and message planning conditions were different from those in standard care at delayed posttest. In contrast, there were no differences in perceptions of social benefits between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated perceived social benefits increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. These changes were not significant for standard care.

Self-concept benefits. Hypothesis 3c proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of perceived self-concept benefits compared to participants in the standard care condition over time. Hypothesis 4c proposed that participants in the idea generation and message combined condition would report increased levels of perceived self-concept benefits compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 2c examined

differences in reports of perceived self-concept benefits between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in perceived self-concept benefits from pretest, immediate posttest, to delayed posttest. The means and standard deviations for perceived self-concept benefits across time are presented in Table 23. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 20.21, p < .001$, partial $\eta^2 = .47$, as well as significant main effects for time $F(2, 136) = 156.41, p < .001$, partial $\eta^2 = .70$, and condition $F(3, 68) = 6.15, p < .001$, partial $\eta^2 = .21$ (see Table 24). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in perceived self-concept benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in Table 25. There was a significant difference in perceived self-concept benefits between intervention conditions at immediate posttest, $F(3, 68) = 6.97, p < .001$, partial $\eta^2 = .24$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of perceived self-concept benefits of strength and balance exercise at immediate posttest ($M = 3.83, SD = .79$) than those in the idea generation condition ($M =$

2.67, $SD = .91$), message planning condition ($M = 2.89$, $SD = .76$), or standard care condition ($M = 2.83$, $SD = .92$). Participants' perceptions of self-concept benefits in idea generation and message planning conditions were not different from standard care. In addition, there was no significant difference in levels of perceived self-concepts benefits between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceived self-concept benefits of strength and balance exercise at the immediate posttest. Thus, Hypothesis 3c was partially supported and Hypothesis 4c was supported at the delayed posttest. For Research Question 2c, there was no significant difference in participants' change in perceived self-concept benefits between those in idea generation and message planning conditions.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in perceived self-concept benefits of strength and balance exercise between intervention conditions. A summary of results by intervention condition is presented in Table 25. There was a significant difference in perceived self-concept benefits between intervention conditions at delayed posttest, $F(3, 68) = 17.69$, $p < .001$, partial $\eta^2 = .44$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of perceived self-concept benefits of strength and balance exercise at delayed posttest ($M = 4.72$, $SD = .46$) than those in the idea generation condition ($M = 3.11$, $SD = 1.08$), message planning condition ($M = 3.33$, $SD = .69$), or standard care condition ($M = 2.89$, $SD = .96$). Participants' perceptions of self-concept benefits in idea generation and message planning conditions were not different from standard care. In

addition, there was no significant difference in levels of perceived self-concept benefits between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceived self-concept benefits of strength and balance exercise at the delayed posttest. Thus, Hypothesis 3c was partially supported and Hypothesis 4c was supported at the delayed posttest. For Research Question 2c, there was no significant difference in participants' change in perceived self-concept benefits between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in perceived self-concept benefits of strength and balance exercise from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on perceived self-concept benefits for participants in the idea generation group, $F(2, 34) = 31.51, p < .001$, partial $\eta^2 = .65$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation only group. Changes in perceived self-concept benefits were different between pretest and immediate posttest ($M = .67, SE = .11, p < .001$), pretest and delayed posttest ($M = 1.11, SE = .18, p < .001$), and immediate posttest and delayed posttest ($M = .44, SE = .12, p < .01$).

Similarly, there was a significant effect of time on perceived self-concept benefits for participants in the message planning group, $F(2, 34) = 34.31, p < .001$, partial $\eta^2 = .67$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in perceived self-concept benefits were different between pretest and immediate posttest ($M = .72, SE = .11, p <$

.001), pretest and delayed posttest ($M = 1.17$, $SE = .19$, $p < .001$), and immediate posttest and delayed posttest ($M = .44$, $SE = .12$, $p < .01$).

Likewise, there was a significant effect of time on perceived self-concept benefits for participants in the idea generation and message planning combined group, $F(2, 34) = 100.35$, $p < .001$, partial $\eta^2 = .86$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in perceived self-concept benefits were different between pretest and immediate posttest ($M = 1.33$, $SE = .14$, $p < .001$), pretest and delayed posttest ($M = 2.22$, $SE = .19$, $p < .001$), and immediate posttest and delayed posttest ($M = .89$, $SE = .14$, $p < .001$).

In contrast, there was not a significant effect of time on perceived self-concept benefits for participants in the standard care group, $F(2, 34) = 2.53$, $p = .09$, partial $\eta^2 = .13$. Changes in perceived self-concept benefits were not different between pretest and immediate posttest ($M = .11$, $SE = .08$, $p = .16$), pretest and delayed posttest ($M = .17$, $SE = .09$, $p = .08$), and immediate posttest and delayed posttest ($M = .06$, $SE = .06$, $p = .33$).

Summary of results for self-concept benefits. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceived self-concept benefits at immediate and delayed posttests. Specifically, participants in idea generation and message planning combined reported higher levels of perceived self-concept benefits at than those in the idea generation, message planning, or standard care conditions at immediate and delayed posttests. In contrast, participants' perceptions of self-concept

benefits in idea generation and message planning conditions were not different from those in standard care at immediate and delayed posttests. There were no differences in perceptions of self-concept benefits between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated perceived self-concept benefits increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. These changes were not significant for standard care.

Subjective norms. Hypothesis 5a proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of perceived subjective norms compared to participants in the standard care condition over time. Hypothesis 6a proposed that participants in the idea generation and message combined condition would report increased levels of perceived subjective norm compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 3a examined differences in levels of perceived subjective norms between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in perceptions of subjective norms from pretest, immediate posttest, to delayed posttest. The means and standard deviations for subjective norms across time are presented in Table 26. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 12.75, p < .001$, partial $\eta^2 = .36$, a significant main effect

for time $F(2, 136) = 79.86, p < .001$, partial $\eta^2 = .54$, but no main effect for condition $F(3, 68) = 2.48, p = .07$, partial $\eta^2 = .10$ (see Table 27). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in perceptions of subjective norms between intervention conditions. A summary of results by intervention condition is presented in Table 28. There was not a significant difference in perceptions of subjective norms between intervention conditions at immediate posttest, $F(3, 68) = 1.87, p = .14$, partial $\eta^2 = .08$. Thus, Hypothesis 5a and Hypothesis 6a were not supported at the immediate posttest.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in perceptions of subjective norms between intervention conditions. A summary of results by intervention condition is presented in Table 28. There was a difference in perceptions of subjective norms between intervention conditions at delayed posttest, $F(3, 68) = 6.81, p < .001$, partial $\eta^2 = .23$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of perceptions of subjective norms at delayed posttest ($M = 3.89, SD = 1.23$) than those in the idea generation condition ($M = 2.83, SD = 1.04$), message planning condition ($M = 2.67, SD = .69$), or standard care condition ($M = 2.67, SD = .76$). Participants' perceptions of subjective norms in idea generation and message planning conditions were not different from standard care. In addition, there was

no significant difference in perceptions of subjective norms between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in perceptions of subjective norms at the delayed posttest. Thus, Hypothesis 5a was partially supported and Hypothesis 6a was supported at the delayed posttest. For Research Question 3a, there was no significant difference in participants' change in perceptions of subjective norms between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in perceptions of subjective norms from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on perceptions of subjective norms for participants in the idea generation group, $F(2, 34) = 26.14, p < .001$, partial $\eta^2 = .61$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation only group. Changes in perceptions of subjective norms were different between pretest and immediate posttest ($M = .19, SE = .07, p < .05$), pretest and delayed posttest ($M = .85, SE = .15, p < .001$), and immediate posttest and delayed posttest ($M = .67, SE = .14, p < .001$).

Similarly, there was a significant effect of time on perceptions of subjective norms for participants in the message planning group, $F(2, 34) = 9.17, p < .001$, partial $\eta^2 = .35$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in perceptions of subjective norms were different between pretest and immediate posttest ($M = .20, SE =$

.09, $p < .05$), pretest and delayed posttest ($M = .48$, $SE = .14$, $p < .01$), and immediate posttest and delayed posttest ($M = .28$, $SE = .11$, $p < .05$).

Likewise, there was a significant effect of time on perceptions of subjective norms for participants in the idea generation and message planning combined group, $F(2, 34) = 49.39$, $p < .001$, partial $\eta^2 = .74$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in perceptions of subjective norms were different between pretest and immediate posttest ($M = .50$, $SE = .14$, $p < .01$), pretest and delayed posttest ($M = 1.56$, $SE = .20$, $p < .001$), and immediate posttest and delayed posttest ($M = 1.06$, $SE = .13$, $p < .001$).

In contrast, there was not a significant effect of time on perceptions of subjective norms for participants in the standard care group, $F(2, 34) = 1.69$, $p = .20$, partial $\eta^2 = .09$. Changes in perceptions of subjective norms were not different between pretest and immediate posttest ($M = .04$, $SE = .07$, $p = .61$), pretest and delayed posttest ($M = .15$, $SE = .10$, $p = .16$), and immediate posttest and delayed posttest ($M = .11$, $SE = .08$, $p = .16$).

Summary of results for subjective norms. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceptions of subjective norms at delayed posttest. Specifically, participants in idea generation and message planning combined reported higher levels of perceptions of subjective norms at delayed posttest than those in the idea generation, message planning, or standard care conditions. In contrast, participants' perceptions of subjective norms in idea generation and message

planning conditions were not different from those in standard care at immediate and delayed posttests. There were no differences in perceptions of subjective norms between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated perceptions of subjective norms increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. These changes were not significant for standard care.

Descriptive norms. Hypothesis 5b proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased perceptions of descriptive norms compared to participants in the standard care condition over time. Hypothesis 6b proposed that participants in the idea generation and message combined condition would report increased perceptions of descriptive norms compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 3b examined differences in perceptions of descriptive norms between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in perceptions of descriptive norms from pretest, immediate posttest, to delayed posttest. The means and standard deviations for descriptive norms across time are presented in Table 29. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 9.58, p < .001$, partial $\eta^2 = .30$, a significant

main effect for time $F(2, 136) = 68.44, p < .001$, partial $\eta^2 = .50$, but no main effect for condition $F(3, 68) = 1.25, p = .30$, partial $\eta^2 = .05$ (see Table 30). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in perceptions of descriptive norms between intervention conditions. A summary of results by intervention condition is presented in Table 31. There was not a significant difference in perceptions of descriptive norms between intervention conditions at immediate posttest, $F(3, 68) = 1.23, p = .31$, partial $\eta^2 = .05$. Thus, Hypothesis 5b and Hypothesis 6b were not supported at the immediate posttest.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in perceptions of descriptive norms between intervention conditions. A summary of results by intervention condition is presented in Table 31. There was a significant difference in perceptions of descriptive norms between intervention conditions at delayed posttest, $F(3, 68) = 2.81, p < .05$, partial $\eta^2 = .11$. However, post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition did not report higher levels of perceptions of descriptive norms at delayed posttest ($M = 3.44, SD = .78$) than those in the idea generation condition ($M = 3.17, SD = .99$), message planning condition ($M = 2.78, SD = .89$), or standard care condition ($M = 3.50, SD = 1.04$). Participants' perceptions of descriptive norms in idea generation and message planning conditions were not different

from standard care. In addition, there was no significant difference in levels of perceptions of descriptive norms between idea generation and message planning.

Thus, Hypothesis 5b and Hypothesis 6b were not supported at the delayed posttest. For Research Question 3b, there was no significant difference in participants' change in perceptions of descriptive norms between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in perceptions of descriptive norms from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on perceptions of descriptive norms for participants in the idea generation group, $F(2, 34) = 9.27, p < .001$, partial $\eta^2 = .35$. Follow-up tests were conducted to evaluate the three pairwise differences descriptive norms the means for those in the idea generation group. Changes in perceptions of descriptive norms were different between pretest and immediate posttest ($M = .39, SE = .16, p < .05$), pretest and delayed posttest ($M = .72, SE = .21, p < .01$), and immediate posttest and delayed posttest ($M = .33, SE = .11, p < .01$).

Similarly, there was a significant effect of time on perceptions of descriptive norms for participants in the message planning group, $F(2, 34) = 10.96, p < .001$, partial $\eta^2 = .39$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in perceptions of descriptive norms were not different between pretest and immediate posttest ($M = .33, SE = .16, p = .06$). In contrast, changes in perceptions of descriptive norms were different between pretest and delayed posttest ($M = .72, SE = .18, p < .001$), and immediate posttest and delayed posttest ($M = .39, SE = .12, p < .05$).

Likewise, there was a significant effect of time on perceptions of descriptive norms for participants in the idea generation and message planning combined group, $F(2, 34) = 17.75, p < .001$, partial $\eta^2 = .51$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in perceptions of descriptive norms were different between pretest and immediate posttest ($M = .61, SE = .20, p < .01$), pretest and delayed posttest ($M = 1.17, SE = .25, p < .001$), and immediate posttest and delayed posttest ($M = .56, SE = .12, p < .001$).

There was a significant effect of time on perceptions of descriptive norms for participants in the standard care group, $F(2, 34) = 3.40, p < .05$, partial $\eta^2 = .17$. Changes in perceptions of descriptive norms were not different between pretest and immediate posttest ($M = .11, SE = .08, p = .16$) and immediate posttest and delayed posttest ($M = .11, SE = .08, p = .16$). In contrast, changes in perceptions of descriptive norms were different between pretest and delayed posttest ($M = .22, SE = .10, p < .05$).

Summary of results for descriptive norms. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed perceptions of descriptive norms for participants in all four of the intervention conditions did not differ at immediate and delayed posttests. Simple main effects for time indicated perceptions of descriptive norms increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for two of the four conditions as predicted: idea generation and idea generation and message planning combined. This change was significant for message planning from pretest to delayed posttest and

immediate to delayed posttest as predicted. This change was significant for standard care from pre-delayed posttest not as predicted.

Injunctive norms. Hypothesis 5c proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would demonstrate greater levels of change in perceptions of injunctive norms than participants in the standard care condition. Hypothesis 6c proposed that participants in the idea generation and message combined condition would demonstrate greater levels of change in perceptions of injunctive norms than participants in the idea generation and message planning conditions. Additionally, Research Question 3c examined differences in levels of change in perceptions of injunctive norms between participants in the idea generation and message planning only conditions.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on changes in perceptions of injunctive norms from pretest, immediate posttest, to delayed posttest. The means and standard deviations for injunctive norms across time are presented in Table 32. The results for the mixed model ANOVA indicated no interaction between time and condition $F(6, 136) = 1.98, p = .07$, partial $\eta^2 = .08$, a significant main effect for time $F(2, 136) = 76.90, p < .001$, partial $\eta^2 = .53$, and a significant main effect for condition $F(3, 68) = 3.52, p < .05$, partial $\eta^2 = .13$ (see Table 33). Main effects for condition and time are presented in the following paragraphs.

Main effects for condition. The main effect of condition showed that there was a significant difference in perceptions of injunctive norms between intervention groups over time $F(3, 68) = 3.52, p < .05$, partial $\eta^2 = .13$ (see Table 34). Post hoc comparisons

using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of change in perceptions of injunctive norms ($M = .65$, $SE = .20$, $p < .01$) than those in the standard care condition. Changes in participants' perceptions of injunctive norms in idea generation and message planning combined condition were not different from idea generation condition ($M = .41$, $SE = .20$, $p = .19$) or message planning condition ($M = .37$, $SE = .20$, $p = .27$). Changes in participants' perceptions of injunctive norms in idea generation ($M = .24$, $SE = .20$, $p = .52$) and message planning ($M = .28$, $SE = .20$, $p = .63$) conditions were not different from standard care. In addition, there was no significant difference in changes of perceptions of injunctive norms between idea generation and message planning. Thus, Hypothesis 7c was partially supported and Hypothesis 8c was not supported at the delayed posttest.

Main effects for time. The main effect of time showed a significant difference in perceptions of injunctive norms from pretest, immediate posttest, to delayed posttest, $F(2, 136) = 76.90$, $p < .001$, partial $\eta^2 = .53$. Follow-up pairwise comparisons revealed that changes in perceptions of injunctive norms were different between pretest and immediate posttest ($M = .53$, $SE = .07$, $p < .001$), pretest and delayed posttest ($M = .74$, $SE = .06$, $p < .001$), and immediate posttest and delayed posttest ($M = .21$, $SE = .05$, $p < .001$).

Summary of results for injunctive norms. In summary, there was not a significant interaction between time and condition. Participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of perceptions of injunctive norms regardless of time point. Specifically, participants in idea generation and message planning combined reported higher levels of perceptions of injunctive norms at delayed posttest than those in the standard care condition. In contrast,

there were no differences in perceptions of injunctive norms between idea generation and message planning combined and idea generation or message planning conditions.

Participants' perceptions of injunctive norms in idea generation and message planning conditions were not different from those in standard care. There were no differences in perceptions of injunctive norms between participants in idea generation and message planning.

Strength-related exercise stage progression. Hypothesis 7a proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of strength-related exercise change compared to participants in the standard care condition over time. Hypothesis 8a proposed that participants in the idea generation and message combined condition would report increased levels of strength-related exercise compared to participants in the idea generation and message planning conditions over time. Additionally, Research Question 4a examined differences in strength-related exercise change between participants in the idea generation and message planning conditions over time.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on change in strength-related exercise stage progression from pretest, immediate posttest, to delayed posttest. The means and standard deviations for strength-related exercise stage progression across time are presented in Table 35. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 10.87, p < .001$, partial $\eta^2 = .32$, as well as significant main effects for time $F(2, 136) = 25.10, p < .001$, partial $\eta^2 = .64$, and condition $F(3, 68) = 4.61, p < .01$, partial $\eta^2 = .17$.

(see Table 36). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in strength-related exercise stage progression between intervention conditions. A summary of results by intervention condition is presented in Table 37. There was a significant difference in strength-related exercise stage progression between intervention conditions at immediate posttest, $F(3, 68) = 11.52, p < .001$, partial $\eta^2 = .34$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of strength-related exercise stage progression at immediate posttest ($M = 3.44, SD = .62$) than those in the idea generation condition ($M = 2.39, SD = 1.09$), message planning condition ($M = 2.17, SD = .92$), or standard care condition ($M = 2.61, SD = 1.46$). Participants' strength-related exercise stage progression in idea generation and message planning conditions were not different from standard care. In addition, there was no significant difference in levels of strength-related exercise stage progression between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in strength-related exercise stage progression at the immediate posttest. Thus, Hypothesis 7a was partially supported and Hypothesis 8a was supported at the immediate posttest. For Research Question 4a, there was no significant difference in

participants' change in strength-related exercise stage progression between those in idea generation and message planning conditions.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in strength-related exercise stage progression between intervention conditions. A summary of results by intervention condition is presented in Table 37.

There was a significant difference in strength-related exercise stage progression between intervention conditions at delayed posttest, $F(3, 68) = 11.50, p < .001$, partial $\eta^2 = .34$.

Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition reported higher levels of strength-related exercise stage progression at delayed posttest ($M = 4.44, SD = .51$) than those in the idea generation condition ($M = 3.11, SD = 1.02$), message planning condition ($M = 2.78, SD = .94$), or standard care condition ($M = 2.72, SD = 1.36$). Participants' strength-related exercise stage progression in idea generation and message planning conditions were not different from standard care. In addition, there was no significant difference in levels of strength-related exercise stage progression between idea generation and message planning.

The idea generation and message planning combined condition yielded the highest level of change in strength-related exercise stage progression at the delayed posttest. Thus, Hypothesis 7a was partially supported and Hypothesis 8a was supported at the delayed posttest. For Research Question 4a, there was no significant difference in participants' change in strength-related exercise stage progression between those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in strength-related exercise stage progression from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on strength-related exercise stage progression for participants in the idea generation group, $F(2, 34) = 34.79, p < .001$, partial $\eta^2 = .67$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation only group. Changes in strength-related exercise stage progression were different between pretest and immediate posttest ($M = .56, SE = .12, p < .001$), pretest and delayed posttest ($M = 1.28, SE = .20, p < .001$), and immediate posttest and delayed posttest ($M = .72, SE = .15, p < .001$).

Similarly, there was a significant effect of time on strength-related exercise stage progression for participants in the message planning group, $F(2, 34) = 41.92, p < .001$, partial $\eta^2 = .71$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in strength-related exercise stage progression were different between pretest and immediate posttest ($M = .67, SE = .11, p < .001$), pretest and delayed posttest ($M = 1.28, SE = .18, p < .001$), and immediate posttest and delayed posttest ($M = .61, SE = .12, p < .001$).

Likewise, there was a significant effect of time on strength-related exercise stage progression for participants in the idea generation and message planning combined group, $F(2, 34) = 43.52, p < .001$, partial $\eta^2 = .71$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and message planning group. Changes in strength-related exercise stage progression were different between pretest and immediate posttest ($M = .94, SE = .24, p < .001$), pretest

and delayed posttest ($M = 1.94$, $SE = .26$, $p < .001$), and immediate posttest and delayed posttest ($M = 1.00$, $SE = .08$, $p < .001$).

In contrast, there was not a significant effect of time on strength-related exercise stage progression for participants in the standard care group, $F(2, 34) = 3.40$, $p = .08$, partial $\eta^2 = .17$. Changes in strength-related exercise stage progression were not different between pretest and immediate posttest ($M = .11$, $SE = .08$, $p = .16$), pretest and delayed posttest ($M = .22$, $SE = .10$, $p = .08$), and immediate posttest and delayed posttest ($M = .11$, $SE = .08$, $p = .16$).

Summary of results for strength-related exercise stage progression. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of strength-related exercise stage progression at immediate and delayed posttests. Specifically, participants in idea generation and message planning combined reported higher levels of strength-related exercise stage progression than those in the idea generation, message planning, or standard care conditions at immediate and delayed posttests. In contrast, participants' strength-related exercise stage progression in idea generation and message planning conditions were not different from standard care at immediate and delayed posttests. There were no differences in strength-related exercise stage progression between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated strength-related exercise stage progression increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea

generation and message planning combined. These changes were not significant for standard care.

Balance-related exercise stage progression. Hypothesis 7b proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report increased levels of balance-related exercise change compared to participants in the standard care condition. Hypothesis 8b proposed that participants in the idea generation and message combined condition would report increased levels of balance-related exercise change compared to participants in the idea generation and message planning conditions. Additionally, Research Question 4b examined differences in balance-related exercise change between participants in the idea generation and message planning conditions.

To test these hypotheses and research question, a mixed model ANOVA was conducted to evaluate the effects of intervention condition and time on balance-related exercise stage progression from pretest, immediate posttest, to delayed posttest. The means and standard deviations for balance-related exercise stage progression across time are presented in Table 38. The results for the mixed model ANOVA indicated a significant interaction between time and condition $F(6, 136) = 19.34, p < .001$, partial $\eta^2 = .46$, a significant main effect for time $F(2, 136) = 140.81, p < .001$, partial $\eta^2 = .67$, but no main effect for condition $F(3, 68) = 2.02, p = .12$, partial $\eta^2 = .08$ (see Table 39). The significant interaction was investigated further by evaluating the simple main effects of condition separately for immediate and delayed posttest and then by time within condition. Simple main effects for immediate and delayed posttest and time are presented in the following paragraphs.

Simple main effects for immediate posttest. A one-way ANOVA was conducted to explore differences in balance-related exercise stage progression between intervention conditions. A summary of results by intervention condition is presented in Table 40. There was not a significant difference in balance-related exercise stage progression between intervention conditions at immediate posttest, $F(3, 68) = 1.59, p = .22$, partial $\eta^2 = .07$. Thus, Hypothesis 7b and Hypothesis 8b were not supported at the immediate posttest.

Simple main effects for delayed posttest. A one-way ANOVA was conducted to explore differences in balance-related exercise stage progression between intervention conditions. A summary of results by intervention condition is presented in Table 40. There was significant difference in balance-related exercise stage progression between intervention conditions at delayed posttest, $F(3, 68) = 8.14, p < .001$, partial $\eta^2 = .26$. Post hoc comparisons using the Tukey HSD test revealed that participants in the idea generation and message planning combined condition ($M = 4.44, SD = .51$), the idea generation condition ($M = 4.33, SD = .91$), message planning condition ($M = 4.33, SD = .84$) reported higher levels of balance-related exercise stage progression at delayed posttest than those in standard care condition ($M = 3.06, SD = 1.43$). Participants' balance-related exercise stage progression in the idea generation and message planning combined condition was not different from idea generation and message planning conditions. In addition, there was no significant difference in levels of balance-related exercise stage progression between idea generation and message planning.

Thus, Hypothesis 7b was supported and Hypothesis 8b was not supported at the delayed posttest. For Research Question 4b, there was no significant difference in

participants' change in balance-related exercise stage progression for those in idea generation and message planning conditions.

Simple main effects for time. A total of four repeated measures ANOVAs (one for each condition) were conducted to explore differences in balance-related exercise stage progression from pretest, immediate posttest, to delayed posttest. There was a significant effect of time on balance-related exercise stage progression for participants in the idea generation group, $F(2, 34) = 57.36, p < .001$, partial $\eta^2 = .77$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation only group. Changes in balance-related exercise stage progression were different between pretest and immediate posttest ($M = .28, SE = .11, p < .01$), pretest and delayed posttest ($M = 1.17, SE = .15, p < .001$), and immediate posttest and delayed posttest ($M = .89, SE = .08, p < .001$).

Similarly, there was a significant effect of time on balance-related exercise stage progression for participants in the message planning group, $F(2, 34) = 35.59, p < .001$, partial $\eta^2 = .68$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the message planning only group. Changes in balance-related exercise stage progression were different between pretest and immediate posttest ($M = .22, SE = .10, p < .05$), pretest and delayed posttest ($M = 1.00, SE = .16, p < .001$), and immediate posttest and delayed posttest ($M = .78, SE = .10, p < .001$).

Likewise, there was a significant effect of time on balance-related exercise stage progression for participants in the idea generation and message planning combined group, $F(2, 34) = 63.34, p < .001$, partial $\eta^2 = .70$. Follow-up tests were conducted to evaluate the three pairwise differences among the means for those in the idea generation and

message planning group. Changes in balance-related exercise stage progression were different between pretest and immediate posttest ($M = 1.22$, $SE = .24$, $p < .001$), pretest and delayed posttest ($M = 2.28$, $SE = .25$, $p < .001$), and immediate posttest and delayed posttest ($M = 1.06$, $SE = .06$, $p < .002$).

In contrast, there was no effect of time on balance-related exercise stage progression for participants in the standard care group, $F(2, 34) = 2.87$, $p = .07$, partial $\eta^2 = .14$. Changes in balance-related exercise stage progression were not different between pretest and immediate posttest ($M = .06$, $SE = .06$, $p = .33$), pretest and delayed posttest ($M = .23$, $SE = .13$, $p = .10$), and immediate posttest and delayed posttest ($M = .17$, $SE = .09$, $p = .08$).

Summary of findings for balance related-exercise stage progression. In summary, there was a significant interaction between time and condition. Simple main effects for condition revealed participants in the standard care condition reported the lowest levels of balance-related exercise stage progression at delayed posttest. Specifically, participants in idea generation and message planning combined, idea generation, and message planning conditions reported higher levels of balance-related exercise stage progression at delayed posttest than those in the standard care condition. In contrast, participants' balance-related exercise stage progression in idea generation and message planning combined were not different from idea generation or message planning conditions at immediate and delayed posttests. There were no differences in balance-related exercise stage progression between idea generation and message planning at immediate and delayed posttests. Simple main effects for time indicated balance related-exercise stage progression increased from pretest to immediate posttest, pretest to delayed posttest, and immediate to

delayed posttest for three of the four conditions as predicted: idea generation, message planning, and idea generation and message planning combined. These changes were not significant for standard care.

Interpersonal Communication Outcomes

Hypothesis 9a proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would report greater levels of discussion about strength and balance exercise than participants in the standard care condition. Hypothesis 10a proposed that participants in the idea generation and message planning combined condition would demonstrate greater levels of discussion about strength and balance exercise than participants in the idea generation and message planning conditions. Additionally, Research Question 5a examined differences in levels of discussion about strength and balance exercise between participants in the idea generation and message planning conditions. A 4 X 2 chi-square test indicated a significant effect of condition on participants' reported interpersonal communication about strength and balance exercise at delayed posttest, $\chi^2(3, N = 72) = 13.94, p < .01$, Cramer's $V = .44$. Follow-up pairwise comparisons using the Holm's sequential Bonferroni method revealed that participants in the idea generation and message planning combined condition (89%) reported higher levels of interpersonal communication about strength and balance exercise than those in the idea generation (61%), message planning (56%), or standard care (28%) condition. Participants in the idea generation and message planning conditions also reported higher levels of interpersonal communication about strength and balance exercise than those in the standard care condition. There were no differences in interpersonal communication about strength and balance exercise between

the idea generation and message planning conditions (see Table 41). Thus, Hypotheses 9a and 10a were supported for the delayed posttest. For Research Question 5a, there was no difference in participants' level of discussion about strength and balance exercise between those in idea generation and message planning conditions.

Hypothesis 9b proposed that participants in the idea generation, message planning, and idea generation and message combined conditions would demonstrate greater levels of discussion about the intervention activity than participants in the standard care condition. Hypothesis 10b proposed that participants in the idea generation and message planning combined condition would demonstrate greater levels of discussion about the intervention activity than participants in the idea generation and message planning conditions. Additionally, Research Question 5b examined differences in levels of discussion about the intervention activity between participants in the idea generation and message planning conditions. A 4 X 2 chi-square test indicated a significant effect of condition on participants' reported interpersonal communication about the intervention activity at delayed posttest, $\chi^2(3, N = 72) = 19.29, p < .001$, Cramer's $V = .52$. Follow-up pairwise comparisons using the Holm's sequential Bonferroni method revealed that participants in the idea generation and message planning combined condition (83%) reported higher levels of interpersonal communication about the intervention activity than those in the idea generation (44%), message planning (56%), or standard care (11%) condition. Participants in the idea generation and message planning conditions also reported higher levels of interpersonal communication about the intervention activity than those in the standard care condition. There were no differences in reported interpersonal communication about the activity between participants in the

idea generation and message planning conditions (see Table 42). Thus, Hypotheses 9b and 10b were supported for the delayed posttest. For Research Question 5b, there was no difference in participants' level of discussion about the intervention activity between those in idea generation and message planning conditions.

In summary, participants in idea generation and message planning combined and standard care conditions reported the highest and lowest levels of interpersonal communication about both the intervention topic and activity, respectively. Specifically, Hypotheses 9ab and 10ab were supported at the delayed posttest. Participants in idea generation and message planning combined reported higher levels of interpersonal communication about the intervention topic and activity compared to participants in idea generation, message planning, or standard care. Similarly, participants in idea generation and message planning reported increased levels of interpersonal communication about the intervention topic and activity compared to participants in standard care. For Research Question 5ab, there were no differences in reports of interpersonal communication about the intervention topic and activity between participants in idea generation and message planning.

Summary

The results for the hypotheses and research questions were analyzed using univariate and multivariate tests. Table 43 summarizes the overall results for all hypotheses and research questions. The results are explored further in the discussion section. The discussion section elaborates on the findings for the TAI (Greene, 2013), prior research on determinants of physical activity among older adults, and practical

implications for designing fall prevention programs. Finally, the discussion section presents limitations and directions for future research.

CHAPTER 5

DISCUSSION

The goal of this dissertation was threefold. First, this study examined the process through which active involvement interventions influence target audience cognitions and behaviors. Second, this project applied portions of the Theory of Active Involvement (TAI; Greene, 2013) in older adulthood and explored whether using it to develop an intervention was appropriate across the lifespan. Finally, this study contributed to the growing literature on participatory research with older adults and on fall prevention in this population.

This study proposed the use of the TAI (Greene, 2013) as a guide for designing interventions to encourage older adults to participate in strength and balance exercise. Based on the TAI, engagement with the intervention (arousal and involvement) leads to perspective taking and reflection (perceived discrepancy) and eventually to cognitive (perceived benefits, perceptions of norms), behavioral (strength and balance exercise-related stage progression), and interpersonal communication (discussion about strength and balance exercise and the intervention activity) outcomes. Components of active involvement interventions were tested individually (idea generation, message planning), combined (idea generation and message planning combined), and compared to a standard care group in the context of promoting older adult strength and balance exercise-related stage progression. Results indicate that the constructs in this study were generally related in ways predicted by theory and past research. Across most variables, idea generation and message planning combined was rated the highest, followed by idea generation, then message planning, and finally standard care performed the worst. This chapter discusses

findings regarding the TAI and prior research on older adult strength and balance exercise. Then, the chapter provides practical implications for designing fall prevention programs including the novelty, age-appropriateness, brevity of the program as well as proposed agents of implementation. The chapter concludes with limitations and directions for future research.

Findings for the Theory of Active Involvement

On a theoretical level, this study extends the TAI (Greene, 2013) to previously unexamined target audience and health behavior contexts. Components of the theory have previously been applied to reducing intention to engage in risk-taking behaviors among adolescents including smoking initiation (Banerjee & Greene, 2006; 2007) and alcohol use (Greene et al., 2012). The present study applies the TAI (Greene, 2013) to increasing intention to participate in pro-health behaviors among older adults. Study findings suggest that the TAI can be appropriately applied across the lifespan and may be a useful tool for designing interventions to promote strength and balance exercise-related stage progression among older adults.

Active involvement interventions (Greene & Hecht, 2013) engage participants in message creation. Some of these message design opportunities include participants through production of videos or radio ads (e.g., Hecht et al., 1993), while others focus on more preliminary planning activities where participants generate ideas for messages such as posters (e.g., Banerjee & Greene, 2006; 2007). Evidence from previous research has shown that active involvement interventions can be successful in reducing intention to engage in risk-taking behavior, particularly in the context of media literacy (Banerjee & Greene, 2006; 2007; Greene et al., 2012). Two components of active involvement

interventions in the context of media literacy have included analysis of media messages and planning and/or production of media messages (e.g., Austin & Johnson, 1997; Pinkleton et al., 2007). The analysis component allows students to critique media messages by describing message features and content in detail, which, in turn, activates reflective thinking (Pinkleton et al., 2007). The production/planning component involves students in creating media messages, while providing an understanding of how media messages are constructed and how interactions among various production techniques produce specific effects. The production/planning component is highly audience centered and is often credited for increasing youth self-esteem by engaging them and providing opportunities for self-expression (Tyner, 1992). Banerjee and Greene (2006; 2007) found the analysis of and then planning anti-tobacco messages superior to the analysis of tobacco ads in changing substance use expectancies and intentions. Greene and et al. (2012) reported the analysis of and then planning anti-alcohol messages superior to the analysis of alcohol ads in decreasing alcohol use intentions and positive expectations about the effects of alcohol use.

While, the studies described above provide support for active involvement as a promising intervention strategy neither address the specific components of active involvement interventions and the processes that influence outcomes of interest. The present study addresses the issue of intervention design by investigating if active involvement components individually or in combination had a greater effect on motivation to process information, cognitive and behavioral outcomes, and interpersonal communication outcomes than standard care. The idea generation condition (similar conceptually to media literacy analysis) evaluates reasons why peers do or do not engage

in strength and balance exercise. Instead of describing message features and content (media literacy analysis activities), participants compare current behavior with the behavior they recommend for similar others and the gains and/or losses afforded by current behavior. Similar to reflective thinking activated in analysis, this comparison is likely to lead to perceived discrepancy between recommendations for similar others and personal standards, resulting in change, or it could reinforce internal standards for preventive behavior leading to behavioral maintenance. The message planning condition (similar to media literacy production/planning activities) instructs participants to plan a message (text, people, and setting) designed to motivate peers to participate in strength and balance exercise. Message planning is highly participant-centered and expected to engage older adults by providing an opportunity for self-expression. The idea generation and message planning combined condition evaluates reasons for and against strength and balance exercise, selects the most significant consequence associated with strength and balance exercise (message text), and generates the number of and type of people, as well as setting of the pro-health message. The following section discusses the first set of outcomes proposed by the TAI, motivation to process information.

Motivation to Process Information

One of the early stages in the process of activating any intervention is engaging the audience or creating conditions where the target processes the intervention. If targets find the intervention activity boring or irrelevant, they will likely ignore or disregard the information it offers despite being exposed. On the other hand, if participants find the intervention activity interesting and engaging, they are more likely to process and remember the information provided. Therefore, participants are more likely to use this

information to form their cognitions and to guide their behavior. The present study examined motivation to process information variables as a function of intervention condition. The results demonstrated overall support for idea generation and message planning combined eliciting greater levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness compared to idea generation, message planning, and standard care as expected. The following sections discuss findings in relation to the four dimensions of motivation to process information proposed by the TAI (Greene, 2013), starting with perceived novelty.

Perceived novelty. Participants in the idea generation and message planning combined condition reported higher levels of perceived novelty than those in the idea generation, message planning, and standard care conditions (Hypotheses 1a and 2a). The present findings are consistent with previous active involvement interventions that focused on reducing intention to engage in risk-taking behaviors among adolescents including smoking initiation (Banerjee & Greene, 2006; 2007) and alcohol use (Greene et al., 2012). Perceived novelty was greater among participants in the analysis and production than analysis and analysis workshop (Banerjee & Greene, 2006; 2007). Similarly, results indicated that students perceived the *YMD* Planning (Analysis + Planning) curriculum as more novel than the Analysis (Analysis + Analysis) curriculum (Greene et al., 2012). Thus, present findings are consistent with these prior results but also add new information about the effectiveness of active involvement components individually and compared to standard care.

Participants' novelty perceptions of idea generation and message planning conditions were also different from standard care (Hypothesis 1a). In addition,

participants in message planning reported higher levels of perceived novelty compared to idea generation (Research Question 1a). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

Idea generation and message planning conditions were perceived as more novel than standard care. One possible explanation is the present study defined perceived novelty of the intervention condition as the extent to which it was viewed as different from traditional lecture-based or written health materials (in this case the standard care information packet, see Appendix H for items). Participants in idea generation and message planning conditions may have expressed greater levels of novelty due the active versus passive way of receiving strength and balance-related information. Standard care presented “canned” content meant for older adults generally. In contrast, participants in idea generation and message planning generated their own reasons for/against exercise and selected the most important reason to perform strength and balance exercise, respectively.

Idea generation was perceived as more novel than standard care but less novel than message planning. One possible explanation is actively planning a persuasive message for peers may involve participants in a more meaningful way compared to generating reasons for and against strength and balance exercise. Involving older adults in research is relatively rare (Blair & Minkler, 2009). Fudge et al. (2007) described how for many researchers, participant involvement was limited to having older adults complete a survey or take part in an interview. “Hands on” interventions have gained

popularity as an intervention strategy for adolescents (e.g., Banerjee & Greene, 2006; 2007; Hecht et al., 1993; Miller-Day & Hecht, 2013; Slater & Rouner, 1996). However, the present study was the first known active involvement intervention proposed for older adults and the first to separate key components fully for comparison revealing that message planning elicited greater levels of perceived novelty compared to idea generation.

Consistent with educational gerontology recommendations (Battersby, 1987), the older adults in the present study preferred intervention formats perceived as different from traditional written health materials. They preferred interventions that provided opportunities for hands-on experience instead of “boiler plate” intervention content (Nevins, 2013). Moreover, older adult engagement with the intervention was enhanced when activities were perceived as exciting and lively (Best, 2001; Pearson & Wessman, 1996). Thus, current findings are consistent with geragogy literature (Battersby, 1987) and suggest the current practice of distributing traditional written health materials to older adults to read is not perceived as a novel activity or consistent with educational gerontology recommendations.

The results overall suggest that idea generation and message combined (engaging in a dialogue during idea generation combined with generating text and images from message planning) was viewed as the most novel intervention condition. When separating active involvement components, message planning itself was perceived as more novel than idea generation. The following section turns to the second proposed component of engagement, perceived involvement.

Perceived involvement. Besides perceived novelty, results from this study indicate that participants in the idea generation and message planning combined condition reported higher levels of perceived involvement compared to those in the idea generation, message planning, and standard care conditions (Hypotheses 1b and 2b). The present findings are consistent with previous active involvement interventions that focused on reducing intention to engage in risk-taking behaviors among adolescents including alcohol (Greene et al., 2012) and substance use (Hecht, Graham, & Elek, 2006; Hecht et al., 2003). Perceived involvement was greater among participants in the *YMD* Planning (Analysis + Planning) curriculum than Analysis curriculum (Analysis + Analysis) (Greene et al., 2012). Similarly, exposure to health messages created from youth narratives heightened identification with program content, enhanced the personal relevance of these messages to the message recipients, and ultimately increased involvement (Hecht et al., 1993; Hecht & Miller-Day, 2010; Miller et al., 2000; Miller-Rassulo & Hecht, 1988).

Participants' involvement perceptions of idea generation and message planning were also different from standard care (Hypothesis 1b). In contrast to perceived novelty findings for the present study, participants in idea generation reported higher levels of perceived involvement than message planning (Research Question 1b). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

Idea generation and message planning conditions were perceived as more involving than standard care. One possible explanation is that the ability to generate reasons for action/inaction (idea generation) and to select most the significant reason for action (message planning) designed for peers were perceived as more personally relevant than reading an information packet meant for the “typical” older adult (standard care). Idea generation and message planning activities provided opportunities for participants to express individual preferences and valued reasons for promoting change or reinforcing pro-health behavior. Standard care, in contrast, was a “one size fits all” approach that provided general information about health and everyday benefits of exercise for older adults.

Idea generation was perceived as more involving than message planning. One possible explanation is participants in idea generation generated multiple reasons for/against peer participation in strength and balance exercise. Discussion of alternatives enabled participants to contrast reasons for and against, as well as compare and rank the importance of multiple gains and losses associated with participation and non-participation. Message planning, in contrast, asked older adults to select one reason to promote peer participation and focus on that main reason when planning a pro-strength and balance exercise message. Perceived involvement could be different because the number of reasons generated may have influenced the degree to which the reasons were perceived as important to participants’ lives.

Participants’ perceptions of involvement in active involvement interventions may be influenced by the relevance of content. The more people viewed the content of interventions as being personally relevant, the more motivated participants were to

process messages and the greater depth at which they processed the intervention (Petty & Cacioppo, 1986). When developing interventions for older adults, personal relevance is a major consideration. Older adults have been characterized as using selective attention in situations of low relevance or meaningfulness (Hess, 2000). Idea generation increased relevance by engaging older adults in a dialogue about why peers do/do not participate in strength and balance exercise. Message planning increased relevance (compared to standard care) by having older adults select text and images to be used in pro-strength and balance exercise messages. Idea generation and message planning provided a means of self-expression for older adults, as well as insight into their lived realities. Thus, current findings are consistent with older adult message processing literature.

The results suggest that the combination of participants identifying personally held perceived benefits of strength and balance exercise and designing messages to be used in the future for peers made the idea generation and message planning combined condition the most involving. When separating active involvement components, idea generation was perceived as more involving than message planning. The following section turns to perceived gain of the intervention activity.

Perceived gain. Engagement alone with the content of active involvement interventions may not be sufficient to stimulate individual behavior change unless participants are also motivated to learn from the information provided. Results indicate that participants in the idea generation and message planning combined condition reported higher levels of perceived gain than those in the idea generation, message planning, and standard care conditions (Hypotheses 1c and 2c). The present findings are consistent with previous active involvement interventions that focused on reducing

intention to engage in risk-taking behaviors among adolescents including smoking initiation (Banerjee & Greene, 2006) and alcohol use (Greene et al., 2012). Participants had more positive workshop perceptions (a uni-dimensional, averaged assessment of perceived gain and reflectiveness) for the analysis and production compared to analysis and analysis workshop (Banerjee & Greene, 2006). Perceived gain was greater among participants in the analysis and production than analysis and analysis workshop (Banerjee & Greene, 2006). Similarly, when students perceived the curriculum as more involving and more novel (those who received the Analysis + Planning curriculum), then students thought more about the personal impact of advertising and reported higher levels of perceived gain compared to those in the Analysis (Analysis + Analysis) curriculum (Greene et al., 2012). Thus, present findings are consistent with these results, but also add information about the effectiveness of active involvement components individually and compared to standard care.

Participants' perceptions of gain of idea generation and message planning were also different from standard care (Hypothesis 1c). In contrast to perceived novelty and perceived involvement findings for the present study, there was no significant difference in participants' perceptions of gain between those in idea generation and message planning conditions (Research Question 1c). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

Idea generation and message planning conditions elicited greater levels of perceived gain compared to standard care. One possible explanation is that participants

valued being able to discuss reasons for action/inaction (idea generation) and to identify the most significant reason for performing strength and balance exercise (message planning) compared to passively receiving generalized exercise information. Participants may have already been aware of the positive health and everyday benefits of exercise in older adulthood (presented in the standard care information packet). Thus, simply reading a packet that contained common knowledge may have contributed to the perception that they did not learn any new information and thus did not “gain”.

There was no difference in perceptions of gain between participants in idea generation and message planning. One possible explanation is that the identification of one significant reason for exercising alone may be sufficient to motivate evaluation of the personal impact of exercise. Perceived gain was not different between participants in idea generation and message planning because both idea generation and message planning instructed older adults to generate relevant reasons to perform strength and balance exercise to live more effectively in the immediate future.

Consistent with educational gerontology recommendations, older adults prefer intervention content that was immediately applicable to everyday life (Nevins, 2013). Older adults perceived utility in the evaluation of reasons why peers do/do not participate in strength and balance exercise and identification of the most persuasive reason to change/maintain behavior. Thus, current findings are consistent with geragogy literature (Battersby, 1987).

The results suggest that both active involvement components individually are superior to standard care. However, an activity that both evaluates reasons why peers do/do not participate in strength and balance exercise (from idea generation) and also

identifies the most persuasive reason to change/maintain behavior (from message planning) elicits the greatest level of perceived gain. The following section turns to motivation to critically reflect on the information provided in the intervention activity.

Reflectiveness. Self-reflection in active involvement interventions is determined by comparing the participant's current behavior with the behavior they recommend for similar others and the gains and/or losses afforded by current behavior. This comparison is likely to lead to perceived discrepancy between recommendations for similar others and personal standards. Perceived discrepancy may result in change or it could reinforce internal standards for preventive behavior leading to behavioral maintenance. For older adults who participated in strength and balance exercise, reflection is posited to reinforce pro-exercise cognitions and promote behavioral maintenance. Conversely, reflection is expected to create perceived discrepancy and result in behavior change for those who did not currently participate in strength and balance exercise.

Results from the present study indicate that participants in the idea generation and message planning combined condition reported higher levels of reflectiveness than those in the idea generation, message planning, and standard care conditions (Hypotheses 1d and 2d). The present findings are consistent with previous active involvement interventions (Banerjee & Greene, 2006; Greene et al., 2012). Banerjee and Greene (2006) found that workshop perceptions (a uni-dimensional, averaged assessment of perceived gain and reflectiveness) differed as function of condition exposure (Banerjee & Greene, 2006). Reflectiveness was greater among participants in the analysis and production than analysis and analysis workshop (Banerjee & Greene, 2006). Similarly, when students perceived the curriculum as more involving and more novel (those who

received the Analysis + Planning curriculum), then students thought more about advertising messages in general and reported higher levels of reflectiveness compared to those in the Analysis (Analysis + Analysis) curriculum (Greene et al., 2012). Thus, present findings are consistent with these results, but also add information about the effectiveness of active involvement components individually and compared to standard care.

Participants' reflectiveness perceptions of both idea generation and message planning were also different from standard care (Hypothesis 1d). Similar to perceived involvement findings for the present study, participants in idea generation reported higher levels of reflectiveness compared with participants in message planning (Research Question 1d). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

Idea generation and message planning conditions elicited greater levels of reflectiveness compared to standard care. One possible explanation is that generating multiple reasons for/against peer participation in strength and balance exercise (idea generation) and selecting one reason to promote peer participation and focusing on that main reason when planning a pro-strength and balance exercise message (message planning) may activate more self-reflection than passively obtaining facts about health and everyday benefits of exercise from reading an information packet (standard care). Ultimately, idea generation and message planning activities encouraged participants to reflect on their own behavior in a meaningful way and consider pro-health behaviors.

Idea generation elicited greater levels of reflectiveness compared with participants in message planning. One possible explanation is that idea generation asked participants to generate reasons for and against strength and balance exercise participation. This activity enabled participants to compare gains and losses associated with action and inaction, as well as compare and rank the relative importance of the multiple gains and losses discussed. Message planning instructed participants to identify one significant consequence associated with participation in strength and balance exercise. Reflectiveness could be different because the number of reasons generated may have influenced the degree to which the participants were motivated to critically reflect on reasons for behavior change or behavioral maintenance.

The results suggest that the opportunity to generate multiple reasons for change followed by selection of the most important reason for change make the idea generation and message planning combined condition elicit the greatest level of reflectiveness. When separating active involvement components, idea generation itself elicited greater levels of reflectiveness compared with message planning. The following section provides a summary motivation to process information findings.

Summary of Findings for Phases One Through Three of the TAI

This dissertation applied components of the TAI (Greene, 2013) in older adulthood and explored whether using it to develop an intervention was appropriate across the lifespan. This was the first known active involvement intervention proposed for older adults and the first to separate key components fully for comparison. Idea generation and message planning combined elicited higher levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness compared to idea generation,

message planning, and standard care conditions. Participants in idea generation and message planning reported higher levels of perceived novelty, perceived involvement, perceived gain, and reflectiveness compared to standard care. For two out four dimensions of motivation to process information (perceived involvement and reflectiveness) idea generation was superior to message planning. Participants in message planning reported higher levels of perceived novelty compared to those in idea generation due to uniqueness of designing messages for peers. No significant differences of perceived gain were detected between idea generation and message planning. Thus, both activities made participants think about their own and peer behavior.

If implementers have limited time and are unable to devote 15 minutes to the combined intervention, idea generation is superior to message planning individually in terms of active involvement components. Idea generation enables participants to generate a number of arguments for peers to change exercise behavior. The activity of identifying pros/cons for others to change reveals compelling reasons relevant to the participant and activates self-reflection. Participants in idea generation compare the behavior (and reasons why) they recommend for others with their current behavior. Perceived discrepancy between recommended peer behavior and individual behavior may produce changes in cognitions that may ultimately lead to behavior change. Message planning, in contrast, does not provide an opportunity to compare or rank order reasons for/against change. Selecting the text, number/type of people, and setting of the health message without first activating self-reflection is not sufficient to elicit desired cognitive and behavioral changes. This may be novel but does not account for the pro/con analysis and discussion of alternatives provided by the idea generation active involvement component.

Phases one through three of the TAI describe how engagement (arousal and involvement) leads to perspective taking that generates reflection which in turn leads to cognitive and behavioral changes. The next section describes phases four and five (cognitive and behavioral changes) in relation to previous findings on older adult strength and balance exercise.

Findings for Prior Research and Phases Four and Five of the TAI

The present study examined changes in variables based on the TAI (Greene, 2013) and determinants of physical activity among older adults (e.g., vanStralen et al., 2009) in order to understand the efficacy of four intervention conditions (idea generation, message planning, idea generation and message planning combined, and standard care). These four conditions involved participants differently in generating reasons for/against participation in strength and balance exercise for peers, as previously described. The findings from the present study provide greater support in favor of the idea generation and message planning combined condition in bringing about desired changes in motivation to process information. Specific additional outcomes of interest included: perceived benefits (health, social, self-concept), norms (subjective, descriptive, injunctive), strength and balance exercise-related stage progression (strength and balance), and interpersonal communication (about strength and balance exercise and intervention activity). The following sections organized results based on type of outcomes, starting with perceived benefits.

Perceived Benefits

This section moves beyond the four dimensions of motivation to process information and identifies how participants apply information obtained from active

involvement intervention conditions, initially to perceived benefits of strength and balance exercise. Perceived benefits are defined as beliefs about the positive outcomes associated with a behavior in response to a real or perceived threat (Rosenstock, 1974). Perceived benefits are specific to an individual's perception of the benefits that will accrue by engaging in a specific health action. Perceived benefits are a widely used variable in the literature on determinants of physical activity among older adults (e.g., vanStralen et al., 2009). In the context of strength and balance exercise perceived benefits include an older adult's beliefs about the health, social, and self-concept benefits of engaging in the behavior.

Prior literature on older adult physical activity identified positive outcomes as motivators for older adults to engage in strength and balance exercise, including maintaining independence, social networking, enjoyment, weight reduction, learning new things, building confidence, and looking and feeling good (e.g., Ballinger & Clemson, 2006; Horne, Skelton, & Todd, 2005; Yardley et al., 2006). Messages that conveyed positive images of older people (Yardley et al., 2006) and the positive benefits of interventions, rather than focusing on threatening aspects of fall risk, were the most appealing in prior research (Yardley et al., 2006). Thus, older adults were motivated to participate in strength and balance exercise when they perceived a wide range of benefits from engaging in the behavior.

Results from the present study indicate that participants in the idea generation and message planning combined condition reported higher levels of perceived benefits compared to those in the idea generation, message planning, and standard care conditions at both immediate and delayed posttests (Hypotheses 3 & 4). One possible explanation

for the superiority of the combined active involvement intervention is generation of a number of benefits. Additionally, comparison and rank ordering the importance of benefits during idea generation component is reinforced by the selection of the most important reason for behavior change/maintenance when planning pro-strength and balance exercise message for peers. Thus, the most effective way to influence perceived benefits is to have participants generate multiple benefits, compare, rank order, and select the most significant benefit for behavior change or maintenance.

The present findings are consistent with previous active involvement interventions that focused on reducing intention to engage in risk-taking behaviors among adolescents including smoking initiation (Banerjee & Greene, 2006; 2007) and alcohol use (Greene et al., 2012). The analysis and production workshop was more successful than the analysis and analysis workshop and control group in changing participants' attitude toward smoking (Banerjee & Greene, 2006; 2007). Similarly, results indicated that students who perceived the *YMD* Planning curriculum (Analysis + Planning) as more involving expressed fewer positive expectations about the effects of alcohol use (Greene et al., 2012). Thus, present findings are consistent with these prior results but also add information about the effectiveness of active involvement components individually and compared to standard care.

Generally, participants' perceptions of benefits in idea generation and message planning were not different from standard care at either immediate or delayed posttests (Hypothesis 3). Only perceptions of social benefits differed between participants in idea generation and message planning compared to those in standard care at delayed posttest. One possible explanation for the absence of differences is the standard care information

packet focused on the health (e.g., improving health for older adults who already have diseases and disabilities, managing stress, and improving mood) and everyday benefits of exercise (e.g., walking up and down stairs, and standing on tiptoes to reach something on the top shelf) not the social benefits. Social benefits may be a motivator for older adult exercise, however, it was not highlighted in the NIH packet provided for standard care. Social benefits associated with strength and balance exercise may emerge when participants are able to identify a number of reasons for action/inaction (idea generation) or selecting the most important reason for behavior change and/or maintenance (message planning) but not when reading an information packet that does not list this category of benefits. Future research could examine which type(s) of benefits motivate participation in strength and balance exercise.

In addition, there were no significant differences between participants in idea generation and message planning for perceived health, social, and self-concept benefits at either immediate or delayed posttests (Research Question 2). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

Participants in idea generation generated reasons for and against strength and balance exercise participation, thereby discussing multiple gains and losses associated with action/inaction and reinforcing a range of positive health, social, and self-concept consequences of the pro-health behavior. Participants in message planning selected the most important reason for change and thought about how to influence peers. The results

suggest that the combination of idea generation and message planning created or reinforced the highest levels of perceived positive outcomes of strength and balance exercise. This is a key finding for the older adult physical activity literature. Future research should examine the role of specific intervention components on eliciting multiple perceived benefits associated with strength and balance exercise. The next section turns to perceptions of norms.

Perceptions of Norms

Beyond health, social, and self-concept benefits, this study examined perceptions of subjective, descriptive, and injunctive norms. Previous active involvement interventions (e.g., Banerjee & Greene, 2007) and older adult strength and balance exercise literature (e.g., Yardley et al., 2007) have focused on the influence of intervention components on perceptions of subjective norms which, in turn, may affect behavior change. Both bodies of literature have ignored the potential impact of interventions on perceptions of descriptive and injunctive norms. The present study adds to information about the effectiveness of active involvement components on subjective, descriptive, and injunctive norms as well as role of norms on strength and balance exercise-related stage progression. Findings are organized by each type of norm in the following paragraphs.

For subjective norms, results from this study indicate that participants in the idea generation and message planning combined condition reported higher levels of perceived subjective norms compared to those in the idea generation, message planning, and standard care conditions at delayed posttest (Hypotheses 5a & 6a). One possible explanation for the superiority of the combined active involvement intervention is

reasons for action/inaction (idea generation) are reinforced with pro-strength and balance exercise message content (message planning) such as sources of support/encouragement (people in the message probe), health care provider office or exercise class (setting of the message probe) and performing group-based strength and balance exercise or doing activities/hobbies with relevant others (activity depicted in the message probe). Thus, an effective way to increase perceptions of others' approval of strength and balance exercise is to discuss referent others as sources of support and encouragement.

In addition, participants' perceptions of subjective norms in idea generation and message planning were not different from standard care at either immediate or delayed posttests. There were no significant differences between participants in idea generation and message planning for perceived subjective norms at either immediate or delayed posttests (Research Question 3a). The present findings are inconsistent with previous involvement interventions. Banerjee and Greene (2007) did not document that the analysis and planning workshop was more successful than the analysis and analysis workshop in reducing favorable subjective norms toward smoking. In that study, all workshop types, including control, were successful in reducing subjective norms supporting smoking.

In relation to the physical activity literature, older adults are motivated to participate in strength and balance exercise when they are encouraged by referent others (Yardley et al., 2006; 2007). Concern about social disapproval poses a barrier to undertaking physical activity, although social support and real-life examples of ordinary people doing physical activity could promote greater physical activity (King et al., 2000; King et al., 1998; Ory et al., 2003). Older adults whose family and friends were

enthusiastic about strength and balance exercise (Yardley et al., 2007) or whose health care provider recommended strength and balance exercise (Berlin Hallrup et al., 2009; Hutton et al., 2009; Snodgrass & Rivett, 2005; Yardley et al., 2007) were more likely to participate in strength and balance exercise compared to those who did receive encouragement. Thus, motivation improved when family, friends, and professionals encouraged strength and balance exercise (Hutton et al., 2009).

In contrast to subjective norms, descriptive norms did not vary as a function of active involvement condition exposure at either immediate or delayed posttests. Results from this study indicate that participants in the idea generation and message planning combined condition did not report higher levels of perceived descriptive norms compared to those in the idea generation, message planning, and standard care conditions at either immediate or delayed posttests (Hypotheses 5b & 6b). One possible explanation for the lack of change in descriptive norms over time is the use of an individual instead of group-based active involvement intervention. Previous active involvement interventions (e.g., Banerjee & Greene, 2006; 2007; Greene et al., 2012) had groups of adolescents design anti-tobacco and anti-alcohol messages. These group-based interventions provided opportunities for small group discussion about the perceived frequency of behavior among peers and reasons why peers do or do not engage in risk behaviors. The present study that focused on one participant's perceptions did not provide this opportunity to discuss multiple viewpoints to challenge existing beliefs about the frequency of older adult strength and balance exercise behaviors.

In addition, participants' perceptions of descriptive norms in idea generation and message planning were not different from standard care. There were no significant

differences between participants in idea generation and message planning for perceived descriptive norms at either immediate or delayed posttests (Research Question 3b). These findings are not present in prior literature on active involvement interventions or older adult physical activity because descriptive norms were not reported as an outcome variable for Banerjee and Greene (2006; 2007), Greene et al. (2012), vanStralen et al. (2009), or others. Thus, these findings are a new addition to the active involvement and older adult physical activity literatures.

For injunctive norms, results from this study indicate that participants in the idea generation and message planning combined, idea generation, and message planning conditions reported higher levels of perceived injunctive norms compared to those in standard care at either immediate or delayed posttests (Hypotheses 5c & 6c). One possible explanation for the active involvement components individually and combined being superior to standard care is that each component stressed why peers should perform strength and balance exercise.

In contrast to subjective norm findings, participants' perceptions of injunctive norms in idea generation and message planning combined were not different from idea generation and message planning at either immediate or delayed posttests. A group-based active involvement intervention may have achieved superiority of the combined versus individual active involvement components on this variable. Injunctive norms may have been better targeted if older adults generated reasons for action and designed pro-health messages in groups. This setting would have allowed for expression of peer approval or disapproval of strength and balance exercise. Consistent with subjective and descriptive norm findings, there were no significant differences between participants in idea

generation and message planning for perceived injunctive norms at either immediate or delayed posttests (Research Question 3c). These findings are not present in prior literature on active involvement interventions or older adult physical activity because injunctive norms were not reported as an outcome variable for Banerjee and Greene (2006; 2007), Greene et al. (2012), vanStralen et al. (2009), or others. Thus, these findings are a new addition to the active involvement and older adult physical activity literatures.

For the present study, participants in idea generation identify why peers do or do not engage in strength and balance exercise (e.g., asking participants to describe approval or disapproval of participation in strength and balance exercise). Participants in message planning generate text (the most important reason for participation) and images (people that approve and/support strength and balance exercise). The results suggest that the combination of idea generation and message planning created or reinforced the highest levels of perceived approval of participation in strength and balance exercise but only for subjective norms and not descriptive or injunctive norms. The next section turns to strength and balance exercise-related stage progression.

Stage Progression

The results for stage progression added support to the superiority of idea generation and message planning combined beyond perceived benefits and perceptions of subjective, norms. Idea generation and message planning combined was effective in changing strength exercise-related stage progression from pretest to delayed posttest as compared with idea generation, message planning, and standard care conditions (Hypotheses 7a & 8a). In contrast, participants in idea generation, message planning, and

idea generation and message planning combined reported changes in balance exercise-related stage progression from pretest to delayed posttest as compared with participants in standard care. One possible explanation for differences in strength and balance exercise-related stage progression is that participants started at different stages of change for each type of exercise. The majority of participants were in precontemplation and contemplation for strength exercise and preparation and action for balance exercise.

The stages of change model (Prochaska et al., 1992) identifies different information needs based on current stage of change. Intervention strategies for individuals in precontemplation and contemplation include thinking through pro/cons of change and identifying relevant beliefs (Maibach & Cotton, 1995). Individuals in earlier stages of change are more likely to experience reactance, therefore, self-persuasion (generating why others not self should change) and drawing own conclusion to change may be more appropriate. Individuals in preparation and action, in contrast, already hold positive beliefs about the behavior and benefit from intervention strategies that define goals provide feedback, and provide reinforcement (Maibach & Cotton, 1995). Based on information needs for particular stages of changes, the idea generation and message planning combined condition may be more appropriate for individuals in precontemplation and contemplation compared to participants in preparation and action. The idea generation component had participants generate reasons for/against participation in strength and balance exercise. Message planning had participants generate a message for peers when the main goal was to build commitment and ownership of their conclusions expressed in the pro-strength and balance exercise message. Thus, the combined active involvement intervention condition is more suitable for individuals in

earlier stages of changes because it is an indirect persuasive strategy that activates self-reflection of advantages/disadvantages of behavior change.

Beyond the information needs and stage of change explanation, there was less balance exercise-related stage progression because it was more difficult to advance multiple stages when a participant began the study in action or maintenance. Participants in action could not advance any stage from pretest to immediate posttest and could only advance one stage to maintenance from immediate posttest to delayed posttest (redefined for the present study as performing balance exercise for three months). Participants in maintenance could not advance any stage from pretest to immediate posttest or immediate posttest to delayed posttest.

Participants in the standard care group did not have significant changes in strength or balance exercise-related stage progression from pretest to delayed posttest. The present findings are consistent with previous active involvement interventions. In a prior study, the analysis and production workshop was generally more successful than the analysis and analysis workshop and control group in changing participants' behavioral intention to smoke (Banerjee & Greene, 2007). Similarly, students who perceived the *YMD* Planning (Analysis + Planning) curriculum as interesting, involving, and novel reported lower alcohol use intentions (Greene et al., 2012). Thus, present findings are consistent with these results and demonstrate no behavior changes for standard care.

There were no significant differences in participants' strength or balance exercise-related stage progression between those in idea generation and message planning from pretest to delayed posttest (Research Question 4ab). These findings are not present in prior literature on active involvement interventions because there are no published

message planning only conditions for Banerjee and Greene (2006; 2007), Greene et al. (2012), or others. Thus, the comparisons are a new addition to the active involvement literature.

The majority of prior research on older adult fall prevention has been predominately qualitative and has examined the views of fall prevention activities not specific activity components on increasing exercise intentions or changing exercise behavior. A literature review conducted by McMahon et al. (2011) synthesized 19 studies examining older adults' perspectives about fall risk and prevention. The majority of studies identified beliefs, incentives, and barriers that influenced initiation and adherence to exercise for fall prevention among older adults through interviews and focus groups. Only one quantitative study assessed intention to engage in strength and balance exercise (Yardley et al., 2007). Thus, identification of the effect of active involvement components on stage progression is an addition to the strength and balance exercise promotion literature.

The greater efficacy of idea generation and message planning combined condition may be explained by using the concept of self-persuasion (Bem, 1972; Linder et al., 1968). Because the idea generation and message planning combined condition was designed to engage older adults in the creation of pro-strength and balance exercise messages, it provided them an opportunity for self-persuasion. Self-persuasion can lead to an enhancement of the kind of internal dialogue needed to maintain behavior and therefore, can be more efficacious. Messages that people generate themselves can be quite effective in producing change in cognitions that may ultimately lead to behavior change (Bem, 1972; Linder et al., 1968). When people generate arguments, they tend to

come up with reasons that they find the most compelling (Greenwald & Albert, 1968; Slamecka & Graf, 1978). That is, people are effective in tailoring the message for themselves, even if the goal is to persuade another person.

Self-persuasion works best when the motivational strategy is indirect and less obvious (e.g., Petty & Cacioppo, 1979). Indirect self-persuasive strategies present the likelihood of desired and sustained change in behavior (more than direct persuasion), which gives the impression that it is someone else's idea and the desired behavior is for someone else's benefit. The approach taken in the idea generation and message planning combined condition involved the use of self-persuasive indirect strategies. Participants were instructed to generate a message for peers when the main goal was to build commitment and ownership of their conclusions expressed in the pro-strength and balance exercise message.

The present study documents greater efficacy of idea generation and message planning combined in increasing stage progression. The greater efficacy of the combined intervention can be attributed to the likely induction of self-persuasion and an opportunity for creative self-expression compared with standard care. The next section turns to the understudied outcome, interpersonal communication.

Interpersonal Communication

One set of outcomes not discussed or measured in most prior research on older adult physical activity are interpersonal communication outcomes that result from active involvement interventions. Interpersonal communication outcomes may focus on communication (or talk) about the intervention (e.g., idea generation and message planning combined) or about the salience of issue or topic (e.g., older adult strength and

balance exercise, older adult falls, etc.). Based on literature concerning the role of interpersonal communication in mass media campaigns (Southwell & Yzer, 2007), interpersonal communication outcomes may be intended intervention outcomes. Interpersonal communication may provide an opportunity for both reinforcement (maintenance) and dissemination of intervention messages and content.

Results from this study indicate that participants in the idea generation and message planning combined condition reported higher levels of interpersonal communication about both strength and balance exercise and the intervention activity compared to those in the idea generation, message planning, and standard care conditions (Hypotheses 9ab & 10ab). The present findings are consistent with a previous active involvement intervention that focused on reducing intention to engage in alcohol use among adolescents (Greene et al., 2012). Banerjee et al. (2013) assessed interpersonal communication after participation in two versions (Analysis or Planning) of a brief media literacy *YMD* curriculum. Results revealed significantly more interpersonal communication among participants in the *YMD* Planning (Analysis + Planning) curriculum than Analysis curriculum (Analysis + Analysis). Thus, present findings are consistent with these prior results but also add information about the effectiveness of active involvement components individually and compared to standard care.

Participants in the idea generation and message planning conditions also reported higher levels of interpersonal communication about both strength and balance exercise and the intervention activity compared to those in standard care (Hypothesis 9ab). In addition, there were no significant differences in interpersonal communication about both strength and balance exercise and the intervention activity between the idea generation

and message planning conditions (Research Question 5ab). These findings are not present in prior literature on active involvement interventions because there are no published message planning only conditions for Greene et al. (2012), interpersonal communication outcomes for Banerjee and Greene (2006; 2007) or others. Thus, these findings are a new addition to the active involvement literature.

Interpersonal communication associated with idea generation and message planning combined can be explained by intervention message features such as specific content or format components. For example, Hafstad and Aaro (1997) found that provocative, emotional messages led the audience to talk about the campaign and the topic with others. Similarly, Campo et al. (2013) reported that humor-based appeals were significant predictors of talking with and/or showing the campaign to others. Likewise, the use of tropes (e.g., metaphors) and emotionally engaging narratives in the intervention promoted related conversations (Dunlop et al., 2010; Hoeken et al., 2009). In addition, it was reported that, if an intervention topic was important, relevant, complex, and new, the audience was more likely to converse about the topic (Southwell & Yzer, 2007). Prior research findings on interpersonal communication relate to two of the four dimensions of motivation to process information: perceived novelty and perceived involvement. Participants in idea generation and message planning combined condition perceived the combined intervention condition the most novel and involving. Thus, it is logical participants in the idea generation and message planning combined condition elicited the greatest amount of interpersonal communication about strength and balance exercise (generated relevant reasons for/against) and the activity (two engaging, hands-on tasks).

The narrative engagement framework (Miller-Day & Hecht, 2013) suggests that narrative engagement causes social proliferation (Larkey & Hecht, 2010; Southwell & Yzer, 2007). If people are engaged, (see prior findings on adolescent substance use Choi et al., 2013; Shin & Hecht, 2012) they are likely to talk about the messages with peers, family, and others. Interpersonal communication about the involving activity may reinforce desirable behavior changes (Galavotti, Pappas-DeLuca, & Lansky, 2001; Hutchinson & Wheeler, 2006; Salmon, 2001) as well as spread the effects of the intervention (Miller-Day & Hecht, 2013). Thus, present findings are consistent with activity and topic results associated with active involvement interventions.

The results suggest that the effect of participating in two unique activities that identify personally relevant perceived benefits make the idea generation and message planning combined condition the most novel and involving. The TAI (Greene, 2013) and narrative engagement framework (Miller-Day & Hecht, 2013) posit that the relevance of the intervention topic and novelty of the intervention activity will increase interpersonal communication with others, which in turn may provide an opportunity for both reinforcement (maintenance) and dissemination of messages. Interpersonal communication is an outcome that has not been discussed or measured in prior research on older adult physical activity. Future research should examine the role of interpersonal communication on strength and balance exercise promotion interventions.

Beyond theoretical and prior research-related reasons provided above, there may be alternative explanations for study findings. On most variables there was some improvement between pretest, immediate posttest, and delayed posttest (even some variables for the standard care group). Across most variables, idea generation and

message planning combined was rated the highest, followed by idea generation, then message planning, and finally standard care. Favorable ratings of the intervention activity may be due to differential amount of time spent with participants in each condition (under the more time spent with participants equals more reciprocity assumption). Idea generation and message planning combined was 15 minutes in length compared to idea generation, message planning, and standard care each being 5 to 7 minutes in length. Thus, there is the possibility that time spent with participant is confounded with condition. Related to time spent with the interviewer, participants may have appreciated the opportunity for socialization, receiving one-on-one attention, and nonverbal immediacy from the interviewer. Future research should include measurement (need for interaction, ratings of the interviewer) to account for some of these potential alternative explanations.

Practical Implications for Designing Fall Prevention Programs

On a practical level, this study examined the efficacy of intervention formats to more effectively reach older adults. This dissertation addressed the critique of “participatory research” that has older adults complete a survey or interview (Fudge et al., 2007) and actively involved older adults in four versions of an intervention (idea generation, message planning, idea generation and message planning combined, and standard care). Results indicate that idea generation and message planned combined works best. Both active involvement components are needed to elicit motivation to process information (perceived novelty, perceived involvement, perceived gain, and reflectiveness), changes in cognitions and behavior (perceived benefits, perceptions of norms, strength and balance exercise-related stage progression), and interpersonal

communication (about strength and balance exercise and the activity). Idea generation or message planning alone is not sufficient, although both are superior to standard care. If limited time, idea generation is better than message planning individually across multiple outcomes.

Intervention activities addressed older adult cognitive changes and motivation to process information (providing personally relevant and positive information), as well as incorporated recommendations from educational gerontology (creating hands-on activities and experiences immediate applicable to real life contexts). Although this dissertation did not produce evidence of actual effects on behavior (self-reported stage of change) practical recommendations are detailed next and organized according to novelty and involvement of the intervention activity, age-appropriateness of the intervention activity, brevity of the intervention activity, and proposed agents of implementation.

Novelty and Involvement of the Intervention Activity

Older adults tend to favor peripheral processing and rely less on careful central processing of information. Hess et al. (2001) proposed a resource allocation hypothesis, which states that because older adults have limited cognitive resources, they tend to employ peripheral information processing strategies in order to conserve their mental energy for important tasks. However, this hypothesis also suggests that older adults can, when necessary (interested/more personally relevant), employ deliberative information-processing. Older adults prefer information that relates to their background, knowledge, and values (CDC, 2011). For example, older adults identified personal relevance as both a barrier and facilitator to participating in fall prevention programs. If programs were not seen as personally relevant or practical, older adults would not engage in the

recommended activities (McMahon et al., 2011). Therefore, information must be perceived as personally relevant in order to motivate older adults to process and expend cognitive resources.

The intervention proposed by the present study consists of two active involvement components (idea generation and message planning) each 5-7 minutes to complete. Idea generation increased relevance by engaging older adults in a dialogue about why peers do/do not participate in strength and balance exercise. Participants were asked “Why do some older adults participate in strength and balance exercise?” Probes including, “What are some benefits of participating in strength and balance exercise?” and “What are some goals that can be achieved by participating in strength and balance exercise?” assessed relevant indicators for action and inaction (see Appendix D for complete list of instructions and questions). Message planning increased relevance by having older adults select text and images to be used in pro-strength and balance exercise messages. Participants were told “Your goal is to plan a message like a poster that persuades older adults to participate in strength and balance exercise. What would it be?” Then older adults were instructed to “Choose the best reason for promoting strength and balance exercise. What would it be?” (see Appendix D for list of probes). These combined activities provided a means of self-expression for older adults, as well as insight into their lived realities. If limited time and concerned about increasing perceived novelty of the intervention activity, message planning is superior to idea generation individually. If limited time and interested in increasing perceived involvement of the intervention activity, idea generation is better than message planning individually.

Age-appropriateness of the Intervention Activity

Aging research suggests that older adults are motivated to focus more on positive information and/or decrease their focus on negative information in some situations (Charles et al., 2003). Findings of older adults' preference for positive information indicate that fear-inducing campaigns designed to attract attention may, in fact, be ignored by older adults (Lockenhoff & Carstensen, 2007). Risk messages are likely to be better remembered by older adults when they are framed to help them realize emotionally meaningful goals (Fung & Carstensen, 2003). Therefore, information targeting this group should focus on the positive in order to motivate older adults to process the intervention. Idea generation focused on the positive by prompting older adults to reflect on benefits and gains associated with participation in strength and balance exercise. Instructions prompted older adults to describe "why some older adults participate in strength and balance exercise." Probes focused on benefits including "what are some benefits of participating in strength and balance exercise?" and "what are some goals that can be achieved by participating in strength and balance exercise?" Message planning focused on positive aspects by having older adults create empowering pro-health messages for peers. Participants were instructed to "choose the best reason for promoting strength and balance exercise. What would it be?" This activity consisted of generating text (the most important benefit associated with participation in strength and balance exercise) and selecting images (the people, setting, and activities highlighting gains associated with participation in strength and balance exercise). Participation in idea generation and message planning activities provided opportunities to reflect on the benefits and gains associated with behavior change or maintenance.

Brevity of the Intervention Activity

The brevity of the intervention activity increases the likelihood of adoption in health settings (Chou et al., 2006). Intervention implementation is premised on the success of brief motivational interviews (BMIs) that have proven to be effective (e.g., meta-analysis of empirical studies, Lundahl et al., 2010). BMI consist of a single or multiple sessions (ranging from a few minutes to one hour) of motivational engaging discussion for eliciting behavior change by helping individuals explore and resolve ambivalence about reasons for and against changing a behavior (Miller & Rollnick, 2002). By tailoring discussion of reasons for and against change to individual preferences, the dialogue is viewed as more personally relevant and persuasive (Petty & Cacioppo, 1986). Tailored interventions are more likely to be remembered and are associated with improved behavioral outcomes (Noar, Harrington, & Aldrich, 2009; Ryan & Lauver, 2002). Findings from a review of 15 studies investigating the effect of BMI among older adults indicate that BMI is a promising health behavior change strategy (Cummings et al., 2009). For example, in the area of diet, weight control, and exercise, BMIs have produced significant changes among older adults including short-term weight loss, decreased health distress, decreased sodium intake, improved glucose control, decreased blood pressure, and improved adherence to weight control programs, and increased frequency and duration of physical activity (e.g., Bennett et al., 2007; Jackson et al., 2007). The present study conditions aligned with BMI in both tailoring and brevity.

There are a number of existing evidence-based fall prevention programs for older adults worldwide (see Stevens, 2010; Stevens & Sogolow, 2008). Many of these programs are group oriented (limited tailoring) and require multiple session. For

example, *A Matter of Balance (MOB)* is conducted over eight sessions, meeting weekly or twice weekly for two hours per session (with a recommended class size of 10-12 students). *MOB*'s main focus is overcoming fear of falling. *Moving for Better Balance (MBB)* consists of one-hour classes (with a recommended class size of 15 students) are held three times a week for 24-26 weeks. *MBB* emphasizes Tai Chi as a means of fall prevention. Some of these programs address relevant beliefs as one component, but it is not the main focus. Moreover, these programs include multiple, lengthy sessions that require older adult commitment over a number of weeks. Thus, a gap in these programs is a need for individually tailored and brief interventions that can be adapted for community-dwelling older adults.

The combined active involvement intervention proposed by the present study requires only a 15 minute session; each component takes 5-7 minutes to complete. The first active involvement component, idea generation, evaluates reasons why peers do or do not engage in strength and balance exercise. The second active involvement component, message planning, instructs participants to plan a message designed to motivate peers to participate in strength and balance exercise. Message planning includes selecting the most significant consequence associated with strength and balance exercise (message text), and generating the number of and type of people, as well as setting of the health message. When people generate arguments during active involvement activities (idea generation and message planning), they tend to select reasons that they find the most compelling for behavior change or maintenance (Greenwald & Albert, 1968; Slamecka & Graf, 1978). That is, participants in the combined intervention activity are effective in tailoring the message for themselves, even though the instructions direct them

to persuade peers. If limited time and interested increasing self-reflection, idea generation is better than message planning individually yet the overall combined condition is superior.

Proposed Agents of Implementation

Older adults are more likely to take action when the health message is from a trusted source such as an informal caregiver, health care provider, or community health worker (CDC, 2011). A review of studies examining views and preferences of older adults in fall prevention programs reveals that advice and encouragement from informal caregivers and health care providers had a significant influence on older adult's participation in fall prevention programs (Yardley et al., 2006; Yardley et al., 2007; Dickinson et al., 2011). Therefore, the present study recommends informal caregivers, health care providers, and community-based organizations as proposed agents of active involvement intervention implementation. The following paragraphs identify how each agent change can use the intervention, starting with informal caregivers.

Informal caregivers include spouses, adult children, in-laws, and friends (Wolff & Kasper, 2006). Informal caregivers are in the position to negotiate, engage, and encourage older people to participate in fall risks reduction strategies, as well as to adhere to fall prevention programs (Horton & Arber, 2004; Lach & Chang, 2007; Lin & Lane, 2005). The United States Department of Health and Human Services (2012) provides conversation starters about fall prevention for informal caregivers. The three recommended conversation starters include: (1) "I care about you." "You are important to me. I don't want you to fall and get hurt;" (2) "More than 1 in 3 older adults fall each year. Most falls happen at home;" and (3) "Taking steps to protect yourself, like

exercising, will help you feel more positive and stay independent.” These conversation starters lack sophistication in being person-centered. They are generalized statements without recommendations for assessing the target older adult’s needs or follow-up questions and/or suggestions based on possible target responses. Moreover, these statements are overtly persuasive and tell participants what to do instead of having them draw their own conclusions. The active involvement components, idea generation and message planning may be used as conversation starters instead. Informal caregivers can use idea generation questions by asking what peers/similar others are currently doing and why others should or should not change. Informal caregivers can use message planning questions by asking what the older adult has seen in previous health messages, whether or not those messages are effective, and what he/she would prefer to see in health messages. The active involvement conversation starters are indirect, nonthreatening ways of bringing up behavior change. Older adults generate reasons for change, making this conversation more like a discussion or dialogue than a preaching, didactic session. Although these active involvement prompts are more sophisticated than the conversation starters provided by United States Department of Health and Human Services (2012), more research still needs to be done. It may awkward or uncomfortable for an informal caregiver to initiate behavior change or reinforce existing behavior; these conversations may be better suited for health care providers or community-based organizations as described next.

Health care providers include the interdisciplinary team of physicians, nurses, pharmacists, and physical and occupational therapists. Compared to informal caregivers and community health workers, health care providers may have the most limited

interaction time with older adults. If health care providers only have 5 to 7 minutes to spend with patients, they should employ idea generation activities. Current health care provider programs such as *Stopping Elderly Accidents, Deaths, and Injuries (STEADI)* provide guidelines and examples of conversations with patients based on the stages of change model (Prochaska et al., 1992). The active involvement component, idea generation, provides more of an opportunity for discussion by prompting a pro/con analysis of strength and balance exercise and making recommendations for other people their own age. The health care provider still initiates the strength and balance exercise topic, but the patient-provider discussion enables the older adult to draw their own conclusion about behavior change rather than passively receiving provider advice. Although each active involvement prompt is relatively brief (5 to 7 minutes in length) there may be barriers to implementing such an intervention in health care settings. Common barriers cited for lack of health care intervention include: lack of time during the office visit, limited reimbursement for preventive counseling, and the lack of training and perceived effectiveness as a behavioral counselor (Calfas et al., 1996). Due to time constraints and limited training, the most appropriate agent of implementation may be community-based organizations. Yet, these are likely to reach people already using community resources for exercise- and health-related reasons and overlook sedentary and/or isolated older adults most in need of intervention.

Community-based organizations and groups may provide evidence-based fall prevention programs in addition to other activities for older adults. Delivery of fall prevention programs in the community has been successful in sites where older adults participate in activities such as churches/temples, senior centers, or senior housing sites

(Ory et al., 2010). A number of evidence-based fall prevention programs have been developed for dissemination in the community such as *A Matter of Balance (MBB)*. Typically, these programs must be purchased and require that leaders or facilitators attend specific training so that programs are delivered as designed to maintain intervention fidelity and achieve expected outcomes (Stevens et al., 2010). As a result, the cost of providing programs may result in for-fee activities. Some programs can be offered via paid or volunteer peer leaders, which can increase capacity to deliver programs, lower costs, and may increase the uptake of information (Peel & Warburton, 2009). *MBB* facilitated by lay volunteers (Healy et al., 2008) achieved outcomes comparable to those in the original program conducted by professional staff, previously found to be efficacious in a randomized control trial (Tennstedt et al., 1998). As a result, the proposed combined active involvement intervention can be implemented by community health workers or older adult volunteers. Some community-based organizations such as senior centers may have an additional time and space to accommodate longer active involvement intervention sessions (30 to 45 minutes in length). Extended sessions may provide an opportunity to segue from message planning to actual message production. The older adult generated messages can be translated into actual health promotion messages and displayed at the community-based organizations. Older adults walking through the community-based organizations' lobbies could see the benefits of engaging in strength and balance exercise from the perspective of other older adults. Future research could involve an evaluation of the impact of older adult generated messages.

Summary of Practical Implications

The present study's findings are consistent with the TAI and prior research in educational gerontology, recommending that active involvement interventions should follow certain principles to maximize their success. The first feature is a novel and involving activity designed to engage older adults in perspective taking and analysis of motivations or reasons for engaging in preventive health behavior (e.g., idea generation, message planning, idea generation and message planning combined). Second is consideration of age-appropriateness, taking into account target abilities (selective attention and preference for positive information, in the case of this population). The final feature is a brief intervention format (less than 15 minutes) personally tailored to encourage attention and maximize dissemination in health care and community settings. Proposed agents of implementation in order of least to most appropriate include informal caregivers, healthcare providers, and community-based organizations.

Limitations

The results of this study should be interpreted with some limitations in mind. The limitations of the study are detailed next and organized according to application of theory, sampling, measurement, and design.

Application of Theory

This study was guided by the TAI (Greene, 2013) to develop an age-appropriate, involving intervention for older adults. As a result, the TAI was not fully tested and not all proposed variables were measured such as physiological arousal, actual knowledge gain, self-reflection, and perceived discrepancy. Perceived novelty was used as a proxy for arousal, and additional research should measure both constructs. It is possible that

someone can recognize something is novel without experiencing arousal. For example, an older adult may perceive the message planning activity as a unique health intervention without experiencing a physiological reaction. Future research should use more advanced physiological measures (skin conductance, heart rate) to assess arousal, but to date the gerontology intervention literature has not employed such measurement.

Previous active involvement interventions (Banerjee & Greene, 2006; 2007; Greene et al., 2012) developed media literacy curricula that taught youth about persuasion and production techniques and were able to assess actual knowledge gain to a limited extent. The present study was not directly concerned with actual knowledge gain concerning the benefits associated with strength and balance exercise. This project was focused on creating an engaging intervention to overcome age-related cognitive changes. As a result, this study assessed perceived gain (if the participant valued what was discussed). Future studies interested in actual knowledge gain (learning from the experience) should measure participants' knowledge of exercise-related benefits and types of exercise at baseline/pretest, immediate posttest, and delayed posttest, although such measurement will increase time burden. Additional studies should also examine whether perceived gain is as effective on outcomes of interest as actual knowledge gain. An increase in knowledge does not necessarily translate into behavior change. If perceived gain is sufficient to achieve desired intervention outcomes interventions, then implementers can save time by keeping measurement limited and only focusing on increasing perceptions of gain.

The present study assessed self-reflection with a series of questions about how much the activity made participants think about preparing to change, changing, or

maintaining a pro-health behavior. In order to assess whether or not engaging the participants in idea generation or message planning encouraged them to engage in self-reflection as opposed to treating this as an academic exercise that has little bearing on them personally, future research could compare initial self-reported behavior with the number and types of unique reasons generated for behavior change or maintenance. Participants may project their own behavior and attitudes onto those of the peers with whom they most identify.

The present study did not measure perceived discrepancy between one's behavior and social or personal standard. The present study only asked questions about self-reported current behavior and behavior recommendations for peers. Future studies could compare these responses and report findings.

Sampling

Although these data must be interpreted with sampling biases in mind, obtaining a sample of older adults is difficult, especially over time. There were a number of demographic limitations. These data were collected from one northeast state, and it is not known if these results would generalize to other areas of the country or to other countries outside the United States. The data were also collected in mid-sized towns and suburban areas, so these results may not generalize to either inner city or rural populations. These data consisted primarily of Caucasian, female older adults, and other racial groups and men were underrepresented.

The majority of participants were independent of one another (not related through marriage, kinship or friendship), making ANOVA an appropriate method for statistical analysis. The sample consisted of handful of couples (less than 10%, 3 couples or 6 out of

74 participants). Therefore, dyadic dependence was not likely a source of bias in the present findings.

Besides demographic limitations, volunteer bias may affected the sample obtained for the present study. Those who participated and found the topic particularly interesting may have been more likely to volunteer. The participants were predominately physically active, had favorable perceptions regarding exercise, and were interested in physically activity in older adulthood. These findings are generally consistent with prior studies, most of which have found that, compared with individuals who choose not to volunteer for such studies, participants willing to volunteer tend to be in better health, and more favorably disposed toward health promotion and physical activity in general (Chinn, White, Howel, Harland, & Drinkwater, 2006; Jancey et al., 2006; Martinson et al., 2010; Mills et al., 2001; van Heuvelen et al., 2005; Wagner, Grothaus, Hecht, & LaCroix, 1991).

Measurement

Using the same measures for perceived benefits, perceptions of norms, and stage progression at pretest, immediate posttest, and delayed posttest during 10 week data collection periods was necessary to evaluate changes in variables of interest over time.

Using the same items could have sensitized the participants to the measures.

In addition to item sensitivity, quantitative measurement was limited, with several single-item measures at immediate and delayed posttest for ease of face-to-face and phone implementation, as well as to prevent participant fatigue. Previous research suggests older adult preference for interviews compared to surveys and emphasizes the importance of flexible data collection procedures due to the general decline in health

status for older adults (Carter et al., 1991). For example, older adults may appear to have resistance when providing categorical responses to questions (Jobe & Mingay 1990), a tendency which may arise either from the inability to retrieve information in a categorical response format or from a lack of familiarity with the standardized testing procedures and multiple choice test formats now commonly utilized in schools. Kohout (1992) also alluded to older adults' unfamiliarity with standardized testing as a reason for resistance in responding to closed-ended questions. Similarly, Holbrook, Cho, and Johnson (2006) found age, and not gender, race or education level, to be a significant predictor of mapping difficulties, or the ability of participants to map their judgment onto survey response formats. Structured interviews were a compromise to obtain quantitative responses for statistical comparison as well as provide opportunities for participant description and elaboration.

The present study measured an extensive number of variables (see Table 1), yet other possible variables include but are not limited to psychological reactance (Brehm, 1966; Brehm & Brehm, 1981), optimistic bias, perspective taking, social identification, level of involvement in extracurricular activities, frequency and types of family and peer interaction. There may be additional unmeasured variables that could explain intervention effects, and future research could include these.

Design

The present study tested components of active involvement interventions individually (idea generation, message planning), combined (idea generation and message planning combined), and compared to a standard care group across three time points (pretest, immediate posttest, and 10 week delayed posttest). While this is a robust

design on some levels, to advance the TAI (Greene, 2013) and examination of active involvement interventions there is a need for longitudinal assessment greater than a 10 week period. In addition, tracking older adults over a longer period of time may enable researchers to identify dosage and need for boosters at particular time points to maximize active involvement effectiveness and sustain induced effects. This may be particularly relevant to maintaining personal relevance once the novelty of the intervention decays. Thus, future research should conduct longitudinal studies to identify when novelty starts to expire and what types of activities are necessary to bolster intervention effects.

Due to time constraints, the present study was unable to measure motivation to process information and interpersonal communication at two time points (both immediate and delayed posttests). Thus, this study was unable to assess any changes in these outcomes of interest over time. The present study collected baseline information about participants' health and exercise status as well as fall-related perceptions (perceived susceptibility and severity of falls) to demonstrate group equivalence across condition. However, the process of documenting health and exercise status as well as fall-related perceptions was time consuming and took away from probing responses and adding additional questions. While the baseline contains important information, that process should be streamlined. A separate pretest not at the same time as the intervention and immediate posttest would be preferable. More examination is needed to assess the need for a booster and appropriate timing.

Directions for Future Research

The findings of the present research study make a valuable contribution to fall prevention efforts and application of the TAI (Greene, 2013). This section details

recommendations for future research studying active involvement interventions, strength and balance exercise interventions, older adult generated messages, and interpersonal communication as an intended intervention outcome.

Active Involvement Interventions

This study extended the TAI (Greene, 2013) to previously unexamined target audience and health behavior contexts. Components of the theory have previously been applied to reducing intention to engage in risk-taking behaviors among adolescents including smoking initiation (Banerjee & Greene, 2006; 2007) and alcohol use (Greene et al., 2012). The present study applied the TAI (Greene, 2013) to increasing intention to participate in pro-health behaviors among older adults. Future research could examine the appropriateness of applying the TAI to other populations characterized by a need for increased novelty and greater personal relevance of interventions beyond adolescents and older adults and additional pro-health behaviors.

This study demonstrated that the idea generation and message planning condition elicited higher levels of participants' perceived novelty, perceived involvement, perceived gain, and reflectiveness from the participants. Therefore, participant involvement in message generation/designing creates avenues for self-persuasion. It is relatively easy to generate reactance in older adults, especially in the context of health behaviors that threaten positive self-identity (Braun, 1998). Older adults have been found to have an overly positive perception of their state of health and underestimate their risk of falling compared to their peers (Ballinger & Payne, 2002). For example, Braun (1998) found that although community-dwelling older adults considered falls to be an important health issue and understood the significance of risk factors for older adults, their personal

susceptibility was minimized. Similarly, Yardley et al. (2006) found that older adults often supported fall-prevention advice for others but not themselves personally.

Intervention efforts toward promoting self-persuasion, increasing personal relevance, and reducing reactance clearly warrant future examination.

The results of the present study indicated that creative and novel ways of designing health interventions or campaigns merit attention, especially creative ways of involving the target audience in message generation and self-persuasion. However, inclusion of more creative ways of generating self-persuasion should be explored. Interventions delivered by peers have been effective in promoting physical activity among older adults (e.g., Batik et al., 2008; Healy et al., 2008). Peer-led interventions combined with message generation in peer groups also provide a possible avenue for future research.

Previous active involvement interventions (e.g., Banerjee & Greene, 2006; 2007; Greene et al., 2012) had small groups of adolescents (3-5 members) design anti-tobacco and anti-alcohol messages in the target planning condition. Future studies should compare the effectiveness of individual versus group-based active involvement interventions with older adults. Group-based interventions may provide opportunities for small group discussion about the perceived frequency of behavior among peers and allow for expression of peer approval or disapproval of strength and balance exercise. Besides the potential for the group activity to influence how people form their benchmarks of peer norms, group-based activities may provide a much needed opportunity for older adult socialization. Nussbaum et al. (2000) considered a network of close friends in later life to be essential in the ability to adapt to the many health and financial challenges of growing

old. Older adult friendships likely serve a number of supportive functions, including: helping older people maintain contact with larger society, providing a buffer against loneliness and depression, providing a secure context in which declining health can be managed, and providing emotional support during times when it is unavailable from family members (Nussbaum et al., 1996).

Beyond utilizing peer-led and/or group-based interventions, framing has not been applied to active involvement intervention development. Gain framed messages may be more novel in the context of older adult fall prevention because current fall prevention messages are described as overly negative and highlight the physical risks associated with falls instead of the personal and social benefits associated with strength and balance exercise (see Ballinger & Payne, 2002; Yardley & Smith, 2002). Thus, the use of positive images may be more successful in activating motivation to process information and involving participants (O’Keefe & Jensen, 2008). There is a paucity of studies examining message framing across the adult lifespan. Only five studies have included adults over 65 (Banks et al., 1995; Detweiler et al., 1999; Finney & Iannotti, 2002; Schneider et al., 2001; Williams et al., 2001), and no study examined adults over 65 as a unique group. Future research could inform both active involvement development and message framing across the lifespan.

Strength and Balance Exercise Interventions

Beyond informing active involvement intervention development, this research could guide promotion of future strength and balance exercise interventions. The majority of prior research on older adult fall prevention has been predominately qualitative and has examined the views of fall prevention activities but not specific activity components

on increasing exercise intentions or changing exercise behavior. Only one quantitative study assessed intention to engage in strength and balance exercise (Yardley et al., 2007). Thus, there is a need for additional quantitative work examining intervention components that address motivation to process information and intention to and participation in strength and balance exercise.

This study was interested in increasing motivation to process a strength and balance exercise intervention and focused on cognitive changes in later life. Future research should examine other age-related changes in vision, hearing, relationships, and language when designing strength and balance exercise interventions. For example, presbyopia is a loss of normal vision due to decreased elasticity and thickening of the crystalline lenses of the eye, which typically begins to occur after the age of 40 (Kline & Scialfa, 1996), often resulting in an increased need for reading glasses (Botwinick, 1978). By the age of 70, most individuals no longer have normal vision even with correction and less than 30% have retained 20/20 eyesight (Botwinick, 1978). Thus, older adults increasingly have to adjust to problems related to seeing objects both near and far as well as difficulties with spatial acuity, depth perception, motion perception, and ability to see in shadowed areas (Kline & Scialfa, 1996). Presbyopia should be taken into consideration when developing strength and balance exercise materials such as brochures, pamphlets, and posters for older adults. Larger, bolder print, simple layout, white space, and contrast should be employed to make readability easier.

Presbycusis is the term used to describe the hearing loss associated with aging. Hearing problems increase considerably after the age of 45, however, only 20% of older adults over the age of 75 suffer from mild hearing loss (Darbyshire, 1984). Such sensory

difficulties contribute to decreases in confidence with conversational abilities, which in turn may contribute to problems in processing types of strength and balance exercise interventions such as a one-on-one dialogue to motivate behavior change or reinforce behavior maintenance.

Besides age-related sensory considerations, social relationships may hold different significance in later life. Carstensen's (1992) socioemotional selectivity theory found that older adults reduce their overall social interactions while maintaining those relationships that provide the most emotional support. As a result, older adults often spend more time with familiar individuals with whom they have had rewarding relationships. Future strength and balance exercise interventions may benefit from highlighting relationships (family, friends, and/or romantic partners) in health messages. Messages featuring sources of support may emphasize the point that exercise is not a solitary activity for older adults and may serve as a way to socialize and make friends.

In the United States older adults are perceived negatively and often receive negative remarks or experiences from people in younger age groups (Pecchioni, Ota, & Sparks, 2004). People sometimes approximate their behavior to accommodate toward a stereotype that they hold about another person, meaning they move toward a preconceived notion or stereotype of how a particular person looks or is rather than accommodating for the individual's actual behavior (Gallois, Ogay, & Giles, 2004). Future strength and balance exercise interventions should focus on how older adults are portrayed and what type of information is included to appeal to older adults. Previous fall prevention interventions were described as overly negative and stereotypical because they highlighted the physical risks associated with falls instead of the personal and social

benefits associated with strength and balance exercise (see Ballinger & Payne, 2002; Yardley & Smith, 2002).

The stages of change model (Prochaska et al., 1992) has been successfully applied to exercise interventions in older adults (Barke & Nicholas, 1990; Rich & Rogers, 2001) and may be helpful in guiding future quantitative studies. The stages of change model is about supporting the process of behavior change, not simply a tool for diagnosing a person's current behavioral stage. Participants were not assigned to conditions based on stage and the data analytic approach does not distinguish among participants in different stages. Thus, mean estimates of change within each condition may not be the most robust way of assessing the influence of each condition on particular variables. Future research could test the hypothesis that the ratio of perceived pros to cons increases for individuals who started in one stage and then moved to an advanced stage following the intervention. Future studies could also compare the effect of the intervention on initially active and non-active adults within each condition. Additional efforts must be made to identify and recruit more sedentary older adults who are at greater risk of falling and could most benefit from these types of active involvement interventions and activities.

This study attempted to address the considerable reluctance of older adults to take part in fall prevention programs and identify message features that promote participation. Reports indicate that over half of older adults refuse when offered the opportunity to take part in strength and balance exercise programs (Campbell et al., 1997; Robertson et al., 2001; Stevens et al., 2001), and observed rates of uptake fail to exceed 10% (Day et al., 2002; Fabacher et al., 1994). Future research should continue to examine older adults' views of messages promoting these programs and establish what message features are

perceived as helpful and acceptable and what features may be ignored or provoke negative reactions. The next section discusses one possible strategy to identify older adult preferred message content, perform a content analysis of older adult generated messages.

Older Adult Generated Messages

There is a dearth of literature about the pro-strength and balance messages older adults develop in active involvement activities. Few studies have examined older adult depictions of physical activity. Sims et al. (2010) utilized photovoice to gain insight into what is appealing about physical activity from the perspective of older adults. Photovoice provided participants with cameras and taught them how to take pictures capturing their realities, thus allowing older adults to express themselves both visually and textually using the photos as a metaphor for their feelings about aging, physical activity, and their changing bodies. In a similar fashion, active involvement interventions provide participants with opportunities for self-expression through idea generation and message planning. Future research could content analyze messages created by older adults to examine presence and absence of: short versus long term consequences of action/inaction, types and numbers of risks/benefits emphasized, support for relevant others, barriers/facilitators to exercise, people (how active/inactive older adults are portrayed including physical appearance and activities performing), and setting (where the action in the message takes place). Analyses of older adult generated messages may provide insight into the lived experiences of older adults and inform more effective message design.

Once similarities and differences of older adult experiences are identified, they can be translated into actual health promotion messages. These health promotion

messages are posited to invoke personal meanings for the older adult audience and to maximize engagement (e.g., making it as realistic, interesting, and identifiable as possible). For many older adults, the advice and support of another older adult who has had many of the same life experiences is the most accepted and successful approach to healthy aging (Buonocore & Sussman-Skalka, 2002). Future research in this area could involve an evaluation of the impact of older adult generated messages. The next section describes one possible outcome of exposure to health messages that resonate with personal experience, interpersonal communication about the message.

Interpersonal Communication as an Intended Intervention Outcome

Interpersonal communication is an understudied variable as an intended intervention outcome in the active involvement and older adult physical activity literatures. Interpersonal communication may strengthen anti-campaign attitudes within social networks and increase resistance to persuasion attempts, or induce talk that is contrary to the intended message and increase biased processing of intervention or campaign materials (David, Cappella, & Fishbein, 2006; Southwell & Yzer, 2008). The effect of interpersonal communication on other intervention outcomes of interest would differ depending on what content is discussed, the valence of the discussion, and with whom it is discussed. Future research could examine what is being said (e.g., description of topic or activity, evaluation of activity, evaluation of the agent of implementation), reasons for discussing (e.g., self, other, relationship), to whom (e.g., friend, family member, romantic partner, health care provider), message recipient responses (e.g., reinforcement versus dismissal of information shared), and whether or not it diffuses through a social network.

Borrowing from the disclosure literature, intervention participants may decide to discuss the topic and/or activity for a number reasons (see Greene et al., 2006, 2003 or Derlega et al., 2008, 2004 for reviews). Self-focused reasons for disclosure are related to tangible and psychological benefits of disclosure including seeking help. After participating in an active intervention, an older adult may be interested in joining a strength training class at the senior center but unsure of the time and day of the week the class is offered. Therefore, the intervention participant may share in order to get information about the class schedule. Intervention participants may also talk with others in order to express fear of falling. Other-focused reasons emphasize the recipient and include a desire to educate and test others' reactions. An already physically active older adult may discuss the importance of strength and balance exercise in order to motivate the sedentary recipient to become more active. If an older adult is unsure whether other not relevant others endorse participation in strength and balance exercise, he/she may bring up the topic in order to gauge the recipient's view of exercise prior to disclosing participation in these activities. Relationship-focused reasons for disclosure include a desire to increase closeness/intimacy. An older adult may share that he/she wants to start a daily walking program with a close friend or romantic partner and is in need of a "buddy." Sharing may not only result in a new exercise program but also an opportunity to spend quality time with and grow closer to an important other.

Message recipient responses to interpersonal communication are key. If the intervention participant shares that he/she started attending a Tai Chi class at the senior center and the receiver provides an affirming response, the person may feel more

committed to continue going to class. If the receiver dismisses or discourages attending the Tai Class, then the sender may be less likely to continue going to class.

Beyond two-step flow and diffusion, interpersonal communication may be an additional form of participant engagement with the intervention. For example, if participants find the intervention topic or activity so interesting they may feel compelled to tell others about it. Future research should not only analyze the number of participants who did and did not report telling others about the intervention topic and/or activity. Additionally, there should be analysis of interaction effects cognitions and behaviors on those who reported interpersonal communication following the intervention and those who did not.

Besides interpersonal communication message content and receivers, interpersonal communication may serve two roles: mediator of intervention effects or moderator of intervention effects (Southwell & Yzer, 2007). Hwang (2012) argued that interpersonal communication functions as a mediator. The mediator model suggests that interpersonal talk after intervention participation may be a direct effect of intervention participation and influence social norms and strengthen attitudes, further leading to behavior change. Talk with others about the intervention, for instance, may lead to discovery of normative support for intervention-relevant behaviors (Hornik & Yanovitzky, 2003). For instance, an intervention participant may discuss the benefits of strength and balance exercise with others who did not participate in the intervention and learn that relevant others also agree or hold similar attitudes about participating in strength and balance exercise, thereby strengthening pro-strength and balance exercise behavior or encouraging behavior change.

Southwell and Yzer (2007) also acknowledged that other possible relationships exist, such as moderation instead of mediation. Interpersonal communication about the intervention may amplify or attenuate intervention effect outcomes (Druckman, 2004; Southwell, 2005). Talking about an intervention after participation may strengthen one's memory for the content and reinforce health behavior maintenance or facilitate behavior change. For instance, when compared with an intervention participant who does not engage in talk about the intervention, an intervention participant who engages in interpersonal talk about the benefits of strength and balance exercise may better remember the intervention message.

In short, a number of researchers have set forth the possibility that interpersonal communication functions as a moderator, yet other sources suggest mediation. Future research could examine whether interpersonal communication mediates or moderates the influence of the intervention on strength and balance exercise-related stage progression.

Conclusion

The dissertation examined whether older adult engagement in a combined active involvement intervention increases motivation to process information, leads to self-persuasion, and elicits changes in cognitions, behaviors, and interpersonal communication. Using the TAI (Greene, 2013) as a theoretical guide, this study offers insight into involving older adults in the creation of pro-health messages that resonate well with similar-aged older adults and work as the foundation for effective strategies for promoting strength and balance exercise and preventing falls. Components of active involvement interventions were tested individually (idea generation, message planning), combined (idea generation and message planning combined), and compared to a standard

care group in the context of promoting older adult strength and balance exercise-related stage progression.

Specifically, this research indicates that the idea generation and message planning combined was more successful than the idea generation, message planning, and standard care in changing participants' perceived benefits, perceptions of norms, and strength and balance exercise-related stage progression over time. Participants' evaluation of and frequency of discussion about the intervention condition was greater and more positive for idea generation and message planning combined than the other conditions. The ability to promote strength and balance exercise-related stage progression as means of fall prevention is important in light of the prevalence of falls (Hausdorff et al., 2001) and severity of consequences associated with falls in older adulthood (Alexander et al., 1992; Sterling et al., 2001). As this dissertation demonstrates, health communication scholars have the ability to contribute efforts to this significant and largely preventable public health problem and future work on active involvement interventions across the lifespan.

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Table 1

Guided Interview Measures Description List

Variable	Time Measured	Source	Pretest # of items	T1 Post and T2 # of items	Prior Reliability
Perceived benefits	Pretest, T1 Post, T2	Developed by the author	8	3	NA
Subjective norm	Pretest, T1 Post, T2	Developed by the author	3	1	NA
Descriptive norm	Pretest, T1 Post, T2	Developed by the author	1	1	NA
Injunctive norm	Pretest, T1 Post, T2	Developed by the author	1	1	NA
Intent to change/Stage progression	Pretest, T1 Post, T2	Marcus et al., 1992	2	2	NA
Fall status	Pretest, T2	Developed by the author	2	2	NA
Interpersonal communication	T2	Developed by the author	NA	2	NA

Table 1 (continued)

Variable	Time Measured	Source	Pretest # of items	T1 Post and T2 # of items	Prior Reliability
Perceived novelty	T1 Post	Adapted from Greene et al., 2012	3	NA	$\alpha = .75, .69$
Perceived involvement	T1 Post	Adapted from Greene et al., 2012	3	NA	$\alpha = .85, .87$
Perceived gain	T1 Post	Adapted from Greene et al., 2012	3	NA	$\alpha = .75, .69$
Reflectiveness	T1 Post	Adapted from Greene et al., 2012	5	NA	$\alpha = .76, .83$
Prior behavior	Pretest	Developed by the author	4	NA	NA
Prior fall status	Pretest	Developed by the author	2	NA	NA
Risk assessment	Pretest	Developed by the author	10	NA	NA
Perceived susceptibility	Pretest	Yardley et al., 2005	8	NA	$\alpha = .92$
Consequences of falls: Independence	Pretest	Yardley & Smith, 2002	5	NA	$\alpha = .94, .94$
Consequences of falls: Identity	Pretest	Yardley & Smith, 2002	2	NA	$\alpha = .86, .87$
Demographics	Pretest	Developed by the author	5	NA	NA

Table 2

Bivariate Zero-Order Correlation Matrix for Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Strength	1.00														
2. Balance	-.49*	1.00													
3. Suscept.	-.08	-.21	1.00												
4. Independ.	.12	-.18	.48*	1.00											
5. Identity	-.02	-.18	-.04	.13	1.00										
6. Novelty	-.07	-.09	-.02	-.06	.27	1.00									
7. Involve.	-.03	-.12	.12	-.09	.14	.91*	1.00								
8. Gain	.11	-.20	.02	-.05	.18	.78*	.81*	1.00							
9. Reflect.	.08	-.20	.09	-.02	.16	.79*	.88*	.88*	1.00						
10. Health	.34*	.00	-.20	.21	-.18	-.17	-.16	-.07	.07	1.00					
11. Social	-.06	.45*	-.39*	-.04	-.04	-.14	-.19	-.26	.24	.17	1.00				
12. Self-con.	.31*	-.07	-.18	.17	.12	-.11	-.15	-.02	.10	.38*	.50*	1.00			
13. Sub. norm	.12	.08	-.08	.14	-.21	-.14	-.13	-.01	-.06	.32*	.23	.28	1.00		
14. Des. norm	.34*	-.15	-.21	-.14	.01	-.08	-.06	-.10	-.06	.33*	-.02	.16	-.10	1.00	
15. Inj. norm	.10	.02	-.30	.03	-.07	.15	.12	.10	.11	.40*	.08	.07	.15	.29	1.00

1-Strength Stage of Change; 2-Balance Stage Change; 3-Perceived Susceptibility; 4-Perceived Consequences of Falling Independence; 5-Perceived Consequences of Falling Identity; 6-Perceived Novelty; 7-Perceived Involvement; 8-Perceived Gain; 9-Reflectiveness; 10-Perceived Health Benefits; 11-Perceived Social Benefits; 12-Perceived Self-concept Benefits; 13-Subjective Norms; 14-Descriptive Norms; 15-Injunctive Norms.

* $p < .01$, ** $p < .001$.

Table 3

ANOVA for Variables at Pretest

	Idea Generation		Message Planning		IG & MP Combined		Standard Care		<i>F</i> (df)	<i>p</i>	partial η^2
Variable	M	(SD)	M	(SD)	M	(SD)	M	(SD)			
1. Strength	1.88	(1.38)	1.50	(1.15)	2.50	(1.54)	2.08	(1.45)	2.25(3)	.09	.09
2. Balance	3.17	(1.38)	3.33	(1.28)	2.17	(1.50)	2.83	(1.50)	2.37(3)	.08	.10
3. Suscept.	1.63	(0.59)	1.47	(0.56)	1.59	(0.48)	1.56	(0.55)	0.28(3)	.84	.01
4. Independ.	2.34	(0.72)	2.63	(0.98)	2.81	(0.75)	2.86	(1.12)	1.17(3)	.33	.05
5. Identity	1.22	(0.43)	1.61	(0.78)	1.56	(0.78)	1.22	(0.55)	1.86(3)	.15	.08
6. Health	3.26	(0.51)	3.17	(0.51)	3.06	(0.86)	3.37	(0.84)	0.66(3)	.58	.03
7. Social	2.15	(1.00)	2.39	(0.93)	1.98	(1.09)	2.54	(0.87)	1.16(3)	.33	.08
8. Self-con.	1.97	(1.09)	2.14	(0.94)	2.42	(0.99)	2.72	(1.00)	1.92(3)	.13	.08

Table 3 (continued)

	Idea Generation		Message Planning		IG & MP Combined		Standard Care		<i>F</i> (df)	<i>p</i>	partial η^2
Variable	M	(SD)	M	(SD)	M	(SD)	M	(SD)			
9. Sub. norm	1.98	(0.90)	2.19	(0.63)	2.33	(0.78)	2.52	(0.89)	1.43(3)	.24	.06
10. Des. norm	2.72	(0.89)	2.44	(0.86)	2.33	(0.91)	2.50	(0.79)	.65(3)	.59	.03
11. Inj. norm	3.72	(0.83)	3.72	(0.46)	4.17	(0.62)	3.72	(0.67)	2.06(3)	.11	.08

1-Strength Stage of Change; 2-Balance Stage Change; 3-Perceived Susceptibility; 4-Perceived Consequences of Falling Independence; 5-Perceived Consequences of Falling Identity; 6-Perceived Health Benefits; 7-Perceived Social Benefits; 8-Perceived Self-concept Benefits; 9-Subjective Norms; 10-Descriptive Norms; 11-Injunctive Norms.

Table 4

Demographic Groups and χ^2 by Intervention Condition

Variable	Idea Generation	Message Planning	IG & MP Combined	Standard Care	χ^2	df, <i>N</i>	<i>p</i>
Gender					.30	3,72	.96
Male	5	5	4	4			
Female	13	13	14	14			
Age Group					15.57	12,72	.21
65-70	9	3	4	8			
71-75	4	4	4	5			
76-80	3	7	2	2			
81-85	2	2	4	2			
85+	0	2	4	1			
Res. Status					2.53	6,72	.87
Spouse or Partner	7	6	7	10			
Alone	9	10	10	7			
Family	2	2	1	1			
Prior fall status					.47	3,72	.93
Yes	3	3	2	2			
No	15	15	16	16			

Table 5

Ratings of Perceived Novelty of Intervention Condition at Immediate Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
M	3.20 _a	3.80 _b	4.57 _c	1.52 _d
SD	.17	.38	.44	.37

$F(3,68) = 242.03, p < .001$, partial $\eta^2 = .91$

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 6

Ratings of Perceived Involvement of Intervention Condition at Immediate Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
M	3.76 _a	3.37 _b	4.56 _c	1.68 _d
SD	.36	.31	.30	.35

$F(3,68) = 243.16, p < .001, \text{partial } \eta^2 = .92$

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 7

Ratings of Perceived Gain of Intervention Condition at Immediate Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
M	3.06 _{ab}	2.72 _{ac}	4.28 _d	1.94 _e
SD	.55	.38	.53	.38

$F(3,68) = 77.47, p < .001$, partial $\eta^2 = .77$

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 8

Ratings of Reflectiveness of Intervention Condition at Immediate Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
M	3.53 _a	2.77 _b	4.43 _c	1.66 _d
SD	.60	.48	.51	.44

$F(3,68) = 95.51, p < .001$, partial $\eta^2 = .81$

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 9

Paired t Test Results for Pretest through Delayed Posttest Perceived Health Benefits by Intervention Condition

Condition	M (SD)	t	df	p	d _r
Idea Generation		2.92	17	.01	.26
Pretest	3.22 (.65)				
Immediate Posttest	3.56 (.62)				
Idea Generation		4.27	17	.001	.41
Pretest	3.22 (.65)				
Delayed Posttest	3.83 (.71)				
Message Planning		3.30	17	.01	.33
Pretest	3.22 (.55)				
Immediate Posttest	3.61 (.61)				
Message Planning		5.10	17	.001	.53
Pretest	3.22 (.55)				
Delayed Posttest	4.00 (.69)				
IG & MP Combined		7.38	17	.001	.69
Pretest	3.11 (.85)				
Immediate Posttest	4.44 (.51)				
IG & MP Combined		8.17	17	.001	.83
Pretest	3.11 (.83)				
Delayed Posttest	4.83 (.38)				
Standard Care		1.29	17	.22	.14
Pretest	3.39 (.85)				
Immediate Posttest	3.61 (.70)				
Standard Care		1.68	17	.11	.21
Pretest	3.39 (.85)				
Immediate Posttest	3.72 (.67)				

Table 10

Paired t Test Results for Pretest through Delayed Posttest Perceived Social Benefits by Intervention Condition

Condition	M (SD)	t	df	p	d _r
Idea Generation		5.33	17	.001	.36
Pretest	2.17 (1.04)				
Immediate Posttest	2.89 (0.83)				
Idea Generation		8.44	17	.001	.59
Pretest	2.17 (1.04)				
Delayed Posttest	3.56 (0.86)				
Message Planning		3.30	17	.001	.36
Pretest	2.44 (1.10)				
Immediate Posttest	3.17 (0.79)				
Message Planning		7.08	17	.001	.51
Pretest	2.44 (1.10)				
Delayed Posttest	3.67 (0.97)				
IG & MP Combined		10.29	17	.001	.59
Pretest	2.00 (1.08)				
Immediate Posttest	3.50 (0.99)				
IG & MP Combined		12.47	17	.001	.85
Pretest	2.00 (1.08)				
Delayed Posttest	4.67 (0.49)				
Standard Care		1.46	17	.16	.06
Pretest	2.50 (0.92)				
Immediate Posttest	2.61 (0.78)				
Standard Care		1.72	17	.10	.12
Pretest	2.50 (0.92)				
Delayed Posttest	2.72 (0.83)				

Table 11

Paired t Test Results for Pretest through Delayed Posttest Perceived Self-concept Benefits by Intervention Condition

Condition	M (SD)	t	df	p	d_r
Idea Generation		5.83	17	.001	.32
Pretest	2.00 (1.08)				
Immediate Posttest	2.67 (0.91)				
Idea Generation		6.22	17	.001	.46
Pretest	2.00 (1.08)				
Delayed Posttest	3.11 (1.08)				
Message Planning		6.65	17	.001	.39
Pretest	2.17 (0.92)				
Immediate Posttest	2.89 (0.76)				
Message Planning		6.30	17	.001	.58
Pretest	2.17 (0.92)				
Delayed Posttest	3.33 (0.69)				
IG & MP Combined		7.38	17	.001	.60
Pretest	2.50 (0.99)				
Immediate Posttest	4.44 (0.51)				
IG & MP Combined		11.66	17	.001	.82
Pretest	2.50 (0.99)				
Delayed Posttest	4.72 (0.46)				
Standard Care		1.46	17	.16	.06
Pretest	2.72 (0.96)				
Immediate Posttest	2.83 (0.92)				
Standard Care		1.84	17	.08	.09
Pretest	2.72 (0.96)				
Delayed Posttest	2.89 (0.96)				

Table 12

Paired t Test Results for Pretest through Delayed Posttest Subjective Norm by Intervention Condition

Condition	M (SD)	t	df	p	d _r
Idea Generation		2.56	17	.05	.10
Pretest	1.98 (0.90)				
Immediate Posttest	2.17 (1.04)				
Idea Generation		5.85	17	.001	.40
Pretest	1.98 (0.90)				
Delayed Posttest	2.83 (1.04)				
Message Planning		2.37	17	.05	.16
Pretest	2.19 (0.63)				
Immediate Posttest	2.39 (0.61)				
Message Planning		3.49	17	.01	.34
Pretest	2.19 (0.63)				
Delayed Posttest	2.67 (0.69)				
IG & MP Combined		3.49	17	.01	.27
Pretest	2.33 (0.78)				
Immediate Posttest	2.83 (0.98)				
IG & MP Combined		7.78	17	.001	.60
Pretest	2.33 (0.78)				
Delayed Posttest	3.89 (1.23)				
Standard Care		.52	17	.61	.02
Pretest	2.52 (0.89)				
Immediate Posttest	2.56 (0.78)				
Standard Care		1.46	17	.16	.09
Pretest	2.52 (0.89)				
Delayed Posttest	2.67 (0.77)				

Table 13

Paired t Test Results for Pretest through Delayed Posttest Descriptive Norm by Intervention Condition

Condition	M (SD)	t	df	p	d_r
Idea Generation		2.36	17	.05	.23
Pretest	2.72 (0.89)				
Immediate Posttest	3.11 (0.76)				
Idea Generation		3.42	17	.01	.40
Pretest	2.72 (0.89)				
Delayed Posttest	3.44 (0.78)				
Message Planning		2.06	17	.06	.20
Pretest	2.44 (0.86)				
Immediate Posttest	2.78 (0.81)				
Message Planning		4.08	17	.001	.37
Pretest	2.44 (0.86)				
Delayed Posttest	3.17 (0.99)				
IG & MP		3.05	17	.01	.31
Pretest	2.33 (0.91)				
Immediate Posttest	2.94 (0.94)				
IG & MP		4.75	17	.001	.51
Pretest	2.33 (0.91)				
Delayed Posttest	3.50 (1.04)				
Standard Care		1.46	17	.16	.07
Pretest	2.50 (0.79)				
Immediate Posttest	2.61 (0.78)				
Standard Care		2.20	17	.05	.14
Pretest	2.50 (0.79)				
Delayed Posttest	2.72 (0.75)				

Table 14

Paired t Test Results for Pretest through Delayed Posttest Injunctive Norm by Intervention Condition

Condition	M (SD)	t	df	p	d_r
Idea Generation		4.27	17	.001	.32
Pretest	3.72 (0.83)				
Immediate Posttest	4.33 (0.97)				
Idea Generation		6.87	17	.001	.50
Pretest	3.72 (0.83)				
Delayed Posttest	4.56 (0.62)				
Message Planning		5.17	17	.001	.43
Pretest	3.72 (0.46)				
Immediate Posttest	4.33 (0.77)				
Message Planning		9.63	17	.001	.67
Pretest	3.72 (0.46)				
Delayed Posttest	4.67 (0.59)				
IG & MP Combined		3.01	17	.01	.45
Pretest	4.17 (0.62)				
Immediate Posttest	4.72 (0.46)				
IG & MP Combined		5.10	17	.001	.63
Pretest	4.17 (0.62)				
Delayed Posttest	4.94 (0.24)				
Standard Care		2.92	17	.01	.22
Pretest	3.72 (0.67)				
Immediate Posttest	4.06 (0.80)				
Standard Care		3.29	17	.01	.26
Pretest	3.72 (0.67)				
Delayed Posttest	4.11 (0.76)				

Table 15

Paired t Test Results for Pretest through Delayed Posttest Strength Stage Progression by Intervention Condition

Condition	M (SD)	t	df	p	d _r
Idea Generation		4.61	17	.001	.22
Pretest	1.83 (1.38)				
Immediate Posttest	2.39 (1.09)				
Idea Generation		6.56	17	.001	.47
Pretest	1.83 (1.38)				
Delayed Posttest	3.11 (1.02)				
Message Planning		5.83	17	.001	.31
Pretest	1.50 (1.15)				
Immediate Posttest	2.17 (0.92)				
Message Planning		7.21	17	.001	.52
Pretest	1.50 (1.15)				
Delayed Posttest	2.78 (0.94)				
IG & MP Combined		4.01	17	.001	.37
Pretest	2.50 (1.54)				
Immediate Posttest	3.44 (0.62)				
IG & MP Combined		7.43	17	.001	.65
Pretest	2.50 (1.54)				
Delayed Posttest	4.44 (.51)				
Standard Care		1.46	17	.16	.04
Pretest	2.50 (1.54)				
Immediate Posttest	2.61 (1.46)				
Standard Care		2.20	17	.08	.08
Pretest	2.50 (1.54)				
Delayed Posttest	2.72 (1.36)				

Table 16

Paired t Test Results for Pretest through Delayed Posttest Balance Stage Progression by Intervention Condition

Condition	M (SD)	t	df	p	d _r
Idea Generation		2.56	17	.05	.11
Pretest	3.17 (1.38)				
Immediate Posttest	3.44 (0.92)				
Idea Generation		8.01	17	.001	.44
Pretest	3.17 (1.38)				
Delayed Posttest	4.33 (0.91)				
Message Planning		2.20	17	.05	.10
Pretest	3.33 (1.28)				
Immediate Posttest	3.56 (0.86)				
Message Planning		6.19	17	.001	.42
Pretest	3.33 (1.28)				
Delayed Posttest	4.33 (0.84)				
IG & MP Combined		5.17	17	.001	.48
Pretest	2.17 (1.50)				
Immediate Posttest	3.39 (0.50)				
IG & MP Combined		9.00	17	.001	.71
Pretest	2.17 (1.50)				
Delayed Posttest	4.44 (0.51)				
Standard Care		1.00	17	.33	.02
Pretest	2.83 (1.50)				
Immediate Posttest	2.89 (1.45)				
Standard Care		1.72	17	.10	.08
Pretest	2.83 (1.50)				
Delayed Posttest	3.06 (1.43)				

Table 17

Means and Standard Deviations for Perceived Health Benefits by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	3.22 (0.65)	3.22 (0.55)	3.11 (0.83)	3.39 (0.85)
Immediate Posttest	3.56 (0.62)	3.61 (0.61)	4.44 (0.51)	3.61 (0.70)
Delayed Posttest	3.83 (0.71)	4.00 (0.69)	4.83 (0.38)	3.72 (0.67)

Table 18

Mixed Model ANOVA for Perceived Health Benefits

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	9.58	.001	.30
Main Effect for WS Variable				
Time	2, 136	68.44	.001	.50
Main Effect for BS Variable				
Condition	3, 68	4.71	.01	.17

Table 19

Perceived Health Benefits by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	8.76	.001	.28
Idea Generation	3.56 _{ab} (0.62)				
Message Planning	3.61 _{ac} (0.61)				
IG & MP Combined	4.44 _d (0.51)				
Standard Care	3.61 _{bc} (0.70)				
Delayed Posttest		3, 68	11.68	.001	.34
Idea Generation	3.83 _{ab} (0.71)				
Message Planning	4.00 _{ac} (0.69)				
IG & MP Combined	4.83 _d (0.38)				
Standard Care	3.72 _{bc} (0.67)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 20

Means and Standard Deviations for Perceived Social Benefits by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	2.17 (1.04)	2.44 (1.10)	2.00 (1.08)	2.50 (0.92)
Immediate Posttest	2.89 (0.83)	3.17 (0.79)	3.50 (0.99)	2.61 (0.78)
Delayed Posttest	3.56 (0.86)	3.67 (0.97)	4.67 (0.49)	2.72 (0.83)

Table 21

Mixed Model ANOVA for Perceived Social Benefits

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	24.27	.001	.52
Main Effect for WS Variable				
Time	2, 136	181.59	.001	.73
Main Effect for BS Variable				
Condition	3, 68	2.74	.05	.11

Table 22

Perceived Social Benefits by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	3.61	.05	.14
Idea Generation	2.89 _a (0.83)				
Message Planning	3.16 _a (0.79)				
IG & MP Combined	3.50 _b (0.99)				
Standard Care	2.61 _a (0.78)				
Delayed Posttest		3, 68	17.63	.001	.44
Idea Generation	3.56 _{ab} (0.86)				
Message Planning	3.67 _{ac} (0.97)				
IG & MP Combined	4.67 _d (0.49)				
Standard Care	2.72 _e (0.83)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 23

*Means and Standard Deviations for Perceived Self-concept Benefits by Condition for
Pretest through Delayed Posttest*

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	2.00 (1.08)	2.17 (0.92)	2.50 (0.99)	2.72 (0.96)
Immediate Posttest	2.67 (0.91)	2.89 (0.76)	3.83 (0.79)	2.83 (0.92)
Delayed Posttest	3.11 (1.08)	3.33 (0.69)	4.72 (0.46)	2.89 (0.96)

Table 24

Mixed Model ANOVA for Perceived Self-concept Benefits

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	20.21	.001	.47
Main Effect for WS Variable				
Time	2, 136	156.41	.001	.70
Main Effect for BS Variable				
Condition	3, 68	6.15	.001	.21

Table 25

Perceived Self-concept Benefits by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	6.97	.001	.24
Idea Generation	2.67 _a (.91)				
Message Planning	2.89 _a (.76)				
IG & MP Combined	3.83 _b (.79)				
Standard Care	2.83 _a (.92)				
Delayed Posttest		3, 68	17.69	.001	.44
Idea Generation	3.11 _a (1.08)				
Message Planning	3.33 _a (0.69)				
IG & MP Combined	4.72 _b (0.46)				
Standard Care	2.89 _a (0.96)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 26

Means and Standard Deviations for Subjective Norm by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	1.98 (0.90)	2.18 (0.63)	2.33 (0.78)	2.52 (0.89)
Immediate Posttest	2.17 (1.04)	2.39 (0.61)	2.83 (0.99)	2.56 (0.78)
Delayed Posttest	2.83 (1.04)	2.67 (0.69)	3.89 (1.23)	2.67 (0.77)

Table 27

Mixed Model ANOVA for Subjective Norm

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	12.75	.001	.36
Main Effect for WS Variable				
Time	2, 136	79.86	.001	.54
Main Effect for BS Variable				
Condition	3, 68	2.48	.07	.10

Table 28

Perceived Subjective Norm by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	1.87	.14	.08
Idea Generation	2.17 _a (1.04)				
Message Planning	2.39 _a (0.61)				
IG & MP Combined	2.83 _a (0.99)				
Standard Care	2.56 _a (0.78)				
Delayed Posttest		3, 68	6.81	.001	.23
Idea Generation	2.83 _a (1.04)				
Message Planning	2.67 _a (0.69)				
IG & MP Combined	3.89 _b (1.23)				
Standard Care	2.67 _a (0.76)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 29

Means and Standard Deviations for Descriptive Norm by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	2.72 (0.89)	2.44 (0.86)	2.33 (0.91)	2.50 (0.79)
Immediate Posttest	3.11 (0.76)	2.78 (0.81)	2.94 (0.94)	2.61 (0.78)
Delayed Posttest	3.44 (0.78)	3.17 (0.99)	3.50 (1.04)	2.72 (0.75)

Table 30

Mixed Model ANOVA for Descriptive Norm

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	9.58	.001	.30
Main Effect for WS Variable				
Time	2, 136	68.44	.001	.50
Main Effect for BS Variable				
Condition	3, 68	1.25	.30	.05

Table 31

Descriptive Norm by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	1.23	.31	.05
Idea Generation	3.11 _a (0.76)				
Message Planning	2.78 _a (0.81)				
IG & MP Combined	2.94 _a (0.94)				
Standard Care	2.61 _a (0.78)				
Delayed Posttest		3, 68	2.81	.06	.11
Idea Generation	3.44 _a (0.78)				
Message Planning	3.17 _a (0.99)				
IG & MP Combined	3.50 _a (1.04)				
Standard Care	2.72 _a (0.75)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 32

Means and Standard Deviations for Injunctive Norm by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	3.72 (0.82)	3.72 (0.46)	4.17 (0.62)	3.72 (0.67)
Immediate Posttest	4.33 (0.97)	4.33 (0.77)	4.72 (0.46)	4.06 (0.80)
Delayed Posttest	4.56 (0.62)	4.67 (0.59)	4.94 (0.24)	4.11 (0.76)

Table 33

Mixed Model ANOVA for Injunctive Norm

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	1.98	.07	.08
Main Effect for WS Variable				
Time	2, 136	76.90	.001	.53
Main Effect for BS Variable				
Condition	3, 68	3.52	.05	.13

Table 34

Mean Differences and Standard Errors of Injunctive Norm by Intervention Condition

Condition	Mean Difference (SE)	<i>p</i>
Idea Generation with Message Planning	-.04 (0.20)	.99
IG & MP Combined	-.41 (0.20)	.19
Standard Care	.24 (0.20)	.63
Message Planning with Idea Generation	.04 (0.20)	.99
IG & MP Combined	-.37 (0.20)	.27
Standard Care	.28 (0.20)	.52
IP & MP Combined with Idea Generation	.41 (0.20)	.19
Message Planning	.37 (0.20)	.27
Standard Care	.65 (0.20)	.01
Standard Care with Idea Generation	-.24 (0.20)	.63
Message Planning	-.28 (0.20)	.52
IG & MP Combined	-.65 (0.20)	.01

$F(3, 68) = 3.52, p < .05, \text{partial } \eta^2 = .13$

Table 35

Means and Standard Deviations for Strength Stage Progression by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	1.83 (1.38)	1.50 (1.15)	2.50 (1.54)	2.50 (1.54)
Immediate Posttest	2.39 (1.09)	2.17 (0.92)	3.44 (0.62)	2.61 (1.46)
Delayed Posttest	3.11 (1.02)	2.78 (0.94)	4.44 (0.51)	2.72 (1.36)

Table 36

Mixed Model ANOVA for Strength Stage Progression

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	10.87	.001	.32
Main Effect for WS Variable				
Time	2, 136	25.10	.001	.64
Main Effect for BS Variable				
Condition	3, 68	4.61	.01	.17

Table 37

Strength Stage Progression by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	11.52	.001	.34
Idea Generation	2.39 _a (1.09)				
Message Planning	2.17 _a (0.92)				
IG & MP Combined	3.44 _b (0.62)				
Standard Care	2.61 _a (1.46)				
Delayed Posttest		3, 68	11.50	.001	.34
Idea Generation	3.11 _a (1.02)				
Message Planning	2.78 _a (0.94)				
IG & MP Combined	4.44 _b (0.51)				
Standard Care	2.72 _a (1.36)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 38

Means and Standard Deviations for Balance Stage Progression by Condition for Pretest through Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Time	M (SD)	M (SD)	M (SD)	M (SD)
Pretest	3.17 (1.38)	3.33 (1.28)	2.17 (1.50)	2.83 (1.50)
Immediate Posttest	3.44 (0.92)	3.56 (0.86)	3.39 (0.50)	2.89 (1.45)
Delayed Posttest	4.30 (0.84)	4.33 (0.84)	4.44 (0.51)	3.06 (1.43)

Table 39

Mixed Model ANOVA for Balance Stage Progression

Source of Variation	df	<i>F</i>	<i>p</i>	partial η^2
Interaction Effect				
Time X Condition	6, 136	19.34	.001	.46
Main Effect for WS Variable				
Time	2, 136	140.81	.001	.67
Main Effect for BS Variable				
Condition	3, 68	2.02	.11	.08

Table 40

Balance Stage Progression by Intervention Condition at Immediate and Delayed Posttests

Condition	M (SD)	df	<i>F</i>	<i>p</i>	partial η^2
Immediate Posttest		3, 68	1.59	.22	.07
Idea Generation	3.44 _a (0.92)				
Message Planning	3.56 _a (0.86)				
IG & MP Combined	3.39 _a (0.50)				
Standard Care	2.89 _a (1.45)				
Delayed Posttest		3, 68	8.14	.001	.26
Idea Generation	4.33 _a (0.91)				
Message Planning	4.33 _a (0.84)				
IG & MP Combined	4.44 _a (0.51)				
Standard Care	3.06 _b (1.43)				

Note: Means with no subscript in common differ at $p < .05$ using the Tukey HSD post hoc comparisons.

Table 41

Interpersonal Communication about Strength and Balance Exercise at Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Yes	11 _{ab}	10 _{ac}	16 _d	5 _e
No	7	8	2	13

 $\chi^2(3, N = 72) = 13.94, p < .001$

Note: Frequencies with no subscript in common differ at $p < .05$ using Holm's sequential bonferroni post hoc comparisons.

Table 42

Interpersonal Communication about Intervention Activity at Delayed Posttest

	Idea Generation	Message Planning	IG & MP Combined	Standard Care
Yes	8 _{ab}	10 _{ac}	15 _d	2 _e
No	10	8	3	16

 $\chi^2(3, N = 72) = 19.29, p < .001$

Note: Frequencies with no subscript in common differ at $p < .05$ using Holm's sequential bonferroni post hoc comparisons.

Table 43

Summary of Findings for Hypotheses/Research Questions

Hypothesis/Research Question	Supported/Not Supported
Motivation to Process Information	
H1: Participants in the idea generation, message planning, idea generation and planning combined conditions will report higher levels of a) perceived novelty, b) perceived involvement, c) perceived gain, and d) reflectiveness than participants in the standard care condition.	1a: Supported 1b: Supported 1c: Supported 1d: Supported
H2: Participants in the idea generation and message planning combined condition will report higher levels of a) perceived novelty, b) perceived involvement, c) perceived gain, and d) reflectiveness than participants in idea generation or message planning conditions.	2a: Supported 2b: Supported 2c: Supported 2d: Supported
RQ1: How do participants in the idea generation and message planning conditions differ in terms of their reports of a) perceived novelty, b) perceived involvement, c) perceived gain, and d) reflectiveness?	1a: Message Planning > Idea Generation 1b: Idea Generation > Message Planning 1c: No difference 1d: Idea Generation > Message Planning
Cognitive and Behavioral Outcomes	
H3: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared to participants in the standard care condition over time.	3a: Partially supported 3b: Supported 3c: Partially supported
H4: Participants in the idea generation and message planning combined condition will report increased levels of perceived a) health benefits, b) social benefits, and c) self-concept benefits compared with participants in the idea generation or message planning conditions over time.	4a: Supported 4b: Supported 4c: Supported

Table 43 (continued)

Hypothesis/Research Question	Supported/Not Supported
RQ2: How do participants in the idea generation and message planning conditions differ in terms of their reports of changes in perceived a) health benefits, b) social benefits, and c) self-concept benefits?	2a: No difference 2b: No difference 2c: No difference
H5: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared to participants in the standard care condition over time.	5a: Partially supported 5b: Not supported 5c: Partially supported
H6: Participants in the idea generation and planning combined condition will report increased levels of perceived a) subjective norms, b) descriptive norms, and c) injunctive norms compared with participants in the idea generation or message planning conditions over time.	6a: Supported 6b: Not supported 6c: Supported
RQ3: How do participants in the idea generation and message planning conditions differ in terms of their perceptions of a) subjective norms, b) descriptive norms, and c) injunctive norms?	3a: No difference 3b: No difference 3c: No difference
H7: Participants in the idea generation, message planning, idea generation and planning combined conditions will report increased levels of a) strength-related exercise stage progression and b) balance-related exercise stage progression compared to participants in the standard care condition over time.	7a: Partially supported 7b: Supported

Table 43 (continued)

Hypothesis/Research Question	Supported/Not Supported
H8: Participants in the idea generation and message planning combined condition will report increased levels of a) strength-related exercise stage progression and b) balance-related exercise stage progression compared to participants in the idea generation or message planning conditions over time.	8a: Supported 8b: Not supported
H9: Participants in the idea generation, message planning, idea generation and planning combined conditions will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the standard care condition at delayed posttest.	9a: Supported 9b: Supported
H10: Participants in the idea generation and message planning combined conditions will report more discussion about: a) strength and balance exercise with others and b) the intervention activity with others compared with participants in the idea generation or message planning conditions at delayed posttest.	10a: Supported 10b: Supported
RQ5: How do participants in the idea generation and message planning conditions differ in terms of their reports of interpersonal communication a) about strength and balance exercise and b) the intervention activity)?	5a: No difference 5b: No difference

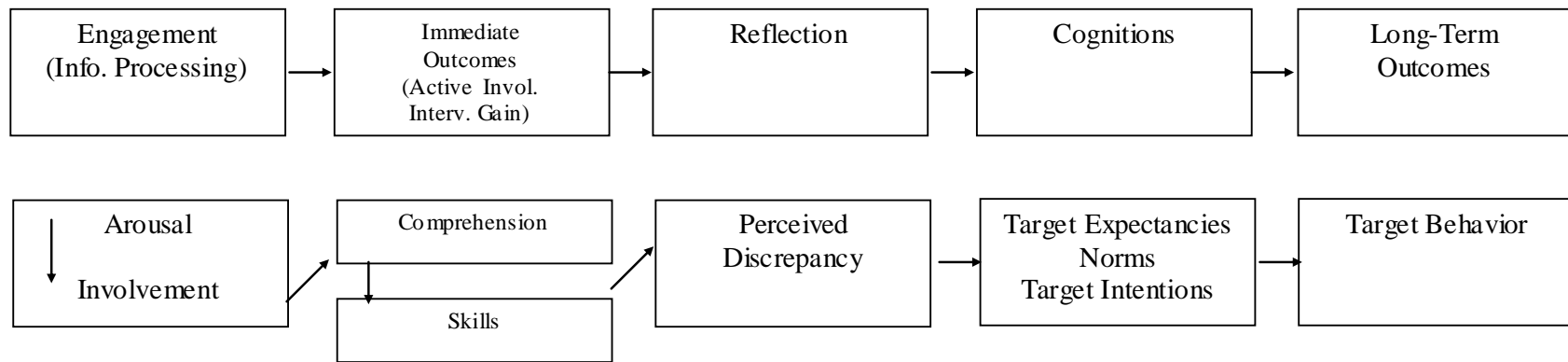


Figure 1. The Theory of Active Involvement

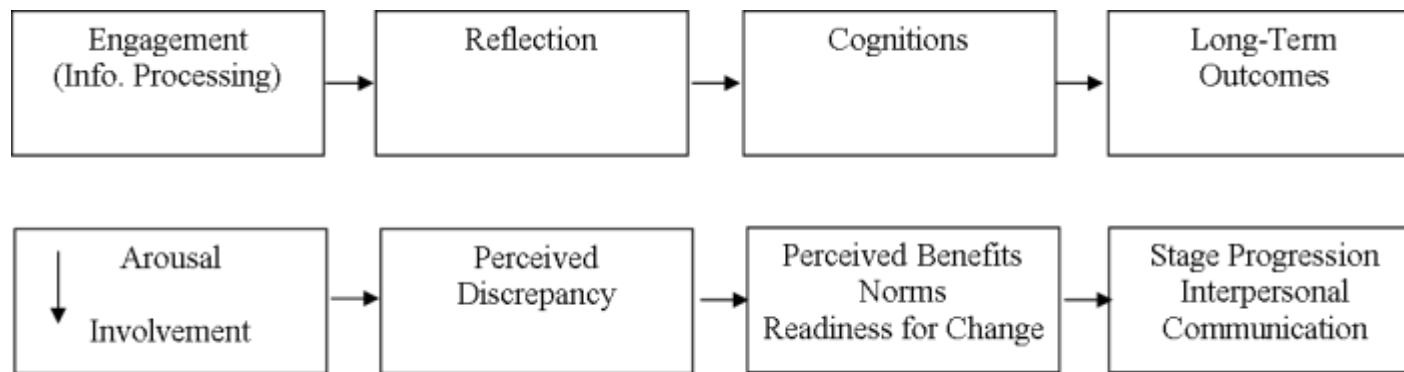


Figure 2. Proposed integrated model

Appendix A

Recruitment Flyer

This flyer was distributed to senior citizen centers, physical therapy offices, and adult education classes as well as posted on the Rutgers School of Communication and Information Studies listserv.



Researchers at Rutgers University

Invite you to participate in a Research Study investigating
How Older Adults View Strength and Balance Exercise



Who is eligible: Persons aged 65 and over.

- Must be able to read and speak English.
- Must not have a diagnosis of cognitive impairment.

What's involved: Participants complete two interviews.

- Participants will complete a 30 minute initial interview.
- Participants will complete a 10 minute follow-up interview three months later.

Compensation: Participants will receive a \$10 gift card.

- Returning participants will be entered into a raffle for one of two \$50 gift cards.

To participate or for more information please contact:

Danielle Catona at 973-986-6196 or email: dcatona@rutgers.edu

This study was approved by the Rutgers University Institutional Review Board on 10/27/13 with protocol #14-213M and expires 10/26/14.

Appendix B

T1 Informed Consent Form



Dr. Kathryn Greene
 Professor
 Rutgers, The State University of New Jersey
 4 Huntington Street • New Brunswick • New Jersey 08901-1071
 Phone: (848) 932-8715 • Fax: (732) 932-6916
 Email: klgreene@rutgers.edu

You are invited to participate in a research study on engaging in strength and balance exercise that is being conducted by Danielle Catona, M.A., who is a doctoral candidate and Kathryn Greene, Ph.D., who is a professor in the Department of Communication at Rutgers University. The purpose of this research is to develop an intervention that helps older adults through planning pro-strength and balance exercise messages.

Approximately 100 adults 65 and older will participate in the study, and participation will last approximately 15 to 30 minutes at Time 1 and less than 10 minutes at Time 2 (3 months later). The study involves talking with an interviewer. You will be asked about how you are doing physically in addition to talking about your views of participating in strength and balance exercise and planning a pro-strength and balance exercise message. If you indicate at any time that you want to stop the study, you will be thanked for participation and allowed to leave.

There are some minimal risks to participating in this study such as thinking about your current health status including falls. Your responses will not be shared with anyone except for project staff. You may also refuse to answer questions.

You may not benefit directly from participation except for the \$10 gift card you receive on completion of the study at Time 1 and you will be entered in a raffle to win one of two \$50 gift cards you receive upon completion of the study at Time 2. The data collected may lead to increased understanding of how older adults view strength and balance exercise.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some link between your identity and your responses exists until the second data collection. Some of the information collected about you includes your name, phone number, age, gender, and race. We will keep this information protected by limiting access to the research data, keeping it in a secure location, keeping the list/link with your name and contact number in a safe, and destroying the link to your name as soon as Time 2 data collection (in 3 months) is complete. The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. After the data has been linked, all identifying information will be removed and the research will become anonymous (and not linked with your name).

If you have any questions about the study procedures, you may contact Dr. Greene at 848-932-8715. If you have any questions about your rights as a research subject, you may contact the Sponsored Programs Administrator at Rutgers University at:

Rutgers University Institutional Review Board for the Protection of Human Subjects
 Office of Research and Sponsored Programs, 3 Rutgers Plaza, New Brunswick, NJ 08901-8559
 Tel: (848) 932-0150 Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.

Sign below if you agree to participate in this research study:

Subject _____ Date _____

Principal Investigator _____ Date _____

Appendix B (continued)

Audiotaping Addendum

I understand that this study involves the audio taping of the interview. After the study is complete, neither my name nor any other identifying information will be associated with the audiotape or the transcript. On the researcher and her team will be permitted to listen to the tapes.

I understand that the tapes will be transcribed by the researcher and erased once the transcriptions are checked for accuracy. Transcripts may be reproduced in whole or in part for use in presentations or written products that result from this study. Neither my name nor any other identifying information (such as my voice) will be used in presentations or in written products resulting from the study.

Please check one of each pair of options.

- A. ☐ I consent to have my interview taped.
☐ I do not consent to have my interview taped.
- B. ☐ I consent to have my interview transcribed into written form.
☐ I do not consent to have my interview transcribed.
- C. ☐ I consent to the use of the written transcription in presentations and written products resulting from the study, provided that neither my name nor other identifying information will be associated with the transcript.
☐ I do not consent to the use of my written transcription in presentations or written products resulting from the study.

 Participant's Signature

 Date

I hereby agree to abide by the participant's above instructions.

 Investigator's Signature

 Date

This study was approved by the Rutgers University Institutional Review Board on 10/27/13 as protocol #14-213M and expires 10/26/14.

Appendix C

T2 Informed Consent

Hello, my name is Danielle Catona. I am a PhD student in the Department of Communication at Rutgers University, and I am conducting follow-up phone interviews for my dissertation research study on strength and balance exercise among older adults.

During the follow-up study, you will be asked to answer some questions about how you are doing physically in addition to talking about your views of participating in strength and balance exercise. The follow-up interview was designed to be approximately 10 minutes in length.

The follow-up study involves the audio taping of the interview. After the study is complete, neither your name nor any other identifying information will be associated with the audiotape or the transcript. Only my research team and I will be permitted to listen to the tapes.

Are there any questions about what I have just explained?

Are you willing to participate in this follow-up interview?

Are you willing to be tape recorded?

Appendix D

Intervention Condition: Idea Generation and Message Planning Combined

I'm going to ask you some questions about how your peers view strength and balance exercise.

Questions:

Earlier in the interview, you indicated that you believe the majority of people your age [do or do NOT] participate in strength and balance exercise.

- Why do some older adults participate in strength and balance exercise?
- Why do some older adults NOT participate in strength and balance exercise?

Probes

- What are some benefits of participating in strength and balance exercise?
- What are some goals that can be achieved by participating in strength and balance exercise?
- What are some reasons you could use to explain why older adults should do strength and balance exercise?

Your goal is to plan a message like a poster that persuades older adults to participate in strength and balance exercise.

Questions:

- Choose the best reason for promoting strength and balance exercise. What would it be?
- Who are the people in your poster and why?
- What is the setting for your poster and why?

Appendix D (continued)

Probes

- What would you include in the poster to appeal to older adults?/What specifically in poster tells you it is for older adults?
- How would you portray older adults?
- What activity would older adults be doing?

Appendix E

Intervention Condition: Idea Generation

I'm going to ask you some questions about how your peers view strength and balance exercise.

Questions:

Earlier in the interview, you indicated that you believe the majority of people your age [do or do NOT] participate in strength and balance exercise.

- Why do some older adults participate in strength and balance exercise?
- Why do some older adults NOT participate in strength and balance exercise?

Probes

- What are some benefits of participating in strength and balance exercise?
- What are some goals that can be achieved by participating in strength and balance exercise?
- What are some reasons you could use to explain why older adults should do strength and balance exercise?

Appendix F

Intervention Condition: Message Planning

Your goal is to plan a message like a poster that persuades older adults to participate in strength and balance exercise.

Questions:

- Choose the best reason for promoting strength and balance exercise. What would it be?
- Who are the people in your poster and why?
- What is the setting for your poster and why?

Probes

- What would you include in the poster to appeal to older adults?/What specifically in poster tells you it is for older adults?
- How would you portray older adults?
- What activity would older adults be doing?

Appendix G

Intervention Condition: Standard Care

Here's an information packet from the National Institutes of Health (NIH). Please take a few minutes to read through the packet. I'll wait while you finish reading the packet, and then I will ask you the remaining interview questions.

Appendix H

Standard Care Information Packet

Exercise: Benefits of Exercise

Health Benefits

One of the Healthiest Things You Can Do

Like most people, you've probably heard that physical activity and exercise are good for you. In fact, being physically active on a regular basis is one of the healthiest things you can do for yourself. Studies have shown that exercise provides many health benefits and that older adults can gain a lot by staying physically active. Even moderate exercise and physical activity can improve the health of people who are frail or who have diseases that accompany aging.

Being physically active can also help you stay strong and fit enough to keep doing the things you like to do as you get older. Making exercise and physical activity a regular part of your life can improve your health and help you maintain your independence as you age.

Be as Active as Possible

Regular physical activity and exercise are important to the physical and mental health of almost everyone, including older adults. Staying physically active and exercising regularly can produce long-term health benefits and even improve health for some older people who already have diseases and disabilities. That's why health experts say that older adults should aim to be as active as possible.

Appendix H (continued)

Being Inactive Can Be Risky

Although exercise and physical activity are among the healthiest things you can do for yourself, some older adults are reluctant to exercise. Some are afraid that exercise will be too hard or that physical activity will harm them. Others might think they have to join a gym or have special equipment. Yet, studies show that "taking it easy" is risky. For the most part, when older people lose their ability to do things on their own, it doesn't happen just because they've aged. It's usually because they're not active.

According to the U.S. Surgeon General's Report on Physical Activity and Health, inactive people are nearly twice as likely to develop heart disease as those who are more active.

Lack of physical activity also can lead to more visits to the doctor, more hospitalizations, and more use of medicines for a variety of illnesses.

Prevent or Delay Disease

Scientists have found that staying physically active and exercising regularly can help prevent or delay many diseases and disabilities. In some cases, exercise is an effective treatment for many chronic conditions. For example, studies show that people with arthritis, heart disease, or diabetes benefit from regular exercise. Exercise also helps people with high blood pressure, balance problems, or difficulty walking.

Manage Stress, Improve Mood

Regular, moderate physical activity can help manage stress and improve your mood.

And, being active on a regular basis may help reduce feelings of depression. Studies also suggest that exercise can improve or maintain some aspects of cognitive function, such as

Appendix H (continued)

your ability to shift quickly between tasks, plan an activity, and ignore irrelevant information.

Physical Activity or Exercise?

Some people may wonder what the difference is between physical activity and exercise. Physical activities are activities that get your body moving such as gardening, walking the dog and taking the stairs instead of the elevator. Exercise is a form of physical activity that is specifically planned, structured, and repetitive such as weight training, tai chi, or an aerobics class. Including both in your life will provide you with health benefits that can help you feel better and enjoy life more as you age.

Benefits for Everyday Life

Staying Strong, Fit, and Independent

Exercise and physical activity are great ways to have fun, be with friends and family, and enjoy the outdoors. But regular exercise and physical activity can also have a direct impact on your everyday life. The benefits they provide can help you stay strong and fit enough to perform your daily activities, get around, and maintain your independence. Older adults who are inactive lose ground in four areas that are important for staying healthy and independent: endurance, strength, balance, and flexibility. Research suggests that you can maintain or at least partially restore these four areas through exercise and physical activity and that doing so improves fitness.

Appendix H (continued)

Four Types of Exercises to Try

For example, increasing your endurance will make it easier for you to walk farther, faster, and uphill. Strengthening your muscles will make you stronger. Improving your balance can help your sense of body control, and increasing flexibility helps keep your body limber and flexible. The goal is to be creative and choose from each of the four types -- endurance, strength, balance, and flexibility. Mixing it up will help you reap the benefits of each type of exercise, as well as reduce the risk for injury.

How Increased Endurance Helps You

Endurance, or aerobic, activities like brisk walking or swimming increase your breathing and heart rate and improve the health of your heart, lungs and circulatory system. They can make it easier for you to

- push your grandchildren on the swings
- vacuum
- work in the garden
- rake leaves
- play a sport

How Increased Muscle Strength Helps You

Strength exercises like lifting weights and using resistance bands can increase muscle strength. Lower-body strength exercises also will improve your balance. Increased muscle strength can maintain your ability to

Appendix H (continued)

- climb stairs
- carry groceries
- open jars
- carry a full laundry basket from the basement to the second floor
- carry your smaller grandchildren
- lift bags of mulch in the garden

How Good Balance Helps You

Balance exercises like tai chi can improve your ability to control and maintain your body's position, whether you are moving or still. Good balance is important to help prevent falls and avoid the disability that may result from falling. Improving your balance can help you

- prevent falls
- stand on tiptoe to reach something on the top shelf
- walk up and down the stairs
- walk on an uneven sidewalk without falling

How Being Flexible Helps You

Flexibility, or stretching, exercises can help your body stay flexible and limber, which gives you more freedom of movement for your regular physical activity as well as for your everyday activities. Stretching exercises can improve your flexibility but will not improve your endurance or strength.

Improving your flexibility makes it easier for you to

Appendix H (continued)

- look over your shoulder to see what's behind you as you back the car out of the driveway
- make the bed
- bend over to tie your shoes
- reach for a food item on a kitchen shelf
- pull a sweater on over your head
- swing a golf club

It's Never Too Late to Start

Exercise and physical activity can have a positive effect on your everyday life. Even if you think you're too old or too out of shape to exercise, becoming active on a regular basis will give you more energy and the ability to do things more easily, faster, and for longer than before. If you're already active, keep up the good work. If you don't exercise now, it's never too late to start.

Frequently Asked Questions

1. What can exercise do for me?

Making exercise a regular part of your daily routine will have a positive impact on your health and your quality of life as you get older. Staying physically active and exercising regularly can improve mood and relieve depression, and prevent or delay some types of cancer, heart disease, and diabetes. Long-term, regular exercise can even improve health for some older people who already have diseases and disabilities.

Appendix H (continued)

Being physically active can also help you stay strong and fit enough to keep doing the things you like to do and stay independent as you get older. For example, improving endurance can make it easier to work in the garden. Increasing muscle strength can make it easier to lift a grandchild or climb stairs. Improving balance helps prevent falls, and being more flexible can help you reach for items on kitchen shelves.

2. What is the difference between exercise and physical activity?

Exercise is a form of physical activity that is planned, structured, and repetitive such as weight training, tai chi, or an aerobics class. Physical activities are activities that get your body moving such as gardening, walking the dog and taking the stairs instead of the elevator. Including both in your life will provide you with health benefits that can help you feel better and enjoy life more as you age

3. How can increasing my endurance help me with everyday activities?

Endurance, or aerobic, activities like brisk walking or swimming increase your breathing and heart rate and improve the health of your heart, lungs and circulatory system.

Increasing your endurance can make it easier for you to

- push your grandchildren on the swings
- vacuum
- work in the garden
- rake leaves
- play a sport

4. How can increasing my muscle strength help me with everyday activities?

Appendix H (continued)

Strength exercises like lifting weights and using resistance bands can increase muscle strength. Lower-body strength exercises also will improve your balance. Increased muscle strength can maintain your ability to

- climb stairs
- carry groceries
- open jars
- carry a full laundry basket from the basement to the second floor
- carry your smaller grandchildren
- lift bags of mulch in the garden

5. How can improving my balance help me with everyday activities?

Balance exercises like tai chi can improve your ability to control and maintain your body's position, whether you are moving or still. Good balance is important to help prevent falls and avoid the disability that may result from falling. Improving your balance can help you

- prevent falls
- stand on tiptoe to reach something on the top shelf
- walk up and down the stairs
- walk on an uneven sidewalk without falling

6. How can increasing my flexibility help me with everyday activities?

Appendix H (continued)

Flexibility, or stretching, exercises can help your body stay flexible and limber, which gives you more freedom of movement for your regular physical activity as well as for your everyday activities. Improving your flexibility makes it easier for you to

- look over your shoulder to see what's behind you as you back the car out of the driveway
- make the bed
- bend over to tie your shoes
- reach for a food item on a kitchen shelf
- pull a sweater on over your head
- swing a golf club

Appendix I

Risk Factor Assessment (created by the author)

During the past three months I have:

1. Received any health diagnoses? Managed any health condition? Taken medication for any health condition? If yes, which condition?
2. Had difficulty walking or standing?
3. Used a mobility device (cane, walker) or had to hold onto things when you walk?
4. Felt unsteady on your feet, weak, or dizzy?
5. Taken prescribed medication daily?
6. Fallen?
 - a. If yes, how many times? Any injuries?
7. Participated in strength exercise (record base stage of change)
 - a. If yes, what type of strength exercise and how often (frequency per week and duration)?
8. Participated in balance exercise (record base stage of change)
 - a. If yes, what type of balance exercise and how often (frequency per week and duration)?

Descriptions for base stage of change (Marcus, Selby, Niaura, & Rossi, 1992)

- Yes, I have been for MORE than 6 months (maintenance).
- Yes, I have been for LESS than 6 months (action).
- No, but I intend to in the next 30 days (preparation).
- No, but I intend to in the next 6 months (contemplation).
- No, and I do NOT intend to in the next 6 months (precontemplation).

Appendix J

Falls Efficacy Scale-International (FES-I, Yardley et al., 2005)

(1 = Not at all worried to 5 = Very worried)

1. Getting dressed or undressed.
2. Taking a bath or shower.
3. Getting in or out of a chair.
4. Going up or down stairs.
5. Reaching for something above your head or on the ground.
6. Standing on a ladder, step stool, chair.
7. Walking up or down a slope.
8. Going out to a social event (e.g. religious service, family gathering or club meeting).

Appendix K

Consequences of Falling Questionnaire (Yardley & Smith, 2002)

Loss of Functional Independence (1 = Strongly Disagree to 5 = Strongly Agree)

1. I will be helpless.
2. I will not be able to cope alone.
3. I will lose my independence.
4. I will be severely injured.
5. I will cause a nuisance.

Damage to Identity (1 = Strongly Disagree to 5 = Strongly Agree)

1. I will be embarrassed.
2. I will feel foolish.

Appendix L

Perceived Benefits (created by the author)

Pretest (1 = Strongly Disagree to 5 = Strongly Agree)

1. Strength and balance exercise is good for my health.
2. Strength and balance exercise lets me have contact with friends and people I enjoy.
3. Strength and balance exercise gives me a sense of personal accomplishment.
4. Strength and balance exercise helps me maintain my independence.
5. Strength and balance exercise is a good way for me to meet new people.
6. Strength and balance exercise improves how I see myself.
7. Strength and balance exercise helps me continue to be active.
8. Strength and balance exercise increases my acceptance by others.

Immediate and Delayed Posttest (1 = Strongly Disagree to 5 = Strongly Agree)

1. Strength and balance exercise is good for my health.
2. Strength and balance exercise is good for my social life.
3. Strength and balance exercise gives me a sense of personal accomplishment.

Appendix M

Perceptions of Norms (created by the author)

Pretest (1 = Strongly Disagree to 5 = Strongly Agree)

Subjective Norm

1. My doctor encourages me to do strength and balance exercise.
2. My family encourages me to do strength and balance exercise.
3. My friends encourage me to do strength and balance exercise.

Descriptive Norm

4. Most other people my age are doing strength and balance exercise.

Injunctive Norm

5. People my age are expected to do strength and balance exercise.

Immediate and Delayed Posttest (1 = Strongly Disagree to 5 = Strongly Agree)

Subjective Norm

1. Other people whose opinions matter to me (e.g. family, friends, doctor) would encourage me to do strength and balance exercise.

Descriptive Norm

2. Most other people my age are doing strength and balance exercise.

Injunctive Norm

3. People my age are expected to do strength and balance exercise.

Appendix N

Strength and Balance Exercise-related Intent to Change (adapted from Marcus et al., 1992)

Immediate and Delayed Posttest: Strength Exercise Intention

Please describe what, if anything, you plan on doing for strength exercise in the next 3 months. How often would you like to do it? [scored based on levels below]

Immediate and Delayed Posttest: Balance Exercise Intention

Please describe what, if anything, you plan on doing for balance exercise in the next 3 months. How often would you like to do it? [scored based on levels below]

Descriptions for stage of change categorization (score 1-5)

- I plan to continue to do strength and balance exercise (maintenance = 5).
- I plan to start doing strength and balance exercise today (action = 4)
- I plan to start doing strength and balance exercise within the next month (preparation = 3).
- I plan to start doing strength and balance exercise within the next three months (contemplation = 2).
- I do not plan to start doing strength and balance exercise (precontemplation = 1).

Appendix O

Motivation to Process Information (adapted from Greene et al., 2012)

Immediate Posttest

Involvement (1 = Strongly Disagree to 5 = Strongly Agree)

1. The activity was interesting to me.
2. I got easily distracted during the activity (R).
3. This activity material was relevant to me/my situation.

Novelty (1 = Strongly Disagree to 5 = Strongly Agree)

1. I've never done anything like what I did in the activity today.
2. The activity was different than health/wellness information I usually learn about.
3. The activity was unique.

Perceived Gain (1 = Not at all to 5 = A Lot)

1. The activity provided new information about strength and balance exercise.
2. The activity made me think about my strength and balance exercise behavior.
3. The activity made me think about my peers' strength and balance exercise behavior.

Reflectiveness (1 = Strongly Disagree to 5 = Strongly Agree)

1. The activity made me think about the importance of strength and balance exercises. _____
2. The activity made me think about reasons for making changes. _____
3. The activity made me think about specific things I can do about my strength and balance exercises. _____

Appendix O (continued)

4. The activity helped me figure out how I can do strength and balance exercise regularly. _____
5. The activity encouraged me to maintain my strength and balance exercise routine.

(R) item is reverse-coded

Delayed Posttest

1. What did you think about/like/remember most about the activity we did a few months ago?

Appendix P

Interpersonal Communication (created by the author)

Delayed Posttest

1. Have you talked to anyone about strength or balance exercise in the last few months? If yes, who? What did you discuss?
2. Have you talked to anyone about the activity we did a few months ago? If yes, who? What did you discuss?