Published in final edited form as:

Am J Health Promot. 2016 November ; 30(8): 638–644. doi:10.4278/ajhp.130522-ARB-265.

Combining Motivational and Physical Intervention Components to Promote Fall-Reducing Physical Activity Among Community-Dwelling Older Adults: A Feasibility Study

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Abstract

Purpose—To assess the feasibility of a new intervention, Ready~Steady, in terms of demand, acceptability, implementation, and limited efficacy.

Design—Randomized controlled trial; repeated measures.

Setting—Two rural communities in Itasca County, Minnesota.

Subjects—Thirty participants were randomized to an intervention (n = 16) or attention-control (n = 14) group.

Intervention—Ready~Steady combined two components: (1) motivational (motivational support, social network support, empowering education), and (2) fall-reducing physical activities (PAs; guidance to practice leg-strengthening, balance, and flexibility activities and walking).

Measures—Acceptability questionnaire and Indices of Procedural Consistency (investigator developed), Community Health Activity Model Program for Seniors Questionnaire (confirmed with accelerometry), Short Physical Performance Battery, Perceived Environmental Support Scale, Social Support for Exercise Questionnaire, Goal Attainment Scale, Index of Readiness, and Index of Self-Regulation.

Analysis—Descriptive statistics and a marginal approach to repeated-measures analysis of variance, using mixed-model procedures.

Results—Attrition was 7% and mean attendance was 7.2 of 8 sessions, participants evaluated Ready~Steady as acceptable, and implementation fidelity was good. The intervention group improved significantly more than the attention-control group in PA behavior, $F_{1,27} = 11.92$, $p = .$

002; fall risk (functional balance and strength), $F_{1,27} = 14.89$, $p = .001$; support for exercise from friends, $F_{1,27} = 11.44$, $p = .002$; and self-regulation, $F_{1,26} = 38.82$, $p < .005$.

Conclusion—The Ready~Steady intervention was feasible as evidenced by low attrition and good attendance and implementation, as well as positive effects on targeted outcomes and theoretical mechanisms of change.

Keywords

Accidental Falls; Physical Activity; Motivation; Wellness Programs; Intervention Studies; Prevention Research; Manuscript format: research, quantitative evaluation; Research purpose: feasibility study; Study design: randomized controlled trial; Outcome measure: physical activity behavior; Setting: rural communities; Health focus: physical activity, fall prevention; Strategy: skill building/behavioral change; Target population age: seniors; Target population circumstances: community-dwelling

INTRODUCTION

Age-related reduction in muscle mass and physical function can be attenuated with safe leg-strengthening, balance, and walking activities that in turn reduce falls across older adult populations.^{1,2} Despite this knowledge, rates of injurious falls continue to increase,³ and most people over the age of 65 do not engage in fall-reducing physical activities (PAs) as recommended.⁴ Limited motivation is an important contributor to low PA levels.

Motivation is a key determinant of PA behavior, for which certain facilitators and constraints are unique in older adults.⁵ Facilitators range from desires to protect health and function to PA experiences that feel pleasurable, beneficial, and socially supportive.⁶ However, older adults' motivation can be undermined by a range of social contextual forces, including limited support from friends, family, and providers and ageist attitudes and messages that treat people as if they are frail and reinforce the belief that inactivity and falls are an inevitable part of aging, illness, and disability.⁵ Given these forces, older adults tend to report beliefs that constrain their motivation for PA.⁷ For example, many older adults describe fearing vulnerability and, as a result, restrict their PA. Others have limited confidence or believe that chronic illness prohibits PA. Still others believe that PA levels are adequate or prevention strategies are not personally relevant. Although the knowledge about factors influencing motivation among older adults has increased over the past several decades, intervention content supporting motivation for behavioral change has been formally evaluated in very few fall-reducing PA interventions.⁸

A new intervention (Ready~Steady) was designed to begin bridging this gap by addressing older adults' motivation to initiate and maintain fall-reducing PA. Ready~Steady includes motivational and physical components, using intervention and evaluation strategies guided by theory,⁹ the wellness motivation theory (WMT). The WMT posits that attention to social-contextual resources and behavioral-change processes facilitates health-related action, such as fall-reducing PA.¹⁰ Constructs in the WMT including social resources, environmental resources, self-knowledge, readiness, and self-regulation represent theoretically predicted mechanisms of change (TMC), or processes through which Ready~Steady is expected to effect change.

Ready~Steady is a complex intervention that uses a new approach to promoting fall-reducing PA and thus warrants investigation of its feasibility to determine if further development is appropriate.¹¹ Primary aims of this study were to (1) assess the demand (attrition and attendance), acceptability, and implementation of Ready~Steady and (2) evaluate its effects ("limited efficacy") on behavioral (PA) and health (fall risk) outcomes, as well as TMC. Convenience sampling and absence of long-term follow-up in this and other similar feasibility studies permits evaluating "limited efficacy" and a new intervention's potential for being successful.¹²

METHODS

Design

Conducted from November 2011 through April 2012, this study used a randomized controlled trial design with two treatment groups, intervention and attention control, to evaluate the 8-week Ready~Steady intervention. A research assistant (RA), blinded to assignment, collected data using standardized procedures 1 week pretreatment (T1) and 1 week posttreatment (T2). Community partners, including older adults, representatives from the county's committee on aging and service agencies, and health care providers, gave advice about recruitment, implementation, and dissemination strategies. Institutional review boards at Arizona State University and Essentia Rural Health Institute approved the study protocol.

Rural, community-dwelling, older adults were eligible if they were ≥74 years of age and had PA levels below recommended guidelines for aerobic and muscle-strengthening activities.¹ Random assignment to treatment group was made using computer-generated numbers. Participants were given \$10 after both T1 and T2 data collection sessions.

Intervention

Intervention and control participants received comparable contact, based on recommendations from community stakeholders for maximizing attention and retention, consisting of eight weekly small-group sessions (four to seven participants), lasting 90 minutes each. The interventionist was a board-certified gerontological nurse practitioner (primary author) trained to deliver content to both treatment groups. She used a manual to guide the delivery of content to both treatment groups.

Control participants received information about health and wellness topics: falls, eye health, home and environmental safety, medication safety, sleep, hearing, hydration and nutrition, and foot health.

Intervention participants received Ready~Steady; see Figure for details. Ready~Steady's motivational component included three facets: social network support, motivational support, and empowering education.¹⁰ A mobile health application (mHealth app) augmented intervention delivery using data from a triaxial accelerometer, built into its iOS platform, to populate its display with messages and feedback. The mHealth app also served as a secondary measure for the behavior outcome of PA (total weekly duration). Descriptions of the mHealth app's design, development, evaluation, and use are in another publication.¹³ Otago,¹⁴ an evidence-based fall-reducing PA protocol, provided a basis for the physical

component of Ready~Steady. Otago includes common leg-strengthening (5), flexibility (5), and balance-challenging (12) exercises as well as key principles that guide interventionists. The first principle is that all exercises are individually tailored according to ability and preference. The second is that the individually tailored programs gradually become more difficult with time and practice. The third is that walking to increase physical capacity complements leg-strengthening and balance-challenging exercises. Finally, older adults can master the exercises in Otago with initial guidance and periodic check-ins from an instructor.¹⁴ In this study, Otago was adapted for delivery to small groups. Each small-group session included time (45–60 minutes) for demonstrating, individualizing, and practicing Otago exercises (see the Figure).

Measures

The RA collected data for (1) demographic, fall risk, and baseline limited-efficacy measures at T1 and (2) acceptability and limited-efficacy measures at T2. The interventionist and RA collected data representing demand and implementation measures throughout delivery.

Demand, Acceptability, and Implementation—Demand was measured using attendance and attrition records. Acceptability was measured using an investigator-developed four-item questionnaire. Items addressed (1) the intervention's organization, (2) its usefulness in supporting PA behavior, (3) the development of new ideas for PA, and (4) the integration of fall-reducing PA into everyday life. Response scales for each item ranged from 1 (strongly disagree) to 5 (strongly agree). The interventionist and an external reviewer monitored implementation through field notes and an investigator-developed index of procedural consistency (IPC). The interventionist kept field notes of each small-group session, outlining activities facilitated and her observations of participants' receipt and enactment of intervention content. The IPC consisted of items for each intervention session objective, indicating the extent to which each was met. Response scales ranged from 1 (not at all) to 3 (very well). The interventionist assessed IPC after each session. Each small-group session was audiotape recorded, which enabled the external reviewer, an advanced-practice registered nurse trained in this intervention, to also assess IPC. She randomly selected 25% of the audiotapes to review. The interventionist and research team reviewed the IPC and feedback from the external reviewer on a regular basis.

Behavior and Health Outcomes—The behavior outcome of PA (total weekly duration) was measured using the Community Health Activities Model Program for Seniors questionnaire (CHAMPS),¹⁵ which includes 50 items reflecting a range of PAs (light and moderate/vigorous intensities) that older adults may or may not engage in. Participants indicated if they engaged in an activity (one activity per item) over the last 4 weeks, and if so, how many times and hours per week they usually engaged in that activity. All CHAMPS subscales including duration (total hours per week) have shown statistically significant sensitivity to changes postintervention. Accelerometer data from the mHealth app was used to confirm CHAMPS, descriptions of which are in another publication.¹³ The health outcome of fall risk (functional balance and strength) was measured using the Short Physical Performance Battery (SPPB).¹⁶ The SPPB assesses physical function using timed chair stands, balance stands (side by side, semitandem, tandem), and a 4-m walk. Studies support

the validity of SPPB's scores (gradient 0–12) to predict disability and functional limitations in community-dwelling older adults.¹⁶

Theoretical Mechanisms of Change—Social support and environmental support were measured using the Social Support and Exercise Survey (SSES) and the Perceived Environmental Support Scale (PESS). The SSES¹⁷ includes 13 items reflecting the level of support people believe they receive for PA from friends and family. For example, participants are asked how often a family member or friend offers to exercise with them, gives them encouragement to continue an exercise program, or discusses exercise with them. Response scales for each item ranges from 1 (none) to 5 (very often). Psychometric tests of SSES in studies targeting older adults provided evidence of internal-consistency reliability (Cronbach α = .84–.90).¹⁸ The PESS¹⁹ includes 14 items addressing community resources used for PA and perceptions of neighborhood characteristics (e.g., safety, sidewalks, hills). It has demonstrated test-retest correlations ranging from r = .80 to r = .68 for items pertaining to the use of community resources and perceived neighborhood characteristics respectively.¹⁹

Self-knowledge, readiness, and self-regulation were measured using the Goal Attainment Scale (GAS), the Index of Readiness (IR), and the Index of Self-Regulation (ISR). The GAS²⁰ is used to help people develop personally meaningful goals linked to a relevant topic, which in this study included health, PA, medication, and safety. Attainment scales are established for each goal ranging from –2 (least favorable outcome) to +2 (most favorable outcome). Composite scores are calculated into standardized T scores prior to analyses.²⁰ Researchers in geriatric settings describe this person-centered approach as being sensitive to changes in behavior.²¹ The IR²² includes nine items reflecting these aspects of initiating behavioral change: reevaluation, acknowledgment of barriers, and goal commitment. The ISR²³ has nine items reflecting these aspects of maintaining a healthy behavior: focusing on the personal benefits of the behavior, self-monitoring and assessing participation in the behavior, and integration of the behavior into everyday life. Response scales for each item in the IR and the ISR ranges from 1 (strongly disagree) to 5 (strongly agree). Initial psychometric testing provided evidence of the internal-consistency reliability in older adults of IR (total scale Cronbach α = .89)²² and ISR (total scale Cronbach α = .87).²³

Data Analysis

Data were summarized using descriptive statistics. Treatment group differences in demographic and fall risk characteristics were assessed using appropriate parametric and nonparametric tests.

A marginal approach to repeated-measures analysis of variance (ANOVA), using mixed-model procedures, was conducted to assess whether there was change over time (T1, T2) in outcomes and TMC, and if that change over time differed by treatment group. This approach enabled intent-to-treat analysis. Assumptions were met with the exception of significant Levene's tests of variance equality in T2 measures of the SPPB, requiring analyses with an unequal-variance ANOVA; results did not change. When repeated-measures ANOVA revealed statistically significant interactive or main effects, follow-up analyses were conducted of simple main effects and planned comparisons respectively. Adjustments for

multiple comparisons were made using Bonferroni corrections. Correlation values were calculated for total weekly PA minutes measured via CHAMPS and accelerometer data,¹³ using Spearman's rank correlation coefficient. Effect sizes were assessed using Cohen d.

RESULTS

Of the 43 people screened, 30 enrolled and 2 dropped out of the study, resulting in a sample size of 28. Most participants were white (96.7%), female (93.3%), and with 12 years of education (75.3%), and their mean age was 83.6 years ($SD = 4.7$). Participants reported the following fall risks: 1 fall in the last year (40%), using a cane (53.3%), difficulty walking (36.7%), and balance problems (36.7%). No significant baseline differences were detected in demographic or fall risk variables between intervention and control groups.

Demand, Acceptability, and Implementation

Mean attendance among participants in intervention and control groups respectively was 7.3 ($SD = .82$) and 7.1 ($SD = .86$) out of 8 sessions. Mean ratings of intervention acceptability items ranged from 4.54 to 4.68. The IPC assessments showed that the intervention was delivered “very well” 87% of the time and “to a considerable degree” 13% of the time. Lower IPC ratings were associated with topics discussed for shorter or longer durations than anticipated.

Behavior and Health Outcomes

The Table summarizes means, standard errors, and effect sizes of outcomes and TMC. Significant group by time interactions on CHAMPS, $F_{1,26} = 5.09$, $p = .03$ (confirmed with accelerometer data, $F_{1,23} = 6.97$, $p = .01$), and on SPPB, $F_{1,26} = 6.58$, $p = .02$, show that change over time in PA behavior and fall risk differed by treatment group. Follow-up analyses of simple main effects showed the intervention group improved significantly more than the control group in CHAMPS, accelerometer, and SPPB measures, $F_{1,27} = 11.92$, $p = .002$, $F_{1,24} = 6.33$, $p = .02$, and $F_{1,27} = 14.89$, $p = .001$, respectively. The correlation of total PA as measured by CHAMPS and accelerometry was positive and became stronger between T1 and T2, T1 $r(25) = .33$, $p = .095$, and T2 $r(23) = .43$, $p = .03$.

Theoretical Mechanisms of Change

The number of intervention participants who used community resources, one domain of the PESS, increased from 5 (pre) to 13 (post), whereas the number of control participants remained similar: 4 (pre) and 5 (post). There were significant main effects of time on the SSES, friends, $F_{1,27} = 9.69$, $p = .004$, and family, $F_{1,26} = 5.99$, $p = .02$. Follow-up analyses of planned comparisons showed that the intervention group increased significantly more than the control group in SSES, friends, $F_{1,27} = 11.44$, $p = .002$, and both groups decreased, but not significantly, in SSES, family.

Significant group by time interactions on the GAS, $F_{1,27} = 8.44$, $p = .007$; the IR, $F_{1,26} = 4.19$, $p = .05$; and the ISR, $F_{1,26} = 26.69$, $p = .001$, showed that change over time in GAS, IR, and ISR differed by treatment group. Follow-up analyses of simple main effects showed significant improvements in GAS in both intervention, $F_{1,27} = 55.98$, $p = .005$, and control

groups, $F_{1,27}=9.03$, $p=.006$, and that the intervention group improved significantly more than the control group in IR, $F_{1,26} = 13.99$, $p = .01$, and ISR, $F_{1,26} = 38.82$, $p < .005$.

DISCUSSION

This purpose of this study was to assess the feasibility of a new intervention, Ready~Steady, in terms of demand, acceptability, implementation, and limited efficacy. Four main findings were evident. First, demand was very good, as evidenced by high attendance and low attrition rates. Second, participants in Ready~Steady evaluated it as acceptable. Third, the intervention was implemented as planned with few exceptions, as evidenced through field notes and IPC. Finally, as evidenced through repeated-measures analyses of outcome and TMC effects, the Ready~Steady intervention helped 75% of participants to increase their PA behavior and to improve their functional balance and strength. It also helped participants use community resources (81%), and increase their perceived social support from friends (62%), their readiness (75%), and their self-regulation (75%) for engaging in PA.

Assessing demand, acceptability, and implementation increased the understanding of participants' use of Ready~Steady and their satisfaction with its organization, understandability, and usefulness as well as intervention delivery, receipt, and enactment. Attendance and attrition (demand) in this study were good, 90% and 7% respectively, when compared to other reports of interventions promoting fall-reducing PA that included these parameters. Approximately 11% of these reports include details about user acceptability and implementation fidelity.⁸ Participants' acceptability ratings support Ready~Steady's organization and content. Also, their narrative comments for improving the intervention, such as meeting twice weekly for more than 8 weeks, and including people younger than 74 (e.g., 70), will support future intervention development. Monitoring implementation throughout intervention delivery helped to identify and correct protocol drift and confirm ultimate implementation fidelity. These feasibility findings may have been influenced by advice from community partners. Their suggestions contributed to the contextual relevance of research processes, such as delivering the intervention in accessible community centers during midday hours, ensuring treatment groups received comparable attention, and framing program messages positively (e.g., emphasizing wellness, mobility, and independence and not fall risk). Initial understanding of Ready~Steady's demand, acceptability, and implementation will be critical to its continued development, testing, and translation into practice.^{11,12}

Modest improvements in observed PA and fall risk measures, including CHAMPS, accelerometers, and SPPB, are consistent with reports of fall-reducing PA interventions that include measures of PA behavior and fall risk.⁸ There is substantial evidence supporting the basis for Ready~Steady's physical component, Otago, delivered to community-dwelling individuals by physical therapists and trained nurses.²⁴ Our findings also add to growing evidence of Otago's positive effects on fall risk when delivered to small groups.²⁵ Understanding if these delivery methods will work in diverse contexts over time requires investigating questions about additional feasibility foci such as practicality, adaptability, integration, and expansion.¹² To make this intervention useful in practice, processes through which PA behavior changes are expected to change (TMC) also need to be explicated.

Modest improvements observed in many TMC measures, including the use of community resources (one domain in the PESS), SSES from friends, GAS, IR, and ISR, are consistent with interventions similar to Ready~Steady's motivational component.²⁶ Field notes from intervention sessions in this study indicated that strategies and the outcomes and TMC they targeted were interdependent. For example, many participants refined their goals; identified tools and strategies to support their goals and plans, be they personal, social, or environmental; and problem-solved anticipated barriers to carrying out their plans. They compared the feedback received from mHealth apps, reflecting on their varied PA patterns, goal attainment, and perceived benefits of improved leg strength and balance. These findings support recommendations guiding clinicians and public health professionals to promote PA using strategies that facilitate older adults' ability to personalize the benefits of PA, set personal goals, and monitor their progress.¹ Using a behavioral change theory (WMT) to guide Ready~Steady's design, implementation, and evaluation is an initial step toward advancing a practical science specifying why, how, and under what conditions its strategies work. In turn, knowledge generated from this approach can improve practice and enable theory testing and refinement.⁹

This feasibility study had several limitations. First, the confidence intervals were wide, indicating there was large variability in the study sample or that the study sample size was too small. In turn, this limits the ability to precisely estimate effect size and to make inferences about intervention efficacy, the mediating effects of TMC, and the potential moderating effects of variables such as age, level of fall risk, and coexisting chronic conditions. Also, the study design prohibited evaluating each facet in the motivational component and their contributions to intervention effects. Future development should include designs that enable incremental testing of intervention components and facets as a basis for programmatically improving effectiveness, efficiency, and practicality.²⁷ Finally, the study design did not include long-term follow-up strategies needed to ascertain the effects of Ready~Steady on the maintenance of fall-reducing PA behaviors and the rate of injurious falls.

Despite these limiting factors, this study is the first to demonstrate the feasibility of a theory-guided intervention to promote fall-reducing PA that combines a motivational component with an established physical component. With the increasing incidence of injurious falls and persistently low levels of PA, many older adults would benefit from fall-reducing PA interventions that incorporate a component addressing motivation. Findings in this study support continued efforts to pursue further development and testing of the Ready~Steady intervention.

Acknowledgments

This project was supported by the John A. Hartford Foundation, the Building Academic Geriatric Nursing Capacity Pre-Doctoral Scholarship Program, and the National Institutes of Health/National Institute of Nursing Research Grant #F31NR01235.

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SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Most people over the age of 65 do not engage in recommended PA, including fall-reducing leg-strengthening and balance exercises. Motivation, a key determinant for PA behavior, has not been evaluated within interventions designed to promote fall-reducing PA.

What does this article add?

This study supports the feasibility of a new 8-week intervention (Ready~Steady) that combines a motivational component with an established fall-reducing PA component (Otago) delivered during small-group sessions.

What are the implications for health promotion practice or research?

Further development and testing are required of motivational components within fall prevention interventions, such as Ready~Steady, to establish a practical science that, in turn, can serve as a basis for translating these strategies into practice.

Motivational Component ¹⁰		Feasibility Foci ¹² • Measures	
Intervention Facets • Strategies	Theoretical Constructs (TMC) • Intervention Goals	Limited-efficacy	
Social Network Support • Discuss /model ways to support others for being physically active (PA) • Discuss ways to receive support from friends, family, providers for PA	Social Support • Increase social support for physical activity (PA)	• <i>Social Support for Exercise</i> ¹⁷	Demand • Attendance • Attrition • <i>Attendance Logs</i>
Empowering Education • Identify community and personal resources that support new PA • Identify & problem solve community/environment barriers to PA • Discuss being champions for change • Discuss strategies for shaping community/ environment	Environmental Support • Increase awareness creation and use of community / environmental resources	• <i>Perceived Environmental Support Scale</i> ¹⁹	
Motivational Support • Discuss benefits of fall-reducing PA • Analyze barriers to being active and strategies for overcoming • Set personally meaningful, realistic & specific goals • Develop plans to reach goals • Self-track, self-evaluate, self-regulate (mHealth app) • Discuss time management for PA • Discuss turning normally inactive events into PA • Replace negative thoughts about PA with positive • Discuss anticipating & overcoming setbacks • Discuss view of self as an active person • Celebrate progress & success in program	Self-Knowledge • Use self-knowledge (values, hopes, fears) to • Create personally meaningful goals for activity and plans to support those goals Readiness • Appraise readiness for action Self-Regulation • Increase self-regulation skills	• <i>Goal Attainment Scale</i> ²⁰ • <i>Index of Readiness</i> ²² • <i>Index of Self Regulation</i> ²³	
Physical Component			
Intervention Facets • Strategies	Theoretical Constructs (TMC) ¹⁰ • Intervention Goals		
Otago Protocol ¹⁴ Individualize recommendations based on ability and performance Gradually progress up to 4 levels of difficulty: • 5 strengthening (knee extensor; knee flexor; hip abductor; ankle plantarflexors; ankle dorsiflexors) • Encourage practicing 3 times per week • 12 balance retraining (knee bends; backwards walking; walking and turning around; sideways walking; tandem stance; tandem walk; one leg stand; heel walking; toe walk; heel-toe backward walk; sit to stand; stair walking) • Encourage practicing 3-7 times per week • 5 flexibility (head, neck, back extension, trunk, ankle movement) • Encourage practicing 3-7 times per week • Walking (promote 30 minutes most days / week (10 minute parts)	Behavior • Increase PA behavior Health • Reduce fall risk	• <i>Minutes of PA per week (CHAMPS)</i> ¹⁵ confirmed with <i>accelerometer data</i> ¹³ • <i>Short Physical Performance Battery</i> ¹⁶	Acceptability • <i>Participant's evaluation of Ready~Steady</i> Implementation Fidelity • Delineation/ specification of content • Observation of intervention delivery, receipt and enactment • <i>Investigator developed Index of Procedural Consistency</i> • Field Notes from meetings • External review

PA indicates physical activity; and CHAMPS, Community Health Activities Model Program for Seniors.

Figure.
Ready~Steady Intervention: Content, Wellness Motivation Theoretical Constructs (TMC), and Feasibility

Table

Outcomes and Theoretical Mechanisms of Change: Means, SEs, and Effect Sizes *

Variables	Mean (SE)				Effect Size Cohen d (95% Confidence Interval)
	Prestudy		Poststudy		
	Ready~Steady Intervention	Attention Control	Ready~Steady Intervention	Attention Control	
Behavioral outcome: physical activity behavior					
CHAMPS total h PA/wk	36.02 (3.90)	36.10 (4.19)	47.22 (3.90)	36.56 (4.19)	0.74 (0.03 to 1.58)
Accelerometer total min PA/d	111.38 (11.79)	137.89 (14.91)	137.05 (12.02)	120.81 (14.91)	0.40 (−0.36 to 1.14)
Health outcome: fall risk (functional balance and strength)					
Short physical performance battery	5.77 (0.53)	5.86 (0.56)	7.65 (0.54)	6.12 (0.58)	0.75 (0.09 to 1.64)
Theoretical mechanisms of change					
Goal attainment scale	44.40 (1.84)	46.83 (1.97)	61.07 (1.89)	54.08 (2.03)	0.79 (−0.01 to 1.53)
Social support, friends	28.06 (1.94)	29.79 (2.07)	36.92 (1.99)	32.69 (2.14)	0.43 (−0.27 to 1.23)
Social support, family	33.81 (1.96)	36.64 (2.11)	30.12 (1.99)	34.15 (2.14)	−0.72 (−1.46 to 0.07)
Index of readiness	30.86 (0.91)	31.57 (0.98)	34.92 (0.94)	32.37 (1.01)	0.61 (−0.04 to 1.49)
Index of self-regulation	28.27 (1.22)	30.92 (1.31)	36.07 (1.22)	29.23 (1.31)	1.34 (0.66 to 2.33)

* PA indicates physical activity; CHAMPS, Community Health Activities Model Program for Seniors; and total PA, light, moderate, and vigorous intensities.