Randomized Controlled Trial Comparing Tailoring Methods of Multimedia-Based Fall Prevention Education for Community-Dwelling Older Adults

Stacey L. Schepens, PhD, OTR[Postdoctoral Fellow],
Department of Physical Medicine and Rehabilitation, University of Michigan, 300 North Ingalls, Room 957, Ann Arbor, MI; schepens@umich.edu. At the time of the study, she was Predoctoral Fellow, Institute of Gerontology, and Research Coordinator, Department of Healthcare Sciences, Physical Therapy Program, Mobility Research Laboratory, Wayne State University, Detroit, MI

Victoria Panzer, PhD[Assistant Professor], and
University of Connecticut Health Center, Farmington, and President, Brookside Research and Development Company, North Salem, NY

Allon Goldberg, PhD, PT[Assistant Professor]
Department of Healthcare Sciences, Physical Therapy Program, Mobility Research Laboratory, and Institute of Gerontology; Wayne State University, Detroit, MI

Abstract

OBJECTIVE—We attempted to determine whether multimedia fall prevention education using different instructional strategies increases older adults' knowledge of fall threats and their fall prevention behaviors.

METHOD—Fifty-three community-dwelling older adults were randomized to two educational groups or a control group. Multimedia-based educational interventions to increase fall threats knowledge and encourage fall prevention behaviors had two tailoring strategies: (1) improve content realism for individual learners (authenticity group) and (2) highlight program goals and benefits while using participants' content selections (motivation group). Knowledge was measured at baseline and 1-mo follow-up. Participants recorded prevention behaviors for 1 mo.

RESULTS—Intervention group participants showed greater knowledge gains and posttest knowledge than did control group participants. The motivation group engaged in more prevention behaviors over 1 mo than did the other groups.

CONCLUSION—Tailoring fall prevention education by addressing authenticity and motivation successfully improved fall threats knowledge. Combining motivational strategies with multimedia education increased the effectiveness of the intervention in encouraging fall prevention behaviors.

Keywords

accidental falls; health behavior; health education; multimedia

Falls in older adults are a major public health concern (Gillespie et al., 2009) and contribute to a cycle of disengagement in occupation, dependence, and increased fall risk (Peterson et al., 1999; Steinmetz & Hobson, 1994). To reduce falls, various interventions have been proposed, including education (Reinsch, MacRae, Lachenbruch, & Tobis, 1992). Education is often part of a multicomponent fall prevention program; these programs have shown

positive effects on outcomes such as fear of falling, activity engagement (Tennstedt et al., 1998), and fall incidence (Clemson et al., 2004).

Although fall prevention education is recommended at a national level (U.S. Department of Health and Human Services, 2000), few studies have specifically addressed this intervention separate from other components, making its unique contribution difficult to evaluate. In addition, design, development, and delivery of the educational content using evidence-based approaches have not been thoroughly explored. The appropriateness of current fall prevention education to address older adults' needs is in question because seniors have criticized these programs for lacking personal applicability (Yardley, Donovan-Hall, Francis, & Todd, 2006).

To consider individual learners, education can be tailored by using information derived from individual assessment and delivering the educational message on the basis of a person's unique characteristics (Kreuter, 1998). Improving the applicability of health-related content for learners by tailoring education to the audience has been one effective strategy in encouraging desired behavioral changes (Bull, Kreuter, & Scharff, 1999; Kreuter, Farrell, Olevitch, & Brennan, 2000; Richards et al., 2007; Strecher et al., 1994). Likewise, tailoring education may be useful in promoting fall prevention behaviors (i.e., actions taken with the intention of preventing a fall; Panzer, Burleson, Wakefield, Into, & Wolfson, 2008). From the holistic viewpoint used in occupational therapy, fall prevention knowledge must consider the characteristics, lifestyle, and environment of individual older adults. Risks are unique to each older adult, and issues critical to one person may be inconsequential to another. Therefore, in this study we termed personalized fall risks *fall threats*.

Because tailored fall prevention education appears to be relatively absent from current research, we investigated two instructional approaches, one that used tailoring strategies aimed at improving the authenticity and realism of content for people and another that used motivational methods. These instructional approaches and accompanying tailoring strategies have been widely used in the education field and have shown successful learning outcomes (Dori, Tal, & Tsaushu, 2003; Van Berkel & Schmidt, 2000; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004; Yoshioka, Uchida, & Kozu, 2003).

Enhancing the authenticity and realism of content is a strategy rooted in situated learning theory (Herrington & Oliver, 2000), which suggests that learning is specific to the real-life situations in which it occurs and that knowledge is best learned in context (Lave & Wenger, 1991). A key component is to ensure an authentic learning context (Brown, Collins, & Duguid, 1989), such as the actual setting, a virtual surrogate, or an anchoring context such as a multimedia presentation (McLellan, 1994). Authentic tasks involve realistic and engaging ideas and real-world problems (Smith, 1986).

Motivational aspects can also be added to instructional content, such as strategies described in the Attention–Relevance–Confidence–Satisfaction (ARCS) model (Keller, 1987a). The relevance component of this model postulates that increasing the likelihood of the learning situation to fulfill the learner's basic needs or values will result in greater personal motivation. Enhancing motivation by targeting relevance in the ARCS model has been shown to improve learning outcomes (Chang & Lehman, 2002; Means, Jonassen, & Dwyer, 1997; Newby, 1991).

To our knowledge, the use of authenticity-enhancing and motivational tailoring strategies has not been studied as an approach applied to occupational therapy fall prevention interventions. The purpose of this study was to compare the effectiveness of two tailored multimedia fall prevention educational interventions in improving fall threats knowledge and engagement in fall prevention behaviors in community-dwelling older adults.

Method

Design

This study was a three-group randomized controlled trial. Participants in the intervention groups received education tailored to improve content realism for individual learners (authenticity group) or to highlight program goals and benefits while using participants' content selections (motivation group). The control group did not receive the education. All procedures were approved by Wayne State University's Human Investigation Committee, and each participant provided informed consent before participation.

Participants and Setting

Fifty-three community-dwelling older adults were recruited in response to flyers and person-to-person solicitation at senior housing and community facilities. Older adults were included if they were community dwelling, age ≥65, and English speaking; reported normal or corrected-to-normal vision and hearing; were alert and oriented to person, place, and time; and were able to follow three-step commands. Older adults were excluded if they had a diagnosed mental disorder or neurological disease that might affect cognition; a diagnosed learning disability; or a history of vertigo, chronic ear infections, or motion sickness. Participants completed the study at a location of their convenience, either in their home or the Mobility Research Laboratory at Wayne State University. Extraneous distractions were minimized using a quiet room and a headset to present the multimedia-based assessments and intervention content.

Materials

Components of the Multimedia Fall Prevention (MFP) system were used for interview, assessment, and intervention. The general design and delivery of the intervention were based on principles of ecological psychology (Young, 2004) and supported by older adult learner characteristics (Dixon, Bèackman, & Nilsson, 2004; Wolf, 1994), authentic learning concepts (Lave & Wenger, 1991), and principles of multimedia design (Mayer, 2001). Pretest and posttest assessment of fall threats knowledge consisted of 10 video clips (approximately 10 s each) presenting everyday situations in common environments. Clips included a brief pan of the setting followed by first-person actions. Participants' training consisted of viewing five pairs of vignettes selected by the MFP software on the basis of interview information and study group. Vignettes presented brief, approximately 45-s scenarios in specific environments, simultaneous with first-person narration. All MFP clips and vignettes were created in real-life quality from a first-person perspective and displayed using a multimedia headset.

Procedures

Interviews, assessments, and intervention procedures were conducted by the primary investigator (Stacey L. Schepens), a licensed occupational therapist and instructional technologist. She received intensive training in the use of the MFP system from the developer and clinical trial study team, who have used these methods with >300 older adults.

Interview—Interviews took place by telephone and at the first visit for all participants. General medical and fall histories were recorded; questions covered health status, number of falls in the past 12 mo, details about recent falls, and current fall prevention behaviors. Other descriptive information was collected, such as fear of falling, mobility aid use, and independence in accessing the community. We used selected interview information to tailor

the authenticity intervention. Additional interview information collected from the motivation group was used to tailor the motivational intervention.

General Intervention—Participants were randomized to one of two multimedia intervention groups or to a control group using a block randomization technique. Participants, but not the primary investigator, were unaware of group allocation and differences in intervention protocols. For participants assigned to the multimedia intervention groups, the pretest was followed by a single, approximately 30-min educational session. Those participants viewed five pairs of vignettes tailored on the basis of group allocation. When the participant finished viewing each pair, the primary investigator and the participant discussed the multimedia content, and the learner was asked to identify fall threats common to both vignettes. The participant was guided as needed with questions such as, "Was there anything that you did or said in both stories that could cause you to lose balance or fall?" If the participant was unable to identify two common fall threats in the pair, the MFP software provided preprogrammed support that included repetition of the vignettes and audio-based peer modeling, in which older adult actors suggested possible fall threats.

Tailoring by Authenticity—Tailoring methods were implemented at the initial visit. Tailoring by authenticity was based on situated learning theory (Lave & Wenger, 1991) and was programmed by the MFP developers. The tailoring focused on realism of the content by individualizing vignettes presented to each participant on the basis of his or her lifestyle, as determined by interview. Scenarios reflected unique learner characteristics, including living situation, use of a mobility aid, and ability to complete activities of daily living (ADLs) independently. For instance, a participant who lived in an apartment building was shown vignettes different from those viewed by someone living in a private house.

Tailoring by Motivation—Tailoring methods for the motivational intervention were designed by the primary investigator and based on previous work targeting the relevance component of the ARCS model (Frymier & Shulman, 1995; Keller, 1987b). Three strategies incorporated into the tailored motivational intervention included (1) a clear statement of the program goals, (2) an emphasis on the positive aspects of completing the program, and (3) participant selection of content to be addressed during the intervention. Program goals and benefits that focused on health benefits and quality-of-life outcomes were discussed using a standardized handout. Use of these intrinsically based goals and benefits has been associated with positive gains in learning and performance (Vansteenkiste et al., 2004). For example, one goal was to "assist you in establishing your own personal fall prevention strategies." The associated benefit was stated as follows: "By developing your own strategies and personal plan now, you may be able to remain active in the environments that are important to you and maintain your independence for your future." Last, participant selection of educational content was accomplished by having participants choose 4–10 situations from a list of 20 that were most relevant to their lives and about which they would like to learn more. Some options included airports, grocery stores, and public transportation. Selections were entered into the MFP program and were incorporated into the vignettes viewed by the participant.

Assessment—All participants were pretested at the initial visit and posttested approximately 1 mo later by the primary investigator to assess fall threats knowledge. Pretesting and posttesting were accomplished using the assessment component of the MFP program. Participants were instructed to verbally identify fall threats they recognized in 10 standardized clips presented in random order. Novel video clips were used for pretesting and posttesting and did not duplicate intervention content.

Falls Diary—Participants in all groups were instructed by the primary investigator in how to keep a falls diary during the 1 mo between the initial and follow-up visits. Participants logged losses of balance and falls, circumstances surrounding these occurrences, new fall prevention measures taken, and any medical issues.

Data Collection

The primary investigator was responsible for primary data collection, which included fall threats knowledge recorded by the MFP software as reported by the participants at pretest and posttest and fall prevention behaviors extracted from the falls diaries. Participants' knowledge was quantified by total number of fall threats identified during pretesting and posttesting using a menu that displayed a standard list of all threats. The appropriate boxes were checked or an "other" box was filled in to reflect participants' answers. Each participant's new fall prevention behaviors during the 1-mo study period were obtained from the falls diaries returned at follow-up. The primary investigator manually tallied participants' daily records. Duplicated responses were excluded from the final total of fall prevention behaviors.

Data Analysis

We calculated means (*M*s) and standard errors of the mean (*SEM*s) for age, number of fall threats identified at pretest and posttest, and number of new fall prevention behaviors. Counts and percentages were computed for sex, independence in community access, fall status, fear of falling, and number of new fall prevention behaviors. Fall status was determined on the basis of the retrospective self-report of falls experienced in the past 12 mo. A *faller* was defined as someone who had experienced one or more falls in the past 12 mo. A *fall* was considered an unexpected event in which the participant came to rest on the ground, floor, or lower level (Lamb, Jørstad-Stein, Hauer, & Becker, 2005). To examine baseline differences in participant characteristics among groups, we conducted χ^2 tests or Fisher's Exact Tests for categorical variables and a univariate analysis of variance (ANOVA) for age. Kolmogorov–Smirnov tests (Chakravarti, Laha, & Roy, 1967) confirmed that all continuous variables were normally distributed.

We conducted a mixed-design repeated-measures ANOVA to investigate Group (i.e., authenticity, motivational, or control group) × Time (pretest or posttest) effects on fall threats knowledge. Fall status was controlled during analysis because of unequal proportions of fallers and nonfallers between groups. To further analyze Group × Time interactions and determine differences between pretest and posttest knowledge within each of the groups, we conducted separate post hoc repeated-measures ANOVAs, controlling for fall status. Separate univariate analysis of covariance models, which covaried baseline pretest knowledge and controlled for fall status, were conducted to determine whether posttest fall threats knowledge, change in knowledge, and number of fall prevention behaviors in which participants engaged differed between groups. We used Bonferroni corrections for multiple comparisons as needed. Analyses were performed using SPSS Version 16.0 (SPSS Inc., Chicago).

Results

Fifty-eight community-dwelling older adults were recruited for this study between April and June 2009. Figure 1 shows the flow and loss of participants during the study. Analyses were conducted on the data of the 53 participants who completed all components of the educational program.

Participant characteristics are shown in Table 1. Groups were comparable at baseline in terms of gender, independence level, and fear of falling ($p > .05$). Although the entire sample contained an approximately equal number of fallers and nonfallers, the ratios of fallers to nonfallers across study groups were not equivalent ($p = .005$). The motivation and control groups had fewer fallers.

The repeated-measures ANOVA evaluation of fall threats knowledge showed a significant Group × Time effect ($p = .037$; Figure 2). The number of fall threats identified at posttest was significantly greater than the number identified at pretest for both the authenticity group (posttest $M \pm SEM = 21.7 \pm 1.7$, pretest $M \pm SEM = 17.1 \pm 1.1$, $p = .004$) and the motivation group (posttest $M \pm SEM = 23.0 \pm 1.5$, pretest $M \pm SEM = 16.6 \pm 2.3$, $p = .002$), but not for the control group (posttest $M \pm SEM = 15.7 \pm 1.4$, pretest $M \pm SEM = 15.6 \pm 2.3$, $p = .96$). The authenticity group identified significantly more fall threats than the control group ($p = .029$), as did the motivation group ($p = .007$). However, the number of fall threats identified at posttest did not significantly differ between the authenticity and motivation groups ($p > .05$). Finally, the increase in fall threats identified from pretest to posttest did not significantly differ between intervention groups ($p > .05$), although it was significantly greater than that evidenced by the control group ($p < .05$).

The number of new fall prevention behaviors reported by the motivation group ($M \pm SEM = 7.5 \pm 1.0$) was significantly greater than that reported by both the authenticity ($M \pm SEM = 4.3 \pm 0.8$, $p = .05$) and the control ($M \pm SEM = 2.1 \pm 1.0$, $p = .001$) groups (Figure 3). We found no significant difference in behaviors between the authenticity and control groups ($p = .27$). Overall, 94.3% of intervention group participants engaged in at least one new fall prevention behavior, 82.9% engaged in at least two new behaviors (authenticity group, 77.8%; motivation group, 88.2%), and >65% of both intervention groups engaged in at least four or more behaviors. In contrast, only 53% of the control group reported at least one new behavior.

Discussion

In this study, we determined whether tailoring multimedia-based fall prevention education by using different evidence-based instructional technology strategies targeted to specific characteristics of older adults was effective in increasing fall threats knowledge and prevention behaviors. Authenticity and motivational tailoring methods were equally effective in increasing older adults' fall threats knowledge. The mechanisms by which both interventions resulted in knowledge gains may be explained by the unique combination of theoretical concepts and strategies chosen to guide the interventions' general design and delivery. Previous research has shown that use of these approaches has improved knowledge retention (Hill et al., 2009; Mayer, 2001; McGuire, 1996).

Knowledge improvements in both intervention groups did not significantly differ, a finding that may be the result of insufficient differences between tailoring strategies. Because increased relevance was the focus of the motivation intervention and improved authenticity has previously been addressed by improving relevance of the material (Hodges, 2004), the selected tailoring strategies may have overlapped, diminishing differences in knowledge gains. Baldwin, Magjuka, and Loher (1991) demonstrated that allowing learners to select the content (motivation group) motivates learners but does not result in greater learning outcomes than for learners presented with content they did not choose (authenticity group). In both cases, learners master content with similar success.

The motivation group, but not the authenticity group, engaged in significantly more fall prevention behaviors than did the control group. Our results suggest that a motivationally

tailored approach effectively promotes fall prevention behaviors, perhaps because this group was given the opportunity to focus on relevant goals with clear outcomes and therefore engaged in more prevention behaviors to accomplish those goals. Interestingly, the motivation group was made up primarily of nonfallers. Fallers view their falls as preventable; therefore, Berg, Alessio, Mills, and Tong (1997) recommended designing individualized prevention strategies on the basis of postfall evaluations. Approaching fall prevention after a fall implies that the utility of tailored interventions is exclusive to fallers. Still others have recommended that fall prevention programs target recurrent fallers (Davison, Bond, Dawson, Steen, & Kenny, 2005). Although research has shown that older adults at high risk for falls are more likely to make behavioral changes in response to fall prevention education (Ness, Gurney, & Ice, 2003), the number of fall prevention behaviors recorded by the motivation group, which was composed mostly of nonfallers, indicates that this intervention offers a fall prevention strategy potentially useful for all older adults.

It is also noteworthy that the authenticity and control conditions also appeared to affect fall prevention activities, even if to a lesser degree than with the motivation group. The authenticity group reported an average of four new fall prevention behaviors, and the control group reported an average of two new fall prevention behaviors. Previous studies have reported success with findings of fewer than two behavior changes (Ness et al., 2003; Ryan & Spellbring, 1996). Using this criterion would suggest that authenticity tailoring methods are also successful in promoting a sufficient number of prevention behaviors and that simply using a falls interview, multimedia assessments, and diary training (control group) may serve to promote new behaviors. These companion parts of the educational intervention may have sensitized the control group to fall prevention. Others have suggested that completion of falls diaries or falls interviews serves as an intervention (Ryan & Spellbring, 1996; Steinberg, Cartwright, Peel, & Williams, 2000). We conclude that attention must be paid not only to the educational strategies used in the design and delivery of fall prevention education but also to the companion parts of the intervention protocol that may make important contributions to promoting fall prevention behaviors.

Clinical Practice Implications

This research contributes to the body of evidence supporting fall prevention education for older adults. Use of a multimedia educational system enhanced by theoretically driven, tailored strategies offers occupational therapists an effective, evidence-based intervention that can be administered within clinical time constraints. Aligned with a holistic approach to intervention, the program can be tailored to fit the specific needs of older adults, resulting in improved fall threats knowledge and engagement in fall prevention behaviors.

Because both forms of tailoring examined here improved knowledge of fall threats, we have provided a feasible solution for occupational therapists interested in addressing the significant deficits in fall-related knowledge and awareness of personal fall risk in community-dwelling older adults (Wiens, Koleba, Jones, & Feeny, 2006). An unexpected but important finding was that nonfallers also increased their fall threats knowledge and fall prevention behaviors. This outcome addresses the concern that nonfallers have a lower level of fall-related knowledge than fallers (Wiens et al., 2006). With knowledge of personal fall threats, a nonfaller may have the opportunity to address fall threats and prevent falls. Moreover, by selecting appropriate educational designs, fall prevention behaviors may also be encouraged in both fallers and nonfallers. Incorporating effective fall prevention educational interventions into clinical care of older adults is an encouraging step toward successfully reducing falls in the community.

Limitations and Strengths

One limitation of this study is that the large proportion of women in the sample (81%) precluded examination of sex-related differences known to affect acceptance of fall prevention education information (Dearborn et al., 2006). Another limitation is use of self-report for fall prevention behaviors, which may have resulted in overreporting or underreporting of behaviors. The convenience sample and limited size may reduce the generalizability of this study. Finally, although we used randomization, fallers and nonfallers were not equally distributed among the three groups. We controlled for fall status during the analysis to address this limitation.

The strengths of this research are the use of novel, evidence-based instructional strategies to support design and delivery of fall prevention education and to address older adult learners' specific needs. Additionally, the fall prevention education was the only intervention delivered, permitting isolation of its effects and direct evaluation of the outcomes without contamination by effects of other rehabilitation components.

Future Research

The use of instructional technology theory and practice is a relatively untapped area of research for older adult health-related education. Investigation of alternative instructional technology strategies and methods and educational theories may produce additional avenues for delivering and tailoring fall prevention education. Extension of these studies to a larger, more diverse population is warranted on the basis of the success of these interventions. Additionally, longitudinal studies may promote an understanding of the persistence of the interventions' effects on fall threats knowledge and prevention behaviors, as well as the relationship of these effects to actual fall experiences. Future studies should also examine the utility of these educational interventions to help older adult nonfallers maintain that status.

Conclusion

Fall prevention education has been proposed as a means of addressing the problem of falls in older adults. This study supports multimedia-based, tailored fall prevention education as an effective intervention for improving fall threats knowledge and engagement in fall prevention behaviors. Future research on the long-term effects of tailored fall prevention education on fall rates in community-dwelling older adults is warranted.
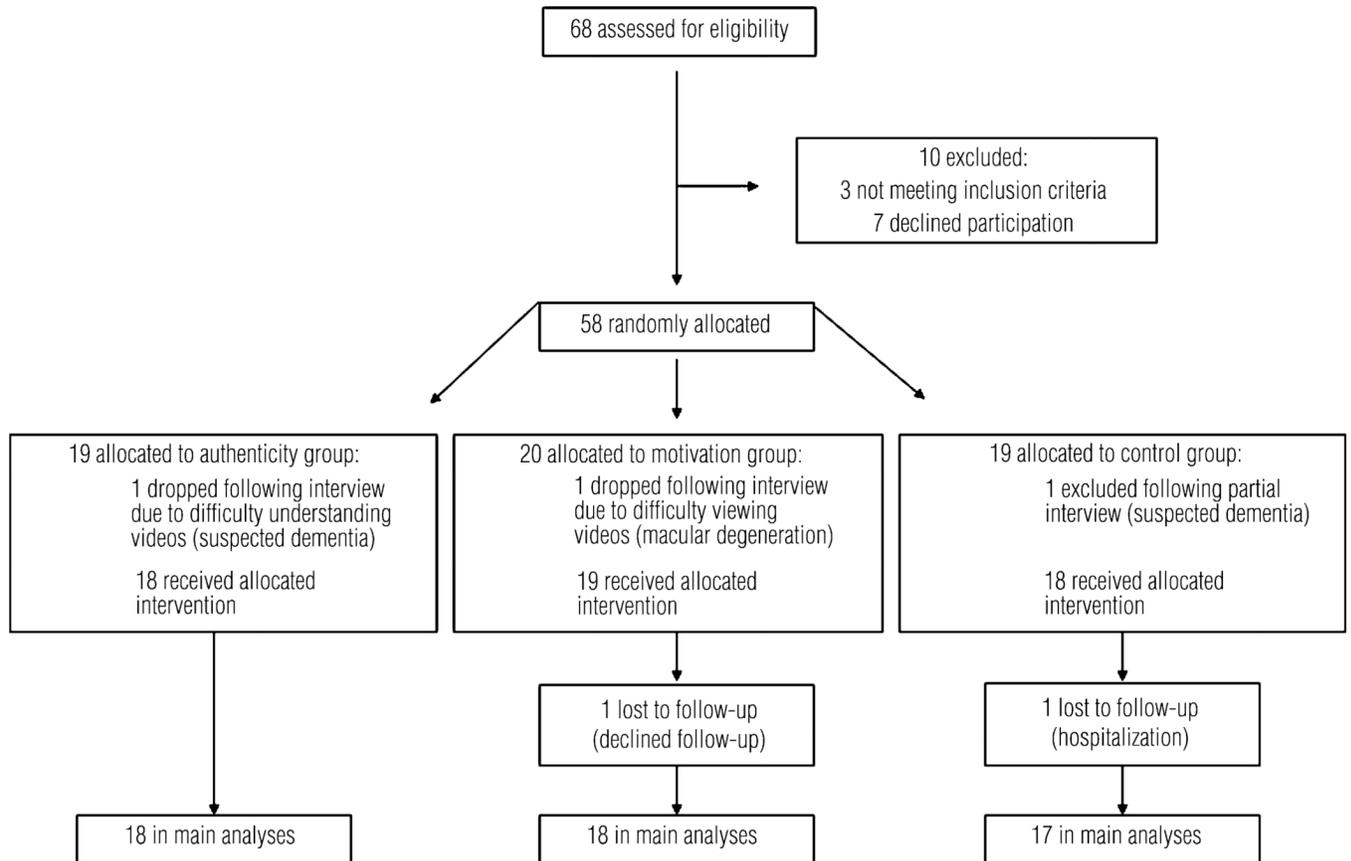
Acknowledgments

References

Baldwin T, Magjuka RJ, Loher BT. The perils of participation: Effects of choice of training on trainee motivation and learning. Personnel Psychology. 1991; 44:51–65.

Berg WP, Alessio HM, Mills EM, Tong C. Circumstances and consequences of falls in independent community-dwelling older adults. Age and Ageing. 1997; 26:261–268. [PubMed: 9271288]
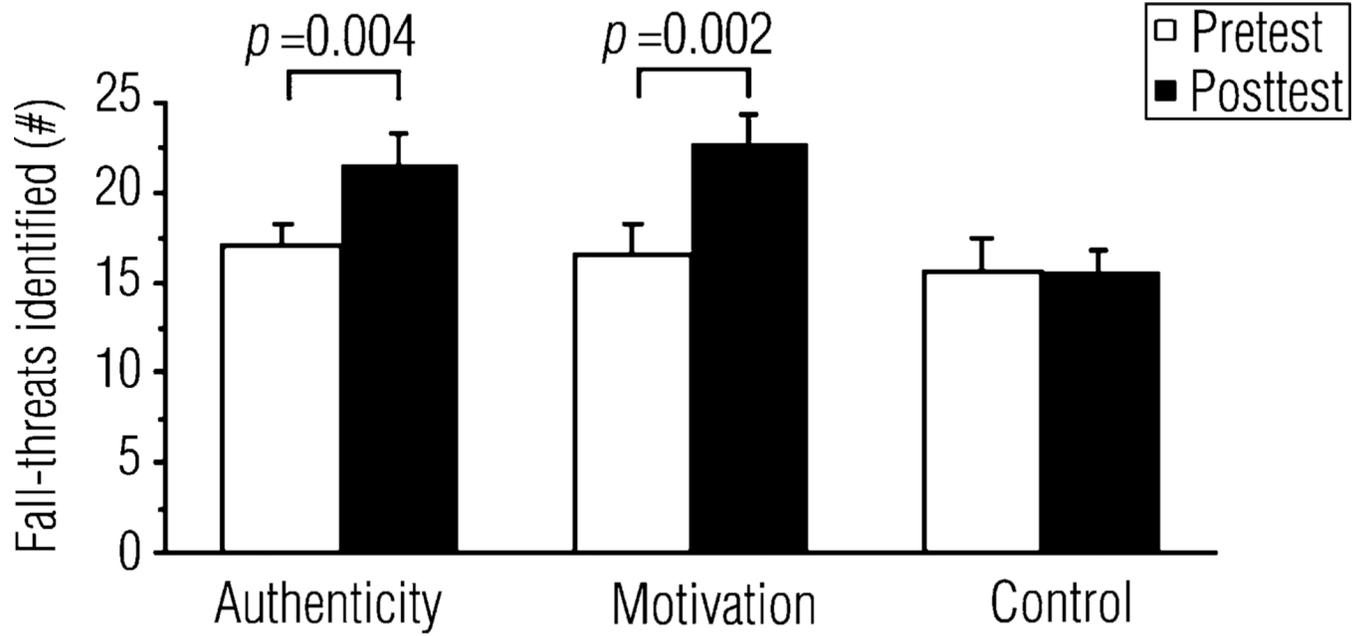
Brown JS, Collins A, Duguid P. Situated cognition and the culture of learning. Educational Researcher. 1989; 18:32–42.

Bull FC, Kreuter MW, Scharff DP. Effects of tailored, personalized and general health messages on physical activity. Patient Education and Counseling. 1999; 36:181–192. [PubMed: 10223022]

Chakravarti, IM.; Laha, RG.; Roy, J. Handbook of methods of applied statistics. Vol. Vol. 1. New York: John Wiley & Sons; 1967. p. 392-394.

Chang M, Lehman JD. Learning foreign language through an interactive multimedia program: An experimental study on the effects of the relevance component of the ARCS model. Computer Assisted Language Instruction Consortium Journal. 2002; 20:81–98.

Clemson L, Cumming RG, Kendig H, Swann M, Heard R, Taylor K. The effectiveness of a community-based program for reducing the incidence of falls in the elderly: A randomized trial. Journal of the American Geriatrics Society. 2004; 52:1487–1494. [PubMed: 15341550]

Davison J, Bond J, Dawson P, Steen IN, Kenny RA. Patients with recurrent falls attending Accident & Emergency benefit from multifactorial intervention—A randomised controlled trial. Age and Ageing. 2005; 34:162–168. [PubMed: 15716246]

Dearborn JL, Panzer VP, Burleson JA, Hornung FE, Waite H, Into FH. Effect of gender on communication of health information to older adults. Journal of the American Geriatrics Society. 2006; 54:637–641. [PubMed: 16686875]

Dixon, RA.; Bèackman, L.; Nilsson, L-G. New frontiers in cognitive aging. New York: Oxford University Press; 2004.

Dori YJ, Tal RT, Tsaushu M. Teaching biotechnology through case studies: Can we improve higher order thinking skills of nonscience majors? Science Education. 2003; 87:767–793.

Frymier AB, Shulman GM. "What's in it for me?": Increasing content relevance to enhance students' motivation. Communication Education. 1995; 44:40–50.

Gillespie LD, Robertson MC, Gillespie WJ, Lamb SE, Gates S, Cumming RG, et al. Interventions for preventing falls in older people living in the community. Cochrane Database of Systematic Reviews. 2009; 2009(2) CD007146.

Herrington J, Oliver R. An instructional design framework for authentic learning environments. Educational Technology Research and Development. 2000; 48:23–48.

Hill A-M, McPhail S, Hoffmann T, Hill K, Oliver D, Beer C, et al. A randomized trial comparing digital video disc with written delivery of falls prevention education for older patients in hospital. Journal of the American Geriatrics Society. 2009; 57:1458–1463. [PubMed: 19515102]

Hodges CB. Designing to motivate: Motivational techniques to incorporate in e-learning experiences. Journal of Interactive Online Learning. 2004; 2(3):1–7.

Keller JM. Development and use of the ARCS model of motivational design. Journal of Instructional Development. 1987a; 10(3):2–10.

Keller JM. Strategies for stimulating the motivation to learn. Performance and Instruction. 1987b; 26(8):1–7.

Kreuter, MW. Community health promotion ideas that work: A field-book for practitioners. Boston: Jones & Bartlett; 1998.

Kreuter, M.; Farrell, D.; Olevitch, L.; Brennan, L. Tailoring health messages: Customizing communication with computer technology. Mahwah, NJ: Erlbaum; 2000.

Lamb SE, Jørstad-Stein EC, Hauer K, Becker C. Prevention of Falls Network Europe and Outcomes Consensus Group. Development of a common outcome data set for fall injury prevention trials: The Prevention of Falls Network Europe consensus. Journal of the American Geriatrics Society. 2005; 53:1618–1622. [PubMed: 16137297]

Lave, J.; Wenger, E. Situated learning: Legitimate peripheral participation. Cambridge, England: Cambridge University Press; 1991.

Mayer, RE. Multimedia learning. New York: Cambridge University Press; 2001.

McGuire LC. Remembering what the doctor said: Organization and adults' memory for medical information. Experimental Aging Research. 1996; 22:403–428. [PubMed: 8968711]

McLellan H. Interactions of student partners in a high school astronomy computer lab. Computers in the Schools. 1994; 11:30–41.

Means TB, Jonassen DH, Dwyer FM. Enhancing relevance: Embedded ARCS strategies vs. purpose. Educational Technology Research and Development. 1997; 45:5–17.

Ness KK, Gurney JG, Ice GH. Screening, education, and associated behavioral responses to reduce risk for falls among people over age 65 years attending a community health fair. Physical Therapy. 2003; 83:631–637. [PubMed: 12837124]

Newby TJ. Classroom motivation: Strategies of first-year teachers. Journal of Educational Psychology. 1991; 83:195–200.

Panzer V, Burleson J, Wakefield D, Into F, Wolfson L. Can a multimedia fall prevention treatment program change behavior and prevent falls? Journal of the American Geriatrics Society. 2008; 56 Suppl. 1:S167.

Peterson E, Howland J, Keilhofner G, Lachman ME, Assmann S, Cote J. Falls, self-efficacy and occupational adaption among elders. Physical and Occupational Therapy in Geriatrics. 1999; 16:1–16.

Reinsch S, MacRae P, Lachenbruch PA, Tobis JS. Attempts to prevent falls and injury: A prospective community study. Gerontologist. 1992; 32:450–456. [PubMed: 1427246]

Richards KC, Enderlin CA, Beck C, McSweeney JC, Jones TC, Roberson PK. Tailored bio-behavioral interventions: A literature review and synthesis. Research and Theory for Nursing Practice. 2007; 21:271–285. [PubMed: 18236771]

Ryan JW, Spellbring AM. Implementing strategies to decrease risk of falls in older women. Journal of Gerontological Nursing. 1996; 22:25–31. [PubMed: 9060344]

Smith, P. Instructional simulation: Research, theory, and a case study. Paper presented at the Annual Convention of the Association for Educational Communications and Technology; Las Vegas, Nevada. 1986 January.

Steinberg M, Cartwright C, Peel N, Williams G. A sustainable programme to prevent falls and near falls in community dwelling older people: Results of a randomised trial. Journal of Epidemiology and Community Health. 2000; 54:227–232. [PubMed: 10746118]

Steinmetz HM, Hobson SJG. Prevention of falls among the community-dwelling elderly: An overview. Physical and Occupational Therapy in Geriatrics. 1994; 12:13–28.

Strecher VJ, Kreuter M, Den Boer DJ, Kobrin S, Hospers HJ, Skinner CS. The effects of computer-tailored smoking cessation messages in family practice settings. Journal of Family Practice. 1994; 39:262–270. [PubMed: 8077905]

Tennstedt S, Howland J, Lachman M, Peterson E, Kasten L, Jette A. A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. Journals of Gerontology, Series B: Psychological Sciences and Social Sciences. 1998; 53B:384–392.

U.S. Department of Health and Human Services. Healthy People 2010: Understanding and improving health. Washington, DC: Author; 2000.

Van Berkel HJM, Schmidt HG. Motivation to commit oneself as a determinant of achievement in problem-based learning. Higher Education. 2000; 40:231–242.

Vansteenkiste M, Simons J, Lens W, Sheldon KM, Deci EL. Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. Journal of Personality and Social Psychology. 2004; 87:246–260. [PubMed: 15301630]

Wiens CA, Koleba T, Jones CA, Feeny DF. The Falls Risk Awareness Questionnaire: Development and validation for use with older adults. Journal of Gerontological Nursing. 2006; 32:43–50. [PubMed: 16915745]

Wolf, MA. Older adults: Learning in the third age (Information Series Report). Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education; 1994.

Yardley L, Donovan-Hall M, Francis K, Todd C. Older people's views of advice about falls prevention: A qualitative study. Health Education Research Theory and Practice. 2006; 21:508–517.

Yoshioka T, Uchida Y, Kozu T. Format of cases affects learning outcomes in first year medical students. Education for Health (Abingdon). 2003; 16:59–67.

Young, MF. An ecological psychology of instructional design: Learning and thinking by perceiving-acting systems. In: Jonassen, DH., editor. Handbook of research for educational communications and technology. 2nd ed.. Mahwah, NJ: Erlbaum; 2004. p. 169-177.
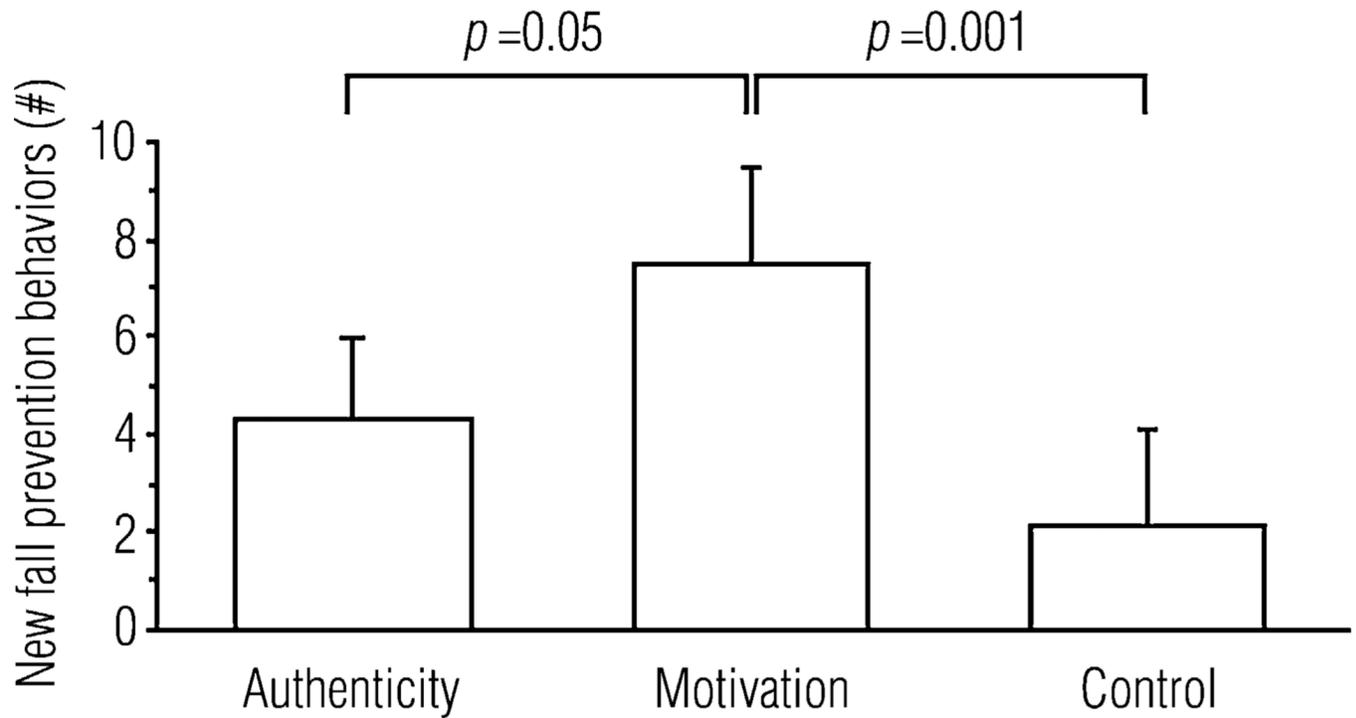
Figure 1.
Study flowchart of research participants. The final sample consisted of 53 participants.

Figure 2.
Pretest and posttest fall threats knowledge for three treatment groups. Posttest results for the authenticity and motivation groups showed significant increases from pretest values, although the control group did not. Values shown are means ± standard errors of the mean adjusted for fall status.

Figure 3.
Number of new fall prevention behaviors for three treatment groups. The number of prevention behaviors reported by the motivation group was significantly higher than those reported by the authenticity and control groups. The authenticity and control group behaviors were not significantly different. Values are means ± standard errors of the mean, adjusted for fall status and covaried by baseline pretest knowledge.

Table 1

Participant Characteristics

Characteristic	All Participants N = 53	Authenticity Group n = 18	Motivation Group n = 18	Control Group n = 17
Age, $M \pm SEM$	79.2 ± 1.0	78.3 ± 1.8	80.1 ± 1.8	79.2 ± 1.8
Sex, N or n (%)				
Female	43 (81)	15 (83)	15 (83)	13 (76)
Male	10 (19)	3 (17)	3 (17)	4 (24)
Independence in community access, N or n (%)[a]				
Goes out alone any time	30 (57)	10 (56)	10 (56)	10 (59)
Goes out alone only during day	9 (17)	4 (22)	2 (11)	3 (18)
Does not usually go out alone	14 (26)	4 (22)	6 (33)	4 (24)
Fall status in 12 mo, N or n (%)[b]				
Faller	27 (51)	10 (56)	4 (22)	13 (76)
Nonfaller	26 (49)	8 (44)	14 (78)	4 (24)
Fear of falling, N or n (%)				
Yes	18 (34)	9 (50)	5 (28)	4 (24)
No	35 (66)	9 (50)	13 (72)	13 (76)

Note. M = mean; SEM = standard error of the mean.

[a]*Independence in community access* refers to the choice participants make in independently accessing the community on the basis of their ability to go out alone.

[b]Fallers and nonfallers were not distributed equally across the three groups.