

Supplemental Table 1. Summary of Evidence on Home Modification and Fall Prevention Programs (N = 33)

Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
Buchner et al. (1997)	Evaluate the effect of strength and endurance training on balance, fall risk, and health services use	Level I RCT N = 105 older adults, 68–85 yr	<i>Intervention</i> Supervised endurance and/or strengthening exercise, followed by self-supervised exercise <i>Outcome Measures</i> • General health status • IADL status • Number of falls	The intervention group went a longer time before the first fall. The control group had more falls during follow-up and had longer hospitalizations. No difference in IADL status.	Self-report bias. Groups not blinded to intervention Possible assessment ceiling effect
Campbell et al. (1997)	Evaluate the impact of a home-based exercise program on falls	Level I RCT N = 116 women ≥80 yr	<i>Intervention</i> Home visits for strengthening and balance <i>Outcome Measures</i> • Balance • Falls • Physical activity scale • IADL status	The intervention group had improved balance and fewer falls after 1 yr. The control group became less active over time at a faster rate. No difference in IADL.	No representation in sample from a more fit, healthy group Self-report bias
Campbell et al. (2005)	Evaluate the efficacy of home safety and exercise programs to reduce falls in older people with low vision	Level I RCT N = 391 older adults ≥75 yr with low vision	<i>Intervention</i> Home safety and assessment delivered by an occupational therapist and an exercise program prescribed by a physical therapist, both, or social visit only <i>Outcome Measures</i> • Number of falls • Injuries resulting from falls	Participants in the home safety program but not in the exercise program experienced fewer falls. Those adhering more strictly to exercise had fewer falls. Neither program was effective in reducing injuries from falls.	Recruitment through primary care may have provided a more generalizable population Self-report bias
Clemson et al. (2004)	Evaluate the effectiveness of a multifactorial small group intervention on fall reduction	Level I RCT (stratified blocks of four) N = 310 adults ≥70 yr	<i>Intervention</i> An occupational therapist led a small-group learning, exercise, cognitive-behavioral fall prevention program. Those receiving the intervention were divided into groups of 12 for the sessions. <i>Outcome Measure</i> Number of falls	The intervention group had a 31% reduction in falls, with men having slightly better results than women.	Self-report bias Contamination may have occurred if control group members completed any exercise program on their own Study evaluated as a multifactorial program

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures		Results	Study Limitations
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Close et al. (1999)	Evaluate the effectiveness of an occupational therapy assessment and referral process on falls	Level I RCT N = 184 adults ≥65 yr seen in ER	<p><i>Intervention</i></p> <ul style="list-style-type: none"> Detailed medical and occupational therapy assessment (home visit) and referral as needed <p><i>Outcome Measures</i></p> <ul style="list-style-type: none"> Number of falls ADL status Hospital admissions 	<p>The intervention group had reduced falls and recurrent fall risk, lower odds of admission to hospital, and slower decline in ADL function.</p>	<p>Contamination may have occurred if control group received assistance or modified their home</p> <p>Small sample size; more frail older adults not included</p> <p>Self-report bias possible</p>	
Cumming et al. (1999)	Evaluate the impact of occupational therapy assessment and environmental modifications on the risk of falls	Level I RCT N = 530 older adults after a hospital stay Mean age: 77 yr	<p><i>Intervention</i></p> <p>Home visit by an occupational therapist to make recommendations for home modifications for safety</p> <p><i>Outcome Measure</i></p> <p>Number of falls</p>	<p>Those in the intervention group with a history of falls had a reduced number of falls during follow-up.</p>	<p>Difficult to separate the impact of the occupational therapy home visit from home modifications specifically</p> <p>Self-report bias possible</p>	
Davison, Bond, Dawson, Steen, & Kenny (2005)	Evaluate a multifactorial intervention on fall prevention	Level I RCT N = 313 older adults ≥65 yr with fall history	<p><i>Intervention</i></p> <p>Referral and recommendation as needed to include home modifications and medical management</p> <p><i>Outcome Measures</i></p> <ul style="list-style-type: none"> Number of falls Number of fallers Length of hospital stay 	<p>In the intervention group, falls were reduced by 36% and participants had significantly shorter hospital stays. There was no difference in the proportion of participants who continued to fall, the number of fall-related visits, or hospital admissions during follow-up.</p>	<p>Contamination and self-report bias a possibility</p> <p>Study evaluated as an intervention package</p> <p>Lack of a related comparison</p>	
Day et al. (2002)	Evaluate the effectiveness of one or more of three interventions (group exercise, home hazard reduction, and vision help) for falls	Level I RCT N = 1,090 adults ≥70 yr	<p><i>Intervention</i></p> <p>Following an assessment, participants were assigned to one or more of the following interventions: strength and balance, home hazard removal, vision assistance.</p> <p><i>Outcome Measure</i></p> <p>Number of falls</p>	<p>The group exercise intervention provided positive results; however, the addition of home hazard reduction or vision recommendations—or both—provided the best results.</p>	<p>Group exercise participants not blinded</p> <p>Self-report bias possible</p>	
Faber, Bosscher, Chin, Paw, & van Wieringen (2006)	Evaluate the effectiveness of an exercise program on fall prevention	Level I RCT	<p><i>Intervention</i></p> <p>One of two exercise programs incorporating balance and functional strength</p>	<p>Prefrail participants (those who scored 1 or 2 out of 5 frailty indicators) had a small but significant reduction in fall risk, particularly after 11 wk of the program.</p>	<p>Some participants in nursing home part of the facility</p> <p>Participants not randomized</p> <p>Self-report bias possible</p>	

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Supplemental Table 1. Summary of Evidence on Home Modification and Fall Prevention Programs (N = 33) (cont.)

Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures		Results	Study Limitations
			Intervention	Outcome Measure		
Gardner (1998)	Evaluate the effectiveness of home-based exercises for fall prevention	N = 278 frail and prefrail older adults Mean age: 85 yr Level I RCT N = 233 older adult women	<i>Intervention</i> Lower-limb strengthening and balance retraining 4x/wk for 2 mo	<i>Outcome Measure</i> Number of falls	Fewer falls were reported by the intervention group at 1 yr	Self-report bias possible
Gitlin et al. (2006)	Evaluate the effect of a multicomponent home intervention on level of functional difficulties	Level I RCT N = 319 adults ≥70 yr who reported difficulty with ADLs	<i>Intervention</i> 5 occupational therapy visits (for evaluation, recommendations, education, home modifications) and 1 physical therapy visit (for balance and strengthening exercise training)	<i>Outcome Measures</i> • Self-report of functional level • Fear of falling • Self-efficacy	At 6 mo, the intervention group reported less difficulty with ADLs and IADLs (especially bathing), less fear of falling, and greater confidence in their abilities.	Attention bias possible Limited generalizability to vulnerable older adults Self-report bias possible
Hauer et al. (2001)	Evaluate the effect of strengthening exercises and progressive functional-balance activities on falls	Level I RCT N = 57 women with fall history 75–90 yr admitted to rehab	<i>Intervention</i> Resistance training with progressive resistance and progressive functional balance tasks	<i>Outcome Measures</i> • Number of falls • Leg strength	The incidence of falls between groups was not significantly different. The intervention group significantly improved motor performance, including sit–stand, stepping, and balance.	Small number of participants Self-report of falls Not clear whether clients lived in assisted living facility or independently
Hogan et al. (2001)	Evaluate the effectiveness of a community-based consultation service on fall prevention	Level I RCT N = 163 adults ≥65 yr with fall history	<i>Intervention</i> After assessment, an interdisciplinary team designed an individualized plan and provided written recommendations for exercise and/or modifications and/or education.	<i>Outcome Measure</i> Number of falls	The time between falls was longer for the intervention group, but results were unclear overall.	Intervention programs not clearly described Self-report of falls (recall over 3-mo time frame)

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
Hornbrook et al. (1994)	Evaluate the effectiveness of home hazard reduction, exercise, and education on fall prevention	Level I RCT N = 3,182 HMO members ≥65 yr, independent	<i>Intervention</i> Home hazard reduction, group educational sessions, and exercises, all with quarterly maintenance sessions <i>Outcome Measure</i> Number of falls	Fall rates were lower for the intervention participants, but there was no significant effect on probability of medical care from a fall.	Self-report bias Low intensity of interventions Cannot generalize about severe falls
Lin, Wolf, Hwang, Gong, & Chen (2007)	Compare the effectiveness of fall prevention programs in improving quality of life in older adults	Level I RCT N = 150 adults who had a recent fall Mean age: 76.8 yr	<i>Intervention</i> Participants were assigned to an exercise training group, education group, or home safety assessment and modification (HSAM) group. <i>Outcome Measures</i> • Quality of life • Number of falls • Balance and gait • Fear of falling • Functional reach and balance	Fall rates between groups were not significantly different. The exercise group had greater improvements in functional reach, balance, gait, and fear of falling than the education group. The HSAM group improved significantly in ADL score. The education group improved significantly in ADL and physical quality-of-life scores.	Low generalizability to frail elderly Use of different therapists to provide intervention Participants may have experienced improvements from simply recovering from their fall Self-report bias Not all home modifications implemented
Liu & Lapane (2009)	Quantify the effect of home modifications on decreasing the risk of physical function decline	Level II Cohort study N = 9,447 participants of the Second Longitudinal Study on Aging, ≥70 yr	<i>Intervention</i> Modifications to the home or assistive technology used in the home <i>Outcome Measure</i> Functional ability status	Participants who had some type of modifications or equipment at baseline had a reduction in risk of functional decline.	Definitions of modifications and assistive equipment varied Participants self-report of functional abilities and presence of modifications
Logan et al. (2010)	Evaluate whether a program to prevent falls in the community would reduce the rate of falls in older people	Level I RCT N = 204 adults ≥60 yr with fall history	<i>Intervention</i> Assessments and individualized plans for group sessions, home evaluations, and/or hazard reduction/home modification recommendations. <i>Outcome Measures</i> • Falls over 1 yr • ADL status • Fear of falling	Participants in the intervention group had a lower rate of falls/yr, higher ADL scores, and less fear of falling and called for an ambulance less frequently.	Self-report bias Length of intervention varied per participant Unclear which intervention affected each individual outcome
Lord et al. (2005)	Evaluate the effect of exercise, maximization of vision, and counseling on fall risk and falls	Level I RCT	<i>Intervention</i> One group of extensive intervention level (assessment, one-on-one	No significant difference was found in rate of falls. Participants in the extensive intervention group had	Participants not blinded Possible contamination

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
		<i>N</i> = 620 people ≥75 yr	training, and classes), one minimal intervention level (assessment, brief training, and written recommendations), one control group <i>Outcome Measures</i> <ul style="list-style-type: none"> • Number of falls • Fall risk 	a reduction in physiological fall risk factors.	
Lord, Ward, Williams, & Strudwick (1995)	Evaluate the effect of a 12-mo exercise program on balance, strength, and falls	Level I RCT <i>N</i> = 197 women 60–85 yr	<i>Intervention</i> Twice-weekly exercise class that was part of a community-based program <i>Outcome Measures</i> <ul style="list-style-type: none"> • Number of falls • Postural sway • Reaction time • Leg strength • Neuromuscular control 	Participants who attended more than 75% of classes during the year had fewer falls and showed improvement in most physiological measures.	Participants not blinded Self-report bias
Luukinen et al. (2007)	Evaluate the impact of an individualized, exercise-oriented program on falls in frail older adults	Level I RCT <i>N</i> = 486 adults Mean age: 88 yr	<i>Intervention</i> Individualized intervention plan that may have included home exercise, group exercises, self-care exercises, walking exercise, or any combination thereof. Participants took the intervention plan to their physician for approval before beginning exercise <i>Outcome Measure</i> Number of falls	No significant difference was found between groups in total number of falls, but after the study, the intervention group went longer without falling.	Limited adherence to recommendations Self-report of falls (study included those with cognitive impairments)
Mann, Ottenbacher, Fraas, Tomita, & Granger (1999)	Evaluate the impact of assistive technology and home environment on the independence and health care costs of frail older adults	Level I RCT <i>N</i> = 104 older adults Mean age: 73 yr	<i>Intervention</i> A comprehensive functional assessment by an occupational therapist, recommendations for assistive technology and environmental interventions, and a follow-up assessment <i>Outcome Measures</i> <ul style="list-style-type: none"> • Functional status • Pain • Health care costs 	Though both groups demonstrated decline in overall functional status, the control group had a significantly greater decline in independence and showed a significant increase in pain. The control group also had higher health care utilization.	“Frail elders” not defined Potential volunteer bias Self-report of issues Intervention group not blinded

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures		Results	Study Limitations
			Intervention	Outcome Measures		
Means, Rodell, & O'Sullivan (2005)	Evaluate the impact of a rehabilitation exercise program on falls, balance, and mobility	Level I RCT N = 338 older adults ≥65 yr who can walk ≥30 ft	<i>Intervention</i> 6-wk group program of active stretching, postural control, endurance walking, and repetitive muscle coordination exercises	<i>Outcome Measures</i> • Time to complete functional obstacle course • Number of falls	Completion time by the intervention group of the functional obstacle course improved. Participants with a history of falls in the intervention group had fewer falls than they previously experienced.	Functional obstacle course not a standardized tool Attention bias not addressed
Morgan, Vinnig, Duque, Abdel-Moty, & DeVito (2004)	Evaluate the effectiveness of a low-intensity exercise program in reducing risk of falls among at-risk older adults	Level I RCT N = 294 men and women ≥60 yr	<i>Intervention</i> Small-group exercise sessions 3x/wk for 8 wk	<i>Outcome Measures</i> • Risk of fall • Number of falls	Participants with low physical functioning had a decreased risk of falls. Intervention increased risk of falls for higher-functioning older adults.	Study included participants who lived in an assisted living facility; this population may be more frail and in poorer health than those living independently Possible contamination
Nikolaus & Bach (2003)	Evaluate the effect of a multidisciplinary home intervention team on falls	Level I RCT N = 360 Mean age: 81.5 yr	<i>Intervention</i> Home visit with individualized package of interventions as needed, including hazard identification, education, and/or recommendations for new or modified techniques	<i>Outcome Measure</i> Number of falls	The intervention group experienced 31% fewer falls.	Self-report bias Not clear which intervention had largest impact or how the exact intervention was determined
Nitz & Choy (2004)	Compare the effectiveness of a workstation format and a community-based traditional exercise class program in reducing falls	Level I RCT N = 73 older adults ≥60 yr	<i>Intervention</i> All participants received a falls risk education booklet and completed an incident calendar. Participants were assigned to workstation-format sessions of functional balance tasks or traditional group exercise—format sessions.	<i>Outcome Measures</i> • Number of falls • Balance	Both groups had significantly fewer falls at the end of the study. The intervention group showed significantly more improvement in functional motor ability and balance, lateral reach, and functional step test.	High dropout rate in part because of location or transportation issues (48% attendance) Not blinded Self-report bias

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Author/Year	Study Objectives	Level/Design/Participants	Intervention and Outcome Measures	Results	Study Limitations
Petersson, Kottorp, Bergström, & Lilja (2009)	Investigate the long-term effect of home modification on the ability of persons aging with disabilities to perform everyday life tasks	Level II Quasi-experimental pretest-posttest N = 103 adults with disabilities ≥40 yr	<i>Intervention</i> Home modifications provided as needed <i>Outcome Measure</i> Performance of everyday life tasks	Participants in the intervention group reported a significantly lower level of difficulty in everyday life tasks, with small to moderate effects continuing at both 2- and 6-mo follow-up.	Lack of randomization Relatively small control group compared with intervention group
Pighills, Torgerson, Sheldon, Drummond, & Bland (2011)	Assess the effectiveness of an environmental assessment and modification provided either by occupational therapists or non-professional assessors to prevent falls	Level I RCT N = 238 adults ≥70 yr with a history of falls in the previous year	<i>Intervention</i> Assessment and modification of home environment. Assessment and training were provided by an occupational therapist (n = 87) or a nonprofessional assessor (n = 73). The control group received usual care (n = 78). <i>Outcome Measures</i> • Fear of falling • Number of falls • Quality of life and ADLs	Although there was no effect on fear of falling, participants in the occupational therapy assessment group had fewer falls than control participants, but there was no difference when comparing falls for the trained assessor and control groups. There was no difference in ADLs at follow-up between occupational therapy or assessor groups versus controls.	Authors reported that it may be difficult to generalize to other populations because community-dwelling older adults in only one center in England were included.
Robertson, Devlin, Gardner, & Campbell (2001)	Evaluate the effectiveness of a home-delivered exercise program on falls	Level I RCT N = 240 adults ≥75 yr	<i>Intervention</i> A walking plan and a set of muscle strengthening and balance retraining exercises that progressed in difficulty <i>Outcome Measure</i> Number of falls	Those ≥80 yr old in the intervention group had fewer falls and less injury from falls that did occur. The intervention was not effective for people taking psychotropic medications.	Self-report of compliance with the home program and falls Participants not blinded
Shumway-Cook et al. (2007)	Evaluate the effectiveness of group exercise and fall prevention education classes in preventing falls	Level I RCT N = 453 Mean age: 75.6 yr	<i>Intervention</i> Intervention group attended group exercise and fall prevention classes; control group received educational brochures only <i>Outcome Measures</i> • Number of falls • Balance	No significant differences were found in the number of falls. Intervention group had small but significant improvements in balance, leg strength, and general mobility.	Possible contamination Different locations may have affected attendance Not blinded Falls were self-reported

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Skelton, Dinan, Campbell, & Rutherford (2005)	Evaluate the effectiveness of an individualized and tailored group exercise intervention on fall reduction	Level I RCT N = 100 women Mean age: 72.8 yr	<i>Intervention</i> Assessment followed by classes targeting dynamic balance, flexibility, gait, and functional skills	<i>Outcome Measures</i> • Number of falls • Fall-related injuries	The intervention group had significantly fewer falls than the control group, especially during the follow-up period.	Not blinded Relatively low number of participants Attention bias Self-report
Stevens, Holman, Bennett, & de Klerk (2001)	Evaluate the effect of home hazard reduction on rate of falls	Level I RCT N = 1,737 adults ≥70 yr	<i>Intervention</i> Home visit with hazard assessment, free installation of devices, and education	<i>Outcome Measure</i> Number of falls	No differences in falls were found between the intervention and control groups.	May not have eliminated enough or the correct home hazards
Tomita, Mann, Stanton, Tomita, & Sundar (2007)	Evaluate the effectiveness of smart home technology in improving functional performance and maintaining current living situation	Level I RCT N = 113 adults ≥60 yr	<i>Intervention</i> Both groups received a 2.5-hr in-home assessment by an occupational therapist or nurse. The intervention group received installation of and training on a computer and smart home technology.	<i>Outcome Measures</i> • Living situation • Functional status • FIM	The intervention group scored significantly higher on the FIM cognitive level. The intervention group remained the same in IADL scores, but the control group significantly declined. The intervention group had a significantly higher rate of living independently.	High attrition rate Attention bias Lack of standardization Lack of reliability in outcome tools Statistical difference in age between groups
Voukelatos, Cumming, Lord, & Rissel (2007)	Evaluate the effectiveness of tai chi in reducing falls and improving balance	Level I RCT N = 702 adults ≥60 yr	<i>Intervention</i> 16-wk community-based tai chi classes	<i>Outcome Measures</i> • Number of falls • Balance	The intervention group had a significantly lower fall rate and better balance.	Self-reported falls Attention bias not addressed Variety of instructors and types of tai chi classes

Note. ADLs = activities of daily living; ER = emergency room; HMO = health maintenance organization; IADLs = instrumental activities of daily living; RCT = randomized controlled trial.

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