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REVIEW ARTICLE

Fall Prevention Self-Management Among Older Adults: A Systematic Review

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Context: Adequate self-management could minimize the impact of falls in older adults. The efficacy of fall prevention self-management interventions has been widely studied, yet little is known about why some older adults engage in fall prevention self-management actions and behaviors, whereas others do not. Through a systematic review of fall prevention self-management studies, this study identified characteristics and the personal, social, and environmental factors of older adults who engage in self-management actions and behaviors.

Evidence acquisition: Medical and nursing literature related to fall prevention self-management was searched in PubMed, Embase, and CINAHL (1997–2017), and relevant publications were selected by three researchers to assess whether the papers included subject characteristics and their fall prevention self-management actions and behaviors. GRADE (Grading of Recommendations, Assessment, Development and Evaluations) was used by the researchers to assess the quality of the included studies and to determine the significance of the extracted characteristics.

Evidence synthesis: Searching literature through 2017, a total of 972 papers were identified, and 28 papers remained after removing those that did not meet inclusion criteria. Nine papers that addressed subject characteristics in relation to the study outcomes were included in a sub-analysis. The authors identified the following characteristics of older adults who participated in fall prevention self-management actions and behaviors: younger males, not living alone and with self-reported good health, having greater fear of falling and high fall prevention self-efficacy, and possessing high motivation for engagement with self-management activities.

Conclusions: The systematic literature review revealed the personal characteristics of older adults who engage in fall prevention self-management actions and behaviors.

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CONTEXT

Falls are the leading cause of morbidity and mortality due to injury in older adults,[1,2] though most falls are preventable.[3,4] There is sound evidence that falls are prevented when a fall prevention plan, tailored to patient-specific risk factors, is followed consistently.[5,6] Despite the evidence, older adults continue to experience falls and the life-changing sequela. Self-management has been defined as day-to-day involvement in health promotion and disease management activities.[7] Although the self-management concept has been used widely in a variety of chronic illness conditions (see the work of Lorig et al.[8–15] and Grey and colleagues[16–18]) and advocated for use as a comprehensive approach to controlling chronic conditions,[19] the self-management concept may be extended to the area of prevention. As Grady and Gough[20] asserted, self-management is the unifying force behind primary, secondary, and tertiary prevention and is,

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therefore, a key factor in maintaining wellness, controlling symptoms, and delaying illness progression.

Primary prevention may be regarded as efforts to preclude the onset of illness among the asymptomatic. People who have risk factors for falling are "among the asymptomatic" and the self-management concept is congruent with preventing falls. The authors define fall prevention self-management as "actions individuals take or behaviors they perform to prevent themselves from falling." The most important person in the chain of fall prevention is the individual at risk for falling. Adequate self-management could minimize falls in older adults and improve the quality and effectiveness of fall-related healthcare services.[21] Deteriorating mobility is one risk factor for falling.[21] The ability to quickly identify changes in mobility may provide older adults with the opportunity to take responsibility for their own mobility-related well-being. Therefore, improving self-management of mobility and mitigating fall risks could lead to the prevention of falls in community settings.[21] Fear of falling and other fall-related psychological concerns, such as low fall prevention self-efficacy and balance confidence, are highly prevalent among community-dwelling older adults.[22] Fear refers to a temporary state of apprehension toward an explicit threat (in this case, a fall), whereas self-efficacy (or fall prevention efficacy) refers to confidence in one's ability to manage a threat, such as a fall.[23,24] Although some community-dwelling older adults with fall-related psychological concerns maintain many risk factors for falls, others do not, and their fall-related psychological concerns seem excessive considering their actual fall risk.[25,26] Improving self-management skills by targeting psychological concerns may help limit fall risks among community-dwelling older adults.

According to a fall prevention guideline,[27] successful multifactorial fall prevention interventions are: strength and balance training, home hazard assessment and intervention, vision assessment, medication review, and withdrawal. These interventions are strongly associated with self-management activities and behaviors that older adults could initiate. The efficacy of these fall prevention interventions has been studied throughout the world. In Australia, researchers investigated perceptions of four evidence-based fall prevention strategies.[28] Their work demonstrated that few older adults were convinced of the benefits of exercise for preventing falls and had high self-perceived risk of falls. Another study, conducted by Nyman et al.[29] identified the psychosocial factors that influence older adults' participation in physical activity interventions to prevent falls. Results revealed older adults will be more likely to engage in fall prevention interventions if they are presented in a manner that fits with a positive self-identity, emphasize the positive benefits, and also if older adults have a high level of self-efficacy and a socially supportive environment.

In the United Kingdom, one study identified intentions to undertake strength and balance training for fall prevention. This was closely related to coping appraisal based upon an evaluation of the many potential benefits of strength and balance training, including enjoyment of the activity and improvement in general health, mood, confidence, and the ability to get out and about, as well as a reduction in the risk of falls.[30] Additionally, one study in Belgium explored older adults' preferences regarding a different program format (e.g., in a group, at home, via Internet) for managing concerns about falls and activity avoidance. Background characteristics, such as sex, perceived general health, level of education, and concerns about falls were associated with preferences for specific program formats.[31] Despite international efforts to address falls and fall prevention, still little is known about why some older adults engage in fall prevention self-management actions and behaviors, whereas others do not.

The purpose of this study is to explore the personal, social, and environmental factors associated with fall prevention self-management actions and behaviors, with a specific focus on exercise and fitness-related activities and self-efficacy. The authors performed a systematic review of the literature to identify the personal, social, and environmental characteristics of older adults who are likely to engage in fall prevention self-management actions and behaviors to prevent falls in the community setting.

EVIDENCE ACQUISITION

Search Strategy

With the assistance of a medical librarian, the authors searched medical and nursing literature from January 1997 to April 2017 in PubMed, Embase, and CINAHL. Combinations of keywords (Table 1) were used to retrieve articles regarding fall prevention self-management. After the results were reviewed, references for relevant articles were searched. Results were pooled using bibliographic software, Refworks-COS, version 2.0, and duplicates were eliminated.

Inclusion and Exclusion Criteria

The literature search was limited to original papers written in English, excluding reviews, case reports, abstracts, and proceedings. The inclusion criteria for study design were: prospective cohort study, RCTs, before–after comparison study, cross-sectional study, or experimental study (Table 1). Three authors reviewed the titles and abstracts to identify potentially relevant articles and then independently reviewed the full manuscripts. The design and manuscript structure of this systematic review conforms to PRISMA (Preferred Reporting Items for Systematic

Table 1. Inclusion Criteria

Variable	Inclusion criteria
Language	Written in English
Study design	Original study (prospective cohort study, RCTs, before–after comparison study, cross-sectional study, experimental study)
Study settings	Subject aged ≥65 years, community dwelling
Search keywords (MeSH and Emtree)	*accidental falls, falls prevention, fear of falls, self-care, safety management/methods, self-management, actions, behaviors, risk reduction behavior, floors and floor coverings, self-efficacy*

Table 2. Strength of Evidence Grades and Definitions

Grade	Definition
High	We are very confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has few or no deficiencies. We believe that the findings are stable (i.e., another study would not change the conclusions).
Moderate	We are moderately confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has some deficiencies. We believe that the findings are likely to be stable, but some doubt remains.
Low	We have limited confidence that the estimate of effect lies close to the true effect for this outcome. The body of evidence has major or numerous deficiencies (or both). We believe that additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect.
Insufficient	We have no evidence, we are unable to estimate an effect, or we have no confidence in the estimate of effect for this outcome. No evidence is available or the body of evidence has unacceptable deficiencies, precluding reaching a conclusion.

Reviews and Meta-Analyses) statements.[32] For each included study, the authors conducted a design-specific risk of bias assessment (low, high, and unclear) using Cochrane Collaboration's tool for assessing risk of bias. Assessment of the risk of bias is summarized in Appendix Table 1 (available online). After this process, the literature was synthesized and analyzed in 2017 to evaluate the personal, social, and environmental factors associated with fall prevention self-management actions (e.g., use of proper lighting, removal of hazards and handrails) and behaviors (e.g., exercise and fitness-related activities, such as engaging in Tai Chi and using stairs). Self-management interventions, defined as "interventions intended to help people understand how individual behaviors can affect how much an illness interferes with their lives and to act on the basis of that understanding"[33] were also included. Self-management programs address areas such as disease and health management, role management, and emotional management.[33] A strength of evidence assessment tool by GRADE (Grading of Recommendations, Assessment, Development and Evaluations) was used to assess the quality of the included studies and to determine the significance of the extracted characteristics of the study subjects that affected the outcomes.[34] Definitions of grading strength of evidence are based on a 4-point qualitative scale,[35] shown in Table 2.

EVIDENCE SYNTHESIS

Characteristics of Included Studies

The flowchart describes the process of selecting studies that met inclusion criteria (Figure 1). A search of databases using all keywords identified 972 papers. Twelve articles were added following the manual search. Of these articles, 107 were considered irrelevant based on their titles and abstracts, and were subsequently removed. The full texts of 72 articles were assessed for eligibility. Of these, 28 were included in the quantitative analysis and 44 were excluded because they did not meet inclusion criteria for the following reasons: they were not related to the research topic, they were non-original research studies, they did not report fall-related outcomes, or they were not written in English. Two papers related to the same study results and were summarized as a single study. A categorization of excluded papers is shown in Table 3. The study design, setting, self-management factors, and main outcomes, as well as a summary of the results of each study that met the inclusion criteria, are summarized in Appendix Table 2 (available online). Most of the studies were conducted in the U.S. (n=7) and Australia (n=7). Other studies were conducted in the Netherlands (n=3), Taiwan (n=2), Canada (n=2), and other locations (n=7). Sixteen studies were conducted as RCTs, whereas other study designs were prospective cohort (n=9), cross-sectional (n=2), and experimental (n=1). Of these 28 studies, only nine conducted a sub-analysis with characteristics of the subjects in relation to the study outcomes. These nine studies were analyzed to identify the characteristics of older adults who are likely to engage in self-management activities and behaviors. The study participants were mostly community-dwelling older adults (n=8), and only one study included patients who were discharged from the hospital.[36] All study subjects were aged >60 years, and included both females and males, except for one

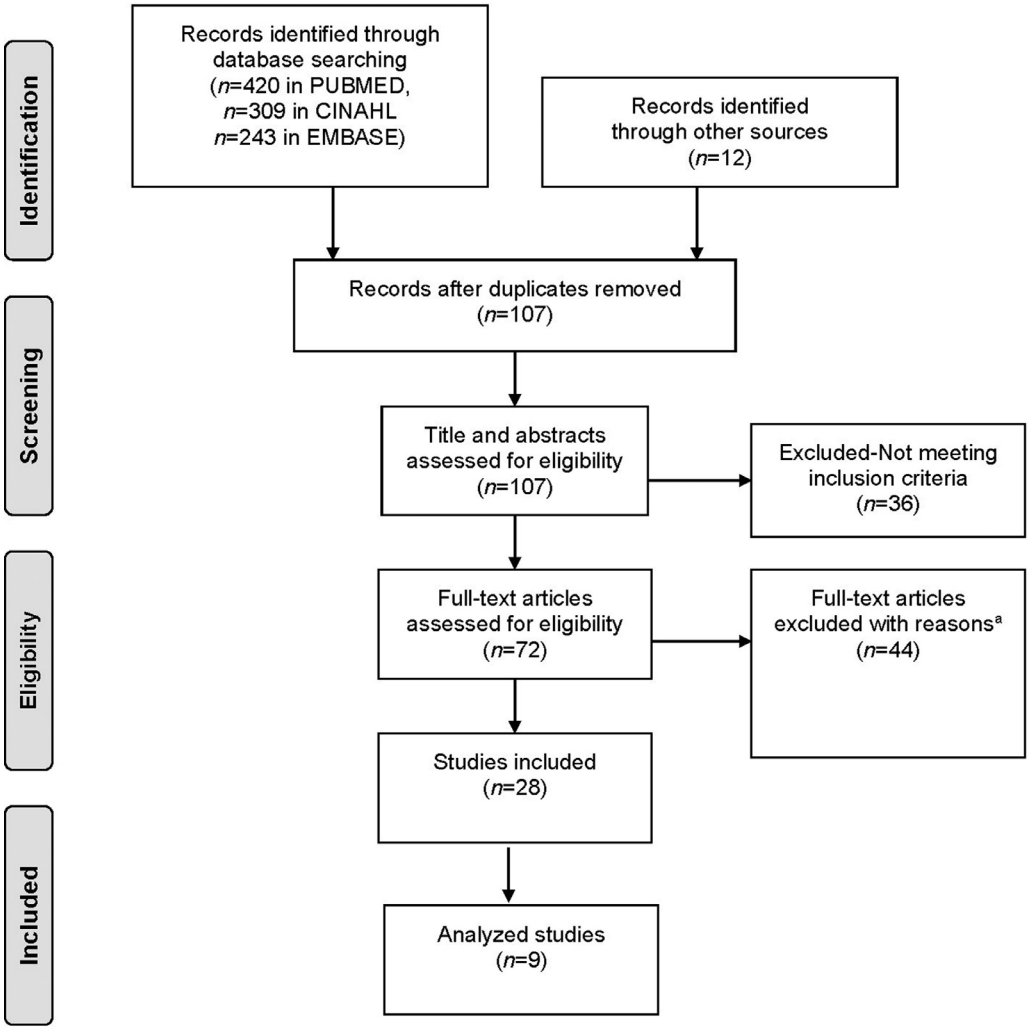

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram, the Process of Selection of Literature.
[a]Table 3 provides reasons.

study that included female subjects only.[37] The main study outcomes of these nine studies included fall incidents,[36,38–40] fear of falling,[41,42] balance and functional mobility,[37] self-perceived risk of falls,[40] self-efficacy on neighborhood walking,[43] fall prevention program adherence,[44] and self-reported barriers to engaging in an exercise program.[36] Multiple outcomes were measured in some studies.[36,37] Included studies were heterogeneous in terms of methodology and outcome measures and included a limited description of the design. There was variability in the comprehensiveness of the data provided. Therefore, the authors did not attempt to summarize the data statistically, but extracted characteristics of the study subjects that significantly affected study outcomes.

Table 3. Reasons for Exclusion From Review

Category	Number of citations
Irrelevant to search topics	14
Non-study papers	14
Disease-specific studies	4
Fall-related outcomes were not measured	3
Inpatient settings	3
Self-management factors were not described	3
Wrong study populations (younger than 65 years)	2
Cognitive impairment	1
Total	44

Characteristics of Older Adults Who Engage in Fall Prevention Self-Management

The identified characteristics of older adults that influenced their likelihood of participation in an intervention

for preventing falls are summarized in Appendix Table 2 (available online).

The personal factors identified related to sociodemographic characteristics were age, sex, race, BMI, education, income level, and marital status. Other personal factors related to health characteristics, such as physical condition and functionality, the presence of chronic diseases or conditions (e.g., pain, shortness of breath), the number of medications taken daily, mobility and balance, functional limitations including activities of daily living (ADLs), and self-efficacy in activities. The cognitive-related factors were cognitive status, vision level, and presence of depression. The fall-related factors were a history of falls, fear of falling, motivation for participating in a fall prevention program, and fall prevention self-efficacy. The social and community factors were living arrangements (e.g., living with somebody versus living alone), feelings of loneliness, and social behavior (e.g., whether any activity limitations exist). The environmental factors included the neighborhood environment (e.g., pedestrian safety from traffic, access to services) and the need for home repairs. Strength of evidence was evaluated based on the study design, intervention, risk of bias, outcomes, and limitation of the study.[36] Of 47 extracted factors, strength of evidence was high for two factors, moderate for 16 factors, low for 27 factors, and insufficient for two factors.

Personal Factors

Four studies[38,39,41,44] showed that the subject's age was a personal factor influencing self-management behaviors and actions in older adults. In three studies,[39,41,44] younger age participants proactively engaged in fall prevention programs, although in one study, the fall prevention intervention was more effective among older age participants.[38] Three studies reported that younger age was related to better fall prevention self-management, and strength of evidence was high in one study[44] and low in two.[39,41] On the other hand, one study reported that older age participants[38] had better fall prevention self-management, but the evidence was low. Sex also was frequently assessed in the sub-analysis of the primary outcome. Four studies[38,39,41,44] demonstrated the significant relevance of sex with respect to active engagement in fall prevention self-management. Among these studies, males were more likely to participate in the interventions (n=3) than females,[38,39,41] but in one study, females were more engaged than males.[44] The evidence for males was one moderate[38] and two low,[39,41] whereas the evidence for females was low.[44] Other significant personal characteristics were race,[39] BMI,[37] marital status,[39] education,[39] and income,[39] but these were reported only in a single study, and the evidence was insufficient for BMI[37] and low for other factors.[39]

Health-related factors often were analyzed to evaluate the efficacy of the intervention. Five studies showed that better health was associated with participation in the intervention, with the evidence ranging from high to low.[36,37,39,41,44] For example, there was high evidence that taking fewer prescription medications was associated with better adherence in the home-based exercise,[44] and moderate evidence that overall good health (no pain, no shortness of breath, or no eye surgery) was associated with better adherence in exercise activity.[36] Two low evidence studies showed that better overall health condition (less chronic conditions) was associated with a less severe fear of falling and fewer falls.[39,41] Similarly, one study reported that a low number of health problems was linked to lower levels of fear of falling, but this evidence was graded as insufficient.[37] ADLs, mobility, and balance were commonly used to assess the association between self-management and characteristics of the study subjects. Three studies[39,41,42] indicated that older adults who were more independent with ADLs and mobility were more likely to engage in fall prevention self-management than those with more dependence. The evidence quality was mixed, with one study rated as moderate[42] and two as low.[39,41] Five studies[36,38,39,42,44] reported that better mobility or balance was associated with better self-management for preventing falls. There was moderate evidence supporting this relationship for three studies[36,42,44] and low evidence for two studies.[38,43]

High self-efficacy also was related to better fall prevention self-management behaviors and activities. Better cognitive function[41,44] and better vision[41] were linked to proactive engagement in fall prevention self-management. The evidence was moderate to low for the cognitive function and low for better vision.[36,41,43] Fall-related factors were a history of falls, a fear of falling, fall prevention self-efficacy, and the motivation to participate in fall prevention interventions. These factors were evaluated with the main outcomes, but the association between self-management behaviors and the characteristics depended on the study and were not consistently related. One study reported that older adults who had previously fallen had fewer falls during the post-intervention period than those who had never fallen.[38] By contrast, another study reported that older adults who had never fallen had less fear of falling than those who had fallen.[41] The evidence for these two studies was low and therefore inconclusive.

The levels of fear of falling and fall prevention self-efficacy were related to the study intervention in two studies providing moderate evidence.[36,44] Hill and colleagues[36] reported that greater fear of falling and greater

perceived risks were associated with the likelihood of engaging in fall prevention exercises. By contrast, Sjosten et al.[44] concluded that subjects who perceived a low risk of falling at home were more proactively engaged in self-management activities. In two studies,[36,40] there was moderate evidence that high motivation positively affected self-management activities.

Social Factors

Several studies reported social- and community-related characteristics of older adults.[36,39,42,43] Living arrangements (e.g., living alone or with someone, living in a senior community) were often evaluated to assess the status of the social environment of older adults. However, only two studies[36,39] showed the association between living arrangement and fall prevention self-management activities and behaviors, and the evidence level was moderate to low. Other social factors that affected the likelihood of engaging in fall prevention self-management were feelings of loneliness[44] and limitations on social behavior.[42] The strength of evidence was low for feelings of loneliness and moderate for limitations on social behavior.

Overall, older adults married or living with someone and less limited in terms of their social behavior were most likely to engage in fall prevention interventions or other self-management activities.

Environmental Factors

Only two studies[39,43] showed a relationship between environmental factors and positive fall prevention self-management. One such environmental factor was whether the home required any repairs.[39] Another factor was the neighborhood's walking environment, including traffic around the home, access to services, and streets.[43] However, this evidence was not significant and rated as low.

Older adults who engaged in fall prevention self-management were younger males who were in relatively good health (including better mobility, balance, and mental and cognitive status, and independence with ADLs), had a greater fear of falling, high self- and fall prevention self-efficacy, and high motivation for self-management activities. Additional characteristics were living with someone, feeling less lonely, and having fewer limitations on social behaviors.

Self-Management

Most of the selected studies reported that the effects of fall prevention programs related to self-management behaviors.[35,36,38,40,42,44] Fall prevention programs consist mainly of exercises and educational programs, such as cognitive-behavioral interventions,[38,42,44] but some provide only one of each type of activity. Exercise-focused programs included different styles of exercise, such as Tai Chi,[37,40] home exercises,[36,40] and group exercises.[38,42,44] Educational programs were designed mainly to reduce the fear of falling, improve fall prevention self-efficacy, and encourage behavioral changes and physical activities. Other types of self-management behaviors noted were neighborhood walking,[43] avoidance of activities,[41] and voluntary participation in educational classes inside or outside the home.[39]

Only two studies reported self-management actions for preventing falls. One study conducted by Clemson and colleagues[38] reported the removal of hazards or the use of proper footwear to prevent falls at home. Another study conducted by Gill et al.[39] reported that getting medical checkups, discontinuing use of sleeping pills, and modifying the home environment were self-management actions taken by older adults.

Hill and colleagues[36] conducted a study to identify factors associated with engagement in a structured exercise program in the 6 months after discharge from the hospital, as well as to identify older patients' perceived barriers to engaging in exercise during this period. Barriers to exercise included low fall prevention self-efficacy, low motivation, medical problems such as pain, and impediments to program delivery. Another study conducted by Taggart et al.[37] examined the effects of Tai Chi exercise on older women. This study also revealed barriers to engaging in fall prevention self-management, including fractures, illness, being busy, moving away (with no fall prevention program available), slow-paced exercises, and post-intervention back pain.

DISCUSSION

The authors identified the characteristics of the older adults who engage in fall prevention self-management—younger males who live with someone, have better health condition and high self- and fall-efficacy, and high motivation, with a greater fear of falling.

These characteristics are similar to risk factors for patient falls reported in previous studies.[45] However, some extracted factors were contradicted in different studies, leaving insufficient evidence at this time to assert that a characteristic was considered a personal factor (e.g., history of falls or self-efficacy). The review included only one third of the selected papers because of insufficient descriptions of the sub-analyses and a lack of significant relationships with subjects' characteristics and the study outcome. In the identified community-based studies, there was considerable diversity in the types of fall prevention programs, methods for implementing interventions, and types of outcome measures.

For some factors, the authors did not see enough evidence to identify the characteristics of older adults who participate in fall prevention self-management. For instance, Hill and colleagues[36] reported several personal factors from a prospective cohort survey. The characteristics of people who did not fall were born in non-English speaking counties and lived in Australia, were married, had high income, were well-educated, and did not require home modification. Although this study identified several characteristics, this evidence was low due to the study design.

Interestingly, the present review found several studies in which males were more likely to participate in the interventions than females,[38,39,41] this finding does not align with previous studies.[46,47] Males have a low perceived risk of falls,[46,47] and they are less likely to utilize healthcare services compared with females.[48] The evidence for male subjects identified in this review was one moderate[38] and two low.[39,41] The findings support the need for further investigations about the role of sex and engagement in fall prevention self-management behaviors and actions.

Among the identified factors, some were modifiable whereas others were not. For instance, subjects' demographic characteristics (e.g., age, sex, race) and some characteristics related to health (e.g., chronic disease, physical, psychological, and functional limitations) are not amenable to change. Alternatively, self-efficacy or motivation could potentially be improved through effort on the part of the subjects or through targeted interventions.

Healthcare professionals or researchers engaged with older adults who are at risk of falls need to consider the varying characteristics when developing effective fall prevention interventions. For example, an intervention program that focuses on improving the self-efficacy of daily activities and fall-related efficacy may lead to better self-management and ultimately reduce the incidence of falls. In fact, in the studies reviewed, high self-efficacy in daily activities indicated better engagement with self-management.[36,41,43] Fall prevention self-efficacy, particularly, perceived lower risks of falls,[36,44] was significantly related to self-management behaviors. Therefore, properly managing fall prevention self-efficacy may be a useful strategy for improving fall prevention self-management behaviors.

As adults age, they are more likely to confront challenges to their mobility from decreased activity and deconditioning. In addition, age-related changes to the vestibular system may impact balance. Mobility and balance are positively affected by the promotion of fall prevention self-management. There is strong evidence that exercise programs promote better mobility and balance, consequently reducing the risk for injurious falls.[49] In fact, four studies that implemented exercise programs or physical function enhancement training resulted in a reduction in the number of falls or in improved fall-related outcomes.[37,38,40,42] Behavioral change educational programs or group activities that decrease the fear of falling could also be effective interventions to encourage older adults to engage in fall prevention self-management. Motivating older adults to engage in fall prevention programs could increase their active engagement in fall prevention self-management activities.

Feelings of loneliness and limitations in social behavior adversely affected self-management. Community support may be a key intervention for older adults to encourage engagement and connection with people around them. The result may be more positive participation in fall prevention programs. Environmental changes, such as encouraging older adults to implement fall prevention home modifications, could help reduce the risk of falling at home.

Through an analysis of the different factors, the authors discovered that not only exercise programs, but also improved fall prevention self-efficacy and psychological factors are vital to increasing active engagement in fall prevention self-management.

Limitations

The main limitations of the selected studies were that the study design, sample size, and outcome measures were heterogeneous, and different outcomes were used to evaluate self-management activities and behaviors. Some studies used outcome measures, such as fall rates, whereas others used fear of falling or adherence to fall prevention interventions, consequently, quantitative data comparisons were not feasible. The characteristics of the subjects were also measured using various instruments and surveys. However, for all included studies, the association between characteristics and the studies' outcomes was statistically analyzed and showed significance; allowing the authors to judge the degree of evidence. Additionally, true self-management occurs when an individual chooses to participate and completes a fall prevention program, but the literature falls short of directly addressing this issue.

The authors obtained three nursing researchers' consensus when rating for the strength of evidence. However, these ratings were based on the authors' judgments and could have some deviations. Furthermore, the research protocol for this study was not published a priori. Despite these limitations, it is reasonable to conclude that the characteristics identified potentially affected the other fall prevention self-management activities and behaviors.

CONCLUSIONS

The purpose of this study was to examine characteristics of older adults who are likely to engage in fall prevention self-management. The systematic literature review revealed the following personal characteristics of older adults who engage in fall prevention self-management, actions and behaviors: younger males, not living alone and with self-reported good health, having greater fear of falling, high fall prevention self-efficacy, and having high motivation for engagement with self-management activities. Examining the identified factors to develop fall prevention interventions may be helpful in tailoring interventions to be more effective for older adults. Attention to modifiable characteristics may enable healthcare providers to implement preliminary interventions aimed at repositioning older people, such that they may become willing participants of fall self-management interventions.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2018.11.007.

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