Strategies for preventing falls in Brazilian community-dwelling elderly people

Estratégias para prevenção de quedas em idosos comunitários brasileiros

Estrategias para prevenir las caídas en ancianos comunitarios brasileños

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Objective: identify and evaluate interventions carried out to prevent falls in community-dwelling elderly people in Brazil. **Methods:** this is an integrative review, with a timeless focus, carried out in the databases Latin American and Caribbean Health Sciences Literature (LILACS), National Library of Medicine (PUBMED) and The Scientific Electronic Library Online (SciELO). **Results:** 69 articles were found in the search, 17 articles published in the period from 2013 to 2022 were selected, analyzed descriptively, taking into account the heterogeneity of the studies. The studies were classified according to the proposed interventions into single interventions (11), multiple interventions (5) and multifactorial intervention (1). There was a predominance of interventions in the exercise category in different modalities, followed by educational strategies. **Conclusion:** the proposed interventions present clinically relevant results, with an emphasis on improving performance components such as balance, gait and postural stability.
Descriptors: Health of the elderly; Accidental falls; Accident prevention.

Objetivo: identificar e avaliar as intervenções realizadas para a prevenção de quedas em idosos comunitários no Brasil. **Método:** trata-se de uma revisão integrativa, com recorte atemporal, realizada nas bases de dados Literatura Latino Americana e do Caribe em Ciências da Saúde (LILACS), *National Library of Medicine (PUBMED)* e *The Scientific Electronic Library Online* (SciELO). **Resultados:** na busca foram localizados 69 artigos, sendo selecionado 17 artigos publicados no período de 2013 a 2022, analisados de forma descritiva, tendo em vista a heterogeneidade dos estudos. Os estudos foram classificados de acordo com as intervenções propostas em intervenções únicas (11), intervenções múltiplas (5) e intervenção multifatorial (1). Houve um predomínio de intervenções na categoria de exercício em diferentes modalidades, seguido por estratégias educacionais. **Conclusão:** as intervenções propostas apresentam resultados clinicamente relevantes, com ênfase na melhora em componentes de desempenho como equilíbrio, marcha e estabilidade postural.
Descritores: Saúde do idoso; Acidentes por quedas; Prevenção de acidentes.

Objetivo: identificar y evaluar intervenciones para la prevención de caídas en ancianos comunitarios en Brasil. **Método**: Se trata de una revisión integradora con un planteamiento atemporal, realizada en las bases de datos de Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS)**,** *National Library of Medicine (PUBMED)* y *The Scientific Electronic Library Online* (SciELO). **Resultados:** Se encontraron 69 artículos en la búsqueda, y se seleccionaron 17 artículos publicados entre 2013 y 2022, que se analizaron de forma descriptiva, dada la heterogeneidad de los estudios. Los estudios se clasificaron según las intervenciones propuestas en intervenciones únicas (11), intervenciones múltiples (5) e intervenciones multifactoriales (1). Hubo un predominio de intervenciones en la categoría de ejercicio en diferentes modalidades, seguidas de estrategias educativas. **Conclusión:** las intervenciones propuestas muestran resultados clínicamente relevantes, con énfasis en la mejora de componentes del rendimiento como el equilibrio, la marcha y la estabilidad postural.
Descriptores: Salud del anciano; Accidentes por caídas; Prevención de accidentes.

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INTRODUCTION

Falls are defined as unintentional displacement of the body to a level lower than the initial position, compromising stability[1]. This event can occur with people in any age group, however when they occur in the elderly population, they have greater consequences, as they impact mobility and lead to a reduction in functional capacity, which can cause psychophysical, functional and economic changes[2].

Elderly people suffer changes in their functional capacity as a result of the natural aging process, which is characterized by being dynamic and progressive, in which morphological, functional, biochemical and psychological changes occur that impact the body's ability to adapt to the environment[3]. This process is accentuated when associated with aspects such as chronic diseases, physical inactivity, frailty syndrome, the presence of mental and cognitive disorders, polypharmacy, among other factors that may predispose this population to falls[2-4].

Advancing age increases the risk of falling linearly and proportionally. In elderly people over 80 years of age, falls represent, on average, a 50% higher occurrence compared to other age groups[5].

The factors that lead elderly people to fall are diverse and are present in the daily lives of this population, and can be classified as intrinsic or extrinsic[6-8]. Intrinsic factors are related to the elderly person's body, such as fear of falling, postural and balance disorders; significant reduction in muscle mass; decreased strength and flexibility; reduced visual acuity and the use of medication. These factors can worsen, influenced by the habits and behaviors adopted by elderly people throughout their lives, which can vary from one subject to another. While extrinsic factors are related to the risks found in the elderly person's living environment, such as: inadequate lighting, slippery floors, carpets and architectural barriers or irregular furniture[1,5,9].

Among the predictors of falls presented, the most prevalent refer to extrinsic factors, related to the home environment[2,10,11], with emphasis on events that occur when the elderly person moves from the bedroom to the bathroom[2,10].

Falls represent the main reason for injuries in the elderly population[2], resulting in the compromise of their autonomy and independence and impacting the morbidity and mortality of this population. Its occurrence is responsible for a high rate of hospital admissions, being the third highest cause of death in Brazil[12].

However, falls do not only affect elderly people, but families and the community, causing high costs to health systems, related to the need for hospitalization, reducing the life expectancy and quality of life of this population. The occurrence of falls in the elderly community

population is a public health problem and tends to worsen due to the aging population and the increase in this population. This scenario calls for the implementation of fall prevention and management strategies aimed at reducing their occurrence, preventing disabilities, reducing morbidity and mortality, reducing hospitalization costs resulting from falls, as well as promoting healthy aging[7].

Fall prevention strategies are divided into categories, according to the factors on which they intervene, and can be classified as physical exercise, medication, psychological intervention, environmental modification, use of assistive technology and information and education to prevent falls. These categories can comprise single, multiple or multifactorial interventions. Single interventions use only one category in the intervention proposal intended for all participants in the intervention group. Multiple interventions consist of the combination of two or more intervention categories, which are carried out equally across the entire group participating in the intervention. In multifactorial interventions, more than one intervention category is used, but each participant receives individual attention, based on the assessment of their potential risk of falling[1,13].

In this sense, it is essential to analyze which interventions to prevent falls are developed at national level and in the community context, considering that the home is the main place where these events occur. This analysis aims to identify more effective interventions in reducing the occurrence of falls, which are capable of contributing to the promotion of "aging in place", quality of life and autonomy and independence of the elderly population. Given this scenario, this study aims to identify and evaluate interventions carried out to prevent falls in community-dwelling elderly people in Brazil.

METHODS

This is an integrative review study guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria[14].

To define the guiding question, the PICO strategy was used (P-Patient, I-Intervention, C-Comparison, O-Results), and the C-Comparison component was excluded from the study because there was no comparison between interventions, resulting on the following question: *What interventions are used to prevent falls in community-dwelling elderly people in Brazil?*

To select the productions, the following combinations between descriptors and keywords were used: "Accidental Falls" OR "Falls" OR "Fall" OR "Falling" OR "Falls Accidental" OR "Accidental Fall" AND "Senior Fear" OR "Fears" OR "Fear of falling" AND "Risk of falls" AND

"Accident prevention" OR "Prevention" AND "Older" OR "Older adult" OR "aged" OR "sênior" OR "seniors" OR "elderly" AND "Brazil" AND "community". There were no language restrictions.

To obtain the sample, the following inclusion criteria were established: 1) clinical intervention articles carried out with the aim of preventing falls or reducing their occurrence; 2) studies carried out among the Brazilian population, aged 60 or over, of both sexes, living in the community. The following were excluded: 1) studies carried out with elderly people living at home, but who were bedridden and/or under the supervision of a caregiver; 2) studies with institutionalized elderly people; 3) studies with elderly people who had comorbidities, such as femur fractures, frail elderly people, claudication, Parkinson's, Alzheimer's, cancer, among others, and 4) review studies.

To select the articles, titles and abstracts were read independently by two reviewers, who did not maintain contact at this stage. In case of disagreement regarding the inclusion of an article in the research, it was resolved by consensus and, if necessary, a third researcher was consulted.

The bibliographic research was carried out concomitantly by two researchers, in January 2023, in a timeless manner, in the databases LILACS (Latin American and Caribbean Health Sciences Literature), PubMed (National Library of Medicine) and SciELO (The Scientific Electronic Library Online).

To analyze the data, a descriptive analysis was carried out, taking into account the heterogeneity of the studies. The data was organized and grouped to characterize the interventions carried out and the participants. The strategies were classified as single, multiple or multifactorial interventions[12,13]. The data were analyzed in a descriptive way, seeking to identify the actions and programs carried out with the greatest recurrence and their results achieved.

The studies were classified according to the level of evidence, using a hierarchical system, which classifies the evidence into seven levels. At level I, the evidence comes from a systematic review or meta-analysis of all randomized controlled clinical trials; at level II, they come from at least one well-designed randomized controlled clinical trial; level III refers to evidence from well-designed clinical trials without randomization; at level IV, there is evidence from well-designed cohort and case-control studies; level V refers to evidence originating from a systematic review of descriptive and qualitative studies; level VI is evidence derived from a single descriptive or qualitative study; at level VII, the evidence comes from the opinion of authorities and/or reports from expert committees[15].

RESULTS

In the selection stage, 69 articles were located and 17 were considered as meeting the inclusion and exclusion criteria, as shown in Figure 1.

Figure 1. Steps for selecting articles on interventions to prevent falls in elderly people living in the community. Brazil, 2023.
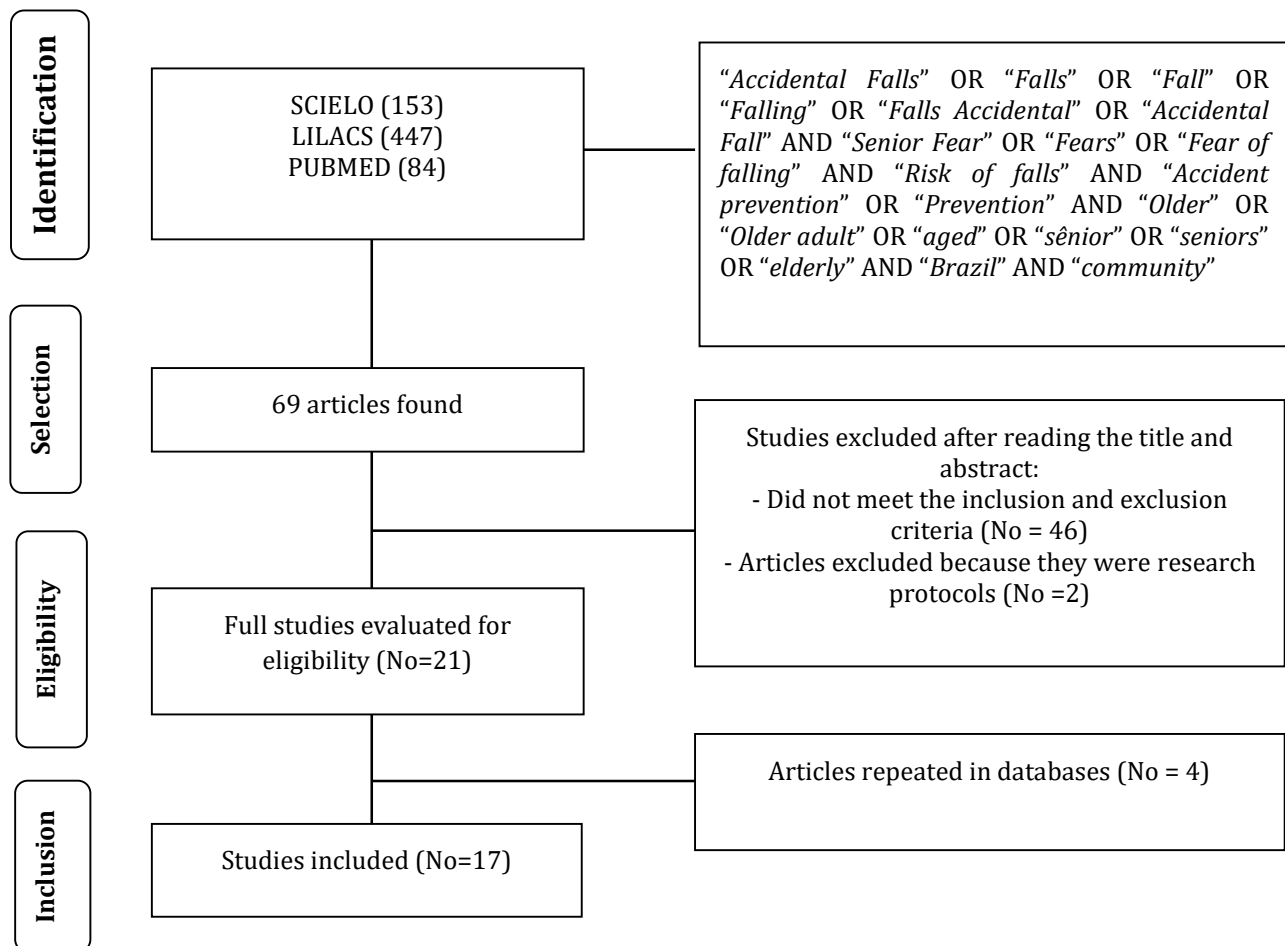
Studies characteristics

The 17 articles analyzed were published between 2013 and 2022, with a predominance of publications in 2016 (N=5). Among the articles, six were published in international journals and in the English language. The others were published in Brazilian periodicals, in Portuguese (N=11).

The studies were developed predominantly by researchers linked to public higher education institutions (N=15), with the others carried out by a private institution (N=1) and in partnership between a public and private institution (N=1). Regarding the regions of Brazil where they were developed, the Southeastern (N=6) and Northeastern (No=6) regions stand out, followed by the Southern (N=4) and Central-Western (N=1) regions.

Regarding the classification of the level of evidence of studies, there was a predominance of studies at level five (N=7), characterized by descriptive studies, and studies at level two (N=6), characterized as randomized clinical trials, followed by studies at level four (N=2) and three (N=2). Chart 1 below presents the characterization of the articles that made up the sample.

Chart 1. Studies selected according to objectives, in chronological order of publication. Uberaba/MG, Brazil, 2023.

ARTICLE IDENTIFIER/TITLE/JOURNAL /YEAR	OBJETICVE	MAIN FINDINGS
A1/Minimally Supervised Multimodal Exercise to Reduce Falls Risk in Economically and Educationally Disadvantaged Older Adults/J Aging Phys Act/2013[16]	Compare the effects of a minimally supervised home exercise program with a fully supervised program in a health center to be offered to economically and educationally disadvantaged older people with a history of falls. And evaluate the effect of exercise on the risk of falls.	Both strategies were equally effective in improving functional mobility and relevant for reducing falls.
A2/Effects of a health promotion and fall prevention program in elderly individuals participating in interaction groups/Fisioter Mov./2014[17]	To verify the effects of a health promotion and falls prevention program in relation to balance and functional capacity in elderly people participating in social groups.	The multisensory stimulation and proprioceptive circuit program was effective in improving functional balance and gait performance. However, the occurrence of falls is multifactorial and it is not possible to confirm their reduction.
A3/Effect of the vibratory pole training on biomechanics of dual-task gait in older female adults/Rev. Bras. Med. Esporte/2014[18]	To verify the effects of eight weeks of balance training with a vibrating pole on step length and lower limb muscle activation in elderly women during dual-task walking.	Balance training with a vibrating pole was effective in improving performance in different walking conditions, contributing to the prevention of falls.
A4/Efficacy in Falls Prevention Programs for the Elderly/Dist Comun./2016[19]	To verify the effectiveness of a fall prevention program in socially active elderly people.	There was a reduction in the risk of falls, with an improvement in body balance and a reduction in the concern about future falls, especially in older elderly people.
A5/Postural control and the fear of falling in frail elderly and the role of a falls prevention program/Acta Fisiatr./2016[20]	Verify and analyze the effects of a multisensory physical exercise program associated with guidance on fall prevention, postural control and fear of falling in frail elderly people treated in a rehabilitation service.	Significant gains were identified in the conditions of dynamic and static balance, functional mobility and decreased fear of falling in frail elderly people.
A6/The effect of supervised and home based exercises on balance in elderly subjects: a randomized controlled trial to prevent falls/Rev. Bras. Geriatr. Gerontol./2016[21]	To evaluate the effect of a training program on the semi-static balance of elderly people, comparing it to supervised group and individual application at home.	The exercise protocol proved to be effective for both strategies.
A7/Effectiveness of a multiple intervention programme for the prevention of falls in older adults persons from a	To evaluate the effectiveness of a multiple intervention to prevent falls in elderly people participating in an University for	The multiple intervention enabled improvements in balance and greater knowledge about risk factors for falls among the elderly.

University of the Third Age/Rev. Bras. Geriatr. Gerontol./2016[22]	the Third Age (*Universidade Aberta à Terceira Idade* - UnATI).	
A8/Effects of two physical exercise protocols on physical performance related to falls in the oldest old: A randomized controlled trial/Geriatr Gerontol Int/2016[23]	Compare the effects of multicomponent and resistance training and detraining on physical variables related to the increased risk of falls in the elderly.	Multicomponent training proved to be more beneficial and presented fewer adverse events when there is greater adherence to the protocol.
A9/Postural balance program: Variables related to falls in elderly/J Phys. Educa/2017[24]	To analyze the effects of a physical balance program on variables associated with falls in the elderly.	A trend towards improved balance was identified after training, helping to prevent falls.
A10/Social dancing to prevent falls in older adults: a control case study/Rev. Cuidarte./2019[25]	To evaluate the practice of ballroom dancing in preventing falls in the elderly.	Ballroom dancing helps prevent falls in elderly people and those who dance have better balance.
A11/Association between falls in older adults and prevention group/Rev. Brasileira de Enfermagem/2020[26]	To evaluate the effectiveness of guidelines on fall prevention in a group of elderly people in Primary Health Care.	There was no protective association between holding a prevention group in the elderly and reducing the number of falls itself.
A12/Effect of Senior Dance (DanSE) on Fall Risk Factors in Older Adults: A Randomized Controlled Trial/BMJ open/2020[27]	To investigate the effect of Senior Dance and brief fall prevention education on balance among people aged 60 and over, compared to a control group receiving only brief education.	Senior Dance was effective in improving balance and mobility, but not cognitive function in community-dwelling older adults.
A13/Effects of water aerobics on posture alignment and risk of falls of older adults: an intervention study/Rev. Bras Ciênc Esporte/2021[28]	To analyze the effects of water aerobics on postural alignment and the risk of falls in the elderly.	Water aerobics improved postural alignment and reduced the risk of falls in the elderly
A14/Speech therapy´s intervention for falling prevention in aging/CoDAS/2021[29]	Verify the effectiveness of a speech therapy intervention to reduce the risk of falls.	The intervention resulted in a reduction in the risk of falls and improved gait performance and functional and dynamic balance.
A15/ Care process for fall prevention in the elderly: theory of nursing praxis intervention/Escola Anna Nery/2022[30]	To analyze the care process to prevent falls in the elderly from the theoretical and methodological perspective of the Theory of Nursing Praxis Intervention in Collective Health.	From the assessment of the risk of falls, it was possible to draw up an intervention plan, based on the main nursing diagnoses and interventions.
A16/Effectiveness of an educational video in older adults' perception about falling risks: a randomized clinical trial/Rev. da Escola de Enfermagem/2022[31]	To evaluate the effectiveness of using educational videos, in comparison with verbal nursing instructions, in increasing elderly people's perception of the risk of falling.	The educational video and verbal guidance promoted an increase in elderly people's perception of the risk of falling, with better results for the group subjected to verbal guidance.
A17/Health beliefs and adherence of the elderly to fall prevention measures: a quasi-experimental study/Rev. Brasileira de Enfermagem/2022[32]	To evaluate the effect of an educational intervention on health beliefs and adherence of elderly people to preventive measures against falls.	The educational intervention was able to improve the elderly's beliefs and adherence to fall prevention measures.

Characterizations of interventions carried out

Regarding study participants, it was identified that five studies had participants with an average age in the 60 to 70 year old range, five studies involved elderly people with an average age in the 70 to 80 year old range, one study with elderly people with an average age of over 80 years old and six studies did not report the average age of the participants.

Regarding the professionals who developed the proposed interventions, unidisciplinary teams (N=7) and multidisciplinary teams (N=3) were identified, however some studies did not inform the composition of the teams (N=7). The single-professional teams covered the professions of Physical Therapy (A6[21], A12[27]), Physical Education (A8[23], A13[28]), Nursing (A5[20], A16[31]) and Speech Therapy (A14[29]). The multidisciplinary teams were composed of two professional categories such as Physical Education and Speech Therapy (A4[19], A9[24]) and Nursing and Physical Therapy (A5[20]).

Regarding the proposed interventions, eleven studies developed single interventions, five studies developed multiple interventions and one study carried out a multifactorial intervention (A15[30]). In the category of single interventions, studies developed exercise programs (N=8) or educational interventions (N=3).

In studies that carried out exercise programs, a variety of proposals were identified, such as proprioceptive and multisensory circuit (A2[16]), balance protocol with vibrating pole (A3[18]), Cawthorne and Cooksey Protocol (A14[29]), water aerobics (A13[28]) and multimodal protocol, consisting of warming up, stretching, balance exercises (A6[21], A8[23], A9[24]), added to strength exercises (A8[23]) or proprioceptive exercises (A9[24]). Ballroom dancing was also evaluated (A10[25]), being considered as an activity that promotes balance, flexibility, motor coordination and body awareness[4].

Regarding the frequency and duration of interventions, among the studies that mentioned duration (A2[17], A3[18], A6[21], A8[23], A9[24], A13[28]) there was a variation of 45 to 60 minutes. As for frequency, they varied from 2 to 3 times a week. The total duration of the interventions varied from 1 to 4 months, with emphasis on one of the studies (A10[25]), which followed the elderly for one year.

The educational interventions used strategies such as the use of video about the risk of falling (A16[30]), dialogued presentations and a protocol based on the belief model (A17[32]), which sought to raise awareness among elderly people regarding intrinsic and extrinsic factors, regarding risk behaviors, in addition to providing guidance on ways to prevent falls. The frequency and duration of the actions varied, occurring once a month (A11[26]) or in four meetings (A17[32]).

In the category of multiple interventions, a combination of an exercise program and educational strategies was identified. In exercise programs, a predominance of multimodal exercises was identified, involving warm-up, stretching, strengthening, balance and relaxation exercises (A1[16], A4[19], A5[20], A7[22]). It is noteworthy that one of the studies (A1[16]) included dual-task exercises and another (A12[27]) used senior dance. Regarding educational strategies, the studies used dialogued exposure, facilitated by different resources, such as pamphlets and videos, which addressed extrinsic and intrinsic factors, fragility in senescence and the occurrence of falls. These interventions ranged from 30 to 60 minutes, being carried out once or twice a week, following the duration of the exercise protocol or occurring on an occasional basis.

In the multifactorial intervention, the participants' health and intrinsic and extrinsic risks for falls were assessed and, based on this information, the researchers drew up an intervention plan to be developed by nursing professionals. This plan covered aspects such as nutrition, excretion, exercise and physical activity, mobility, perception, environment, safety and learning[30].

The studies used different instruments to evaluate the outcomes of the interventions, with a predominance of standardized and validated instruments for assessing balance, such as the Berg Balance Scale (No=5); functional mobility, such as Time Up and Go (No=8), self-efficacy related to falls, such as the Falls Efficacy Scale International (No=5) and cognition, such as the Mini Mental State Examination (No=5).

Carrying out single or multiple interventions that proposed exercises and dance identified as a result the improvement of performance components, such as static and dynamic balance, gait and functional mobility, reducing the risk of falling. Regarding educational interventions, the results achieved, when proposed together with exercise programs, have been little explored. The contributions of these interventions are emphasized in single intervention studies, identifying a greater perception of elderly people about the risks of falls and adherence to measures of prevention.

Chart 2 summarizes the interventions carried out in the studies listed.

Chart 2. Summary of interventions carried out, according to the type of intervention. Uberaba/MG, Brazil, 2023.

INTERVENTION CLASSIFICATION: SINGLE INTERVENTION				
	SAMPLE	**INTERVENTION**	**FREQUENCY/TIME**	**TOOLS**
A2[17]	14 seniors (average age of 72 years) 3 men 11 women	- Proprioceptive and multisensory circuit: warm-up and multisensory exercise (kinesiotherapy and stretching exercises)	45-minute sessions, twice/week, for two months.	- Barthel Index; - TUG; - BBS; - Sample characterization questionnaire.
A3[18]	16 senior women (ages between 60 and 80 years old) Balance training group (BTG): (No=8) Vibrating Pole Balance Training Group (VPBTG): (No=8)	- VPBTG - The proposed exercises were performed using a vibrating pole, moved at a frequency of 5Hz, determined by prior familiarization and performed with an increasing degree of difficulty between sessions. - The BTG carried out the same training protocol, but using rigid poles with the same dimensions as the vibrating pole.	50-minute sessions, weekly, for eight consecutive weeks.	- Gait assessment (walking at preferred speed and dual tasks). - Electromyography of the rectus femoris, vastus lateralis, biceps femoris, tibialis anterior and lateral gastrocnemius muscles; - Kinematic analysis of step length.
A6[21]	56 seniors (average age 66.2 years) 4 men 52 women Supervised Group (SG): (No=18) Home Group (HG): (No=20) Control Group (CG): (No=18)	SG: Exercise protocol: warm-up, stretching, semi-static and dynamic balance, sitting and standing training, gait training and relaxation. HG: Participants received two supervised sessions to learn the exercises and reproduce them at home. The same exercises as the SG were performed; CG: Did not receive any type of intervention.	HG: 18 sessions over 10 weeks; SG: 20 sessions over 10 weeks.	- MMSE; -Force platform for evaluating semi-static balance and postural oscillation
A8[23]	69 seniors (average age 82.4) Control Group (CG): (No=23) (average age - 82.6); Multicomponent training (MT): (No=23) (average age - 81.9); Resistance training (RT): (No=23) (average age - 82.8)	- CG: did not receive intervention; - MT: protocol consisting of warm-up and aerobic exercise, strength exercise, balance activities and relaxation exercises; - RT: performed strength exercises on six devices adapted for the elderly.	One-hour sessions, three times a week, for 16 weeks.	- TUG; -Sit-to-stand test.
A9[24]	17 seniors (average age 75.53) 1 man 16 women	Exercise Program (EP): warm-up, adjustment control exercises (plantar grip; variation of supports, heights and types of flooring; proprioceptive training; displacement in different directions), strength exercises with emphasis on the muscles of the lower limbs, exercises for stretching and relaxation.	Two weekly 50-minute classes.	- Single Leg Stance; - TUG; - Functional Reach; - Lower limb strength; - Lower limb flexibility; - FES – I;

A10[25]	90 seniors Control Group: (CG): (No=60) (average age 68.45) -25 men and 32 women; Case Group (CG): (No=30) (average age 68.63) - 6 men and 24 women	Case Group: elderly people who practiced ballroom dancing.	Twice a week for one year.	- BBS
A11[26]	274 elderly people (average age 71.69 years)	Guidance on preventing falls at home: Elderly people participated in an extension project with the aim of providing guidance on intrinsic, extrinsic and behavioral factors associated with falls at home.	Once a month.	- Semi-structured instrument for sociodemographic and economic variables and factors associated with falls
A13[27]	83 elderly (average age of 67 years and predominance of women) Intervention Group (IG): (No=49) Control Group (CG): (No=34)	Water aerobics sessions divided into: stretching, warming up, resistance and relaxation exercises, with 12 repetitions each exercise.	50-minute sessions, twice/week, for three months.	- Assessment of postural alignment (plumb symmetrograph); - TUG
A14[29]	148 elderly people (≥ 60 years and both sexes)	Cawthorne and Cooksey protocol: eye exercises, head exercises, upper body exercises and balance exercises.	50-minute sessions for five weeks.	- Sociodemographic questionnaire; - Dynamic Gait Index (DGI) test – Brazilian brief; - TUG;
A16[31]	138 elderly people (average age 73.5 years) (female = 66.7%), Intervention Group (IG): (No = 69); Control Group (CG): (nO = 69)	IG - Watched the Educational Video (EV) entitled "Risk of falling: don't fall for it". GC - Received verbal guidance about the risk of falling in the elderly. Both groups were evaluated 30 days after the interventions.	EV lasting 10 minutes. CG - duration of 25 to 30 minutes.	- FRAQ-Brazil; - Script for characterizing demographic, clinical and falls data
A17[32]	68 seniors (average age 70.06 years) (predominance of women (83.82%))	- Educational Intervention Protocol based on the Health Belief Model, which establishes a relationship between behaviors and beliefs, consisting of the dimensions: perceived susceptibility; perceived severity; perceived benefits to acting and perceived barriers to acting.	Four meetings for educational activities.	- MMSE; - Sociodemographic questionnaire; - Health Belief Scale; - Adherence to falls preventive measures questionnaire
INTERVENTION CLASSIFICATION: MULTIPLE INTERVENTIONS				
A1[16]	76 seniors (average age 79 years) 13 men 63 women Control Group (CG): (No=26) Minimally Supervised Group (MSG): (No=22); Fully supervised group	- Educational guidance for all groups regarding the risks of falling at home. - FSG - Supervised multimodal physical training - MSG - subjected to training using an exercise booklet to be performed at home. Every two weeks they held a supervised session.	FSG: 50-minute sessions, three times/week, for four months. MSG: three times a week for 4 months.	- BOMFAQ; - MMSE; -400 meter walk; - BBS; - TUG; - Test protocol using a force platform.

	(FSG): (No=28);	Exercises included stretching, dynamic and static balance, resistance exercises and dual tasking.		
A4[19]	60 seniors 3 men (average age 67.3 years) 57 women (average age 76.6 years)	-Exercises: head, neck and eye movements and postural control in sitting and standing positions. -Waiting room: holding lectures, pamphlets and videos that addressed topics related to health, frailty and falls in senescence	40-minute sessions, weekly, totaling eight meetings. Waiting room: duration 30 minutes	- POMA-Brazil; - FES – I;
A5[20]	28 seniors (average age 67.1 years) 4 men 24 women	-Educational program: approach to intrinsic and extrinsic factors that lead to falls, simulation of activities of daily living and guidance on reducing risks and modifying behavior. -Intervention program: multisensory exercises (warm-up and flexibility, stretching, active strengthening exercises, balance and relaxation exercises).	-Educational program: two weekly one-hour meetings, totaling 10 sessions. -Intervention program: one-hour sessions, totaling ten sessions	- TUG; - Single leg support test; - BBS; - FES – I;
A7[22]	69 seniors Control Group (CG): (No= 23); Physical exercise group (PEG): (No=25); Multiple Intervention Group (MIG): (No=21)	MIG: Multimodal physical training (MPT): aerobic resistance exercises (walking), muscular resistance (lower limb exercises performed in a sitting posture and balance (exercises in static and dynamic posture). Educational Intervention Protocol (EI): lecture, discussion coordination and clarification of doubts. Topics covered: definition of falls, consequences, risk behavior and prevention, diseases and changes in health, extrinsic factors and factors influencing falls. PEG: received Multimodal Physical Training CG: did not receive intervention	MIG: MPT: two weekly 60-minute sessions, for 16 weeks. EI: once a week, lasting 60 minutes PEG: MPT: two weekly 60-minute sessions, for 16 weeks.	- Sociodemographic questionnaire; - Geriatric Depression Scale; - MMSE; - TUG; - Getting up and sitting down from a chair and hand grip strength; - FES – I; - FRAQ
A12[27]	82 seniors (average age 69 years) Control Group (CG): (n=41) Intervention group (GI): (n=41)	Fall Prevention Class (FPC). Senior Dance Program (SD), moderate level, requiring memorization of songs and choreographies (combinations in sitting and standing positions, fast or slow, in circles, in pairs or small groups). Requiring changes in balance, motor coordination and cognitive functions	FPC: duration of one hour. SD: twice a week, for 12 weeks.	- Short Physical Performance Battery; - FES – I; - Trail Making Test; -Montreal Cognitive Assessment.
INTERVENTION CLASSIFICATION: MULTICOMPONENT INTERVENTION				

| A15[30] | 10 elderly women | - Proposed intervention in objective reality: study carried out an assessment of health and intrinsic and extrinsic risks for falls. This information made it possible to draw up a nursing intervention plan. | Not available | -Sociodemographic and health questionnaire;
- Questionnaire to Assess the Risk of Falls in the Elderly;
- MMSE;
- Katz index;
- Lawton and Brody scale;
- Environmental Scale of Risk of Falls;
- IVCF- 20 |

MMSE: Mini Mental State Examination; **TUG**: Timed Up and Go test; **BBS**: Berg Balance Scale; **FES – I**: Falls Effectiveness Scale; **FRAQ-Brazil**: Fall Risk Perception Questionnaire; **BOMFAQ**: Multidimensional functional assessment; **POMA-Brasil**: Performance-Oriented Mobility Assessment; **IVCF- 20**: Functional Clinical Functioning Index-20.

DISCUSSION

This review identified fall prevention interventions for community-dwelling elderly people carried out in Brazil. There was a predominance of descriptive and qualitative studies (No=7), followed by randomized clinical trials (No=6). The diversity of methods used in the studies in this review limited the identification of strong evidence regarding the interventions developed. In a systematic review[13] carried out internationally, the sample was composed of randomized and quasi-randomized clinical trials, making it possible to identify strong evidence for the effectiveness of exercise programs with multiple components and multifactorial interventions.

The interventions developed in the studies that made up this review involved elderly people in different age groups, focusing on participants aged between 60 and 80 years, with only one study being carried out with elderly people with an average age above 80 years. This fact is worrying, since the occurrence of falls is proportional to increasing age, being more prevalent in elderly people over 80 years old[8,33-35] regardless of sex[7]. In this sense, the importance of expanding prevention research among elderly people in this age group is highlighted. However, carrying out appropriate interventions in the younger elderly population and early identification of risk factors are essential for preventing falls[36] during the aging process.

As for the predominance of women in the study sample, it is justified due to the higher prevalence of falls among women[7,34,35]. This prevalence is still unclear and controversial[37]. Studies point to an association with social and physiological aspects, such as the greater longevity of women compared to men, as well as low bone mineral density, a frequent occurrence in postmenopausal women and which can cause serious fractures[35,38].

There was a predominance of studies that developed single interventions, followed by studies with multiple and multifactorial interventions. In both interventions, a predominance

of the exercise category was identified, explored through multimodal, multisensory, proprioceptive, vestibular rehabilitation, water aerobics and dance exercises, with an emphasis on improving performance components such as balance, gait, postural stability. In studies that developed multiple interventions, the exercise category was associated with the information and education category for falls prevention. However, the outcomes resulting from educational strategies have been little explored, with those that used it as a multiple intervention being more evident. This review highlighted the clinical effectiveness of exercise programs in improving performance components, reducing the risk of falling, both in individual or group approaches, and through exercises to be performed at home by the elderly.

These findings are in accordance with work descriptions, which showed that the category of physical exercises that encompass aerobic exercises, strength/endurance, balance/stability, flexibility and motor coordination are the most suitable for proposing unique interventions for fall prevention[13,39], contributing to reducing the risk of falls and preventing functional disability, especially among younger elderly people[39,40].

In multiple interventions, the exercise program was associated with the category of information and education for fall prevention, which were developed in groups and aimed to inform and raise awareness among elderly participants about domestic dangers, risks of falls and precautions. The studies that made up this review did not demonstrate the results of these interventions[13]. This aspect was also found in another study, which indicated the need for further investigation into the impact of these interventions on preventing falls[41].

A fall is a multifactorial event, involving several intrinsic and extrinsic risk factors, which requires programs that include different categories of intervention[34]. In this sense, multifactorial interventions appear to be more effective, followed by multiple interventions that combine physical exercise and educational strategies or exercise and modification of environmental risks[42]. Therefore, actions aimed at reducing the occurrence of falls must be guided by a multidimensional approach, which encompasses different risk factors and is developed by a specialized team, through integrated actions [7,35,37].

In a systematic review[13], international studies were identified that addressed other categories of factors that prevent falls, such as interventions that include the use of medications, involving the withdrawal of psychotropic medications, as well as educational programs for the family, but which still demonstrate limited evidence and require further investigation; as well as what interventions in the home environment contribute to reducing the rates and risk of falls. These interventions are more effective in people with higher levels of risk of falls and when carried out by an occupational therapist[13].

Although the occupational therapist is a differentiated professional for carrying out environmental assessment and modification, developing effective interventions for the risk of falling[13], they were not involved in studies carried out at a national level. Bearing in mind that extrinsic factors related to the home environment are the most prevalent[2,11] and that the assessment of fall risk factors must encompass the environmental assessment of the user's surroundings, with the adequacy of the urban environment and its buildings being one of the priorities of public policies[2,37], the importance of the occupational therapist being part of the multidisciplinary team is highlighted.

Considering the importance of a multidimensional (and, consequently, multidisciplinary) approach to preventing falls in elderly people, it was identified, among the publications considered, a predominance of professional physical educators and physical therapists, accompanied by nurses and speech therapists. This composition was reflected in the interventions developed in national studies. Given this scenario, there is a need to include other professionals in the composition of teams, such as doctors, pharmacists, nutritionists, psychologists and occupational therapists, aiming to encompass the complexity of the factors that lead to falls.

Falls are events that signal to the healthcare team that the elderly person needs special attention, as it is an indication of weakening health conditions in this population. This event highlights the importance of the health sector developing prevention and rehabilitation actions focusing on preventing falls in the elderly[7]. Population aging, combined with effective strategies to prevent the occurrence of falls, contributes to reducing costs arising from the implications of falls on morbidity and mortality in the elderly population[7,35]. Furthermore, recognizing the characteristics of aging and how to prevent falls contributes to the definition of specific policies that ensure comprehensive care, promote the quality of life of the elderly population and aging in place[43].

The studies that made up this review were developed predominantly in public educational institutions, which demonstrates their importance in the construction and dissemination of knowledge of fall prevention strategies at a national level, contributing to tackling a public health problem that can be attenuated and which, due to their high incidence, impact the quality and expectations of the elderly population.

CONCLUSION

17 articles were included in this systematic review, with a predominance of descriptive and qualitative studies with level of evidence V, which classifies them as a weak level of evidence, representing a limitation of this review. Furthermore, it is noteworthy that the heterogeneity of research methods and intervention protocols adopted in the studies prevented the aggregation of results using a statistical method.

This review identified a predominance of the use of strategies in the exercise and educational categories as a way of preventing falls in elderly people living in the community, with important contributions to performance components, such as balance, gait and postural stability.

The need to carry out studies that propose multiple interventions and cover categories, in addition to exercises, and that evaluate the impact of these different categories in reducing the risks and occurrence of falls in elderly people was identified.

It is suggested that new studies be developed by multidisciplinary teams, which consider the complexity of factors that lead to falls in the elderly population. It is also important to highlight the importance of studies aimed at the elderly population over 80 years of age and that cover environmental factors, which are an important risk factor for falls in this population.

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Beatriz Cardoso Lobato contributed to the design, collection and analysis of data, writing and revision. **Karina Costa de Oliveira** participated in data collection and analysis and writing.

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