



(SK) Bezpečná domácnosť pre seniorov z pohľadu ergoterapeuta.

(EN) A safe home for older adults from the point of view of an occupational therapist.

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SUMMARY/ABSTRACT

Starting point: Preventive programs for older adults should focus on promoting aging in their place of residence. A safe household without barriers is one condition for maintaining a high quality of life and supporting self-sufficiency. The occupational therapist plays a key role in evaluating the home environment and supervising follow-up interventions.

Aim: This review study aims to clarify the role of occupational therapist interventions in the home environment of older adults and describe the most common and significant risks and subsequent modifications to the environment to create a safe home and prevent falls based on best practices.

Methods: This is a review of published literature between 2013 and 2024 using the PRISMA methodology. The electronic databases Web of Science, Scopus, EBSCO, and PubMed were searched.

Results: Of the 198 sources, 10 studies met the analysis criteria. Risky areas in older adult homes and possible interventions to increase safety are clearly listed. The areas with the greatest security risk are the bedrooms, bathrooms with toilets, and stairs. Various obstacles, including carpets, objects placed at an inappropriate height, a low toilet, or insufficient lighting, were among the most common causes of falls.

Conclusions: Studies point to the importance of promoting self-sufficiency and raising awareness regarding aging modifications to the homes of older adults.

**The German version of the abstract is attached at the end of the text.

KEYWORDS

Home modifications, older adults, occupational therapy, fall prevention

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1 INTRODUCTION

An important area of occupational therapist intervention is home safety and fall prevention (Thordardottir et al., 2016). Research from the University of Manchester points to the important role of occupational therapist interventions in improving the home environment to maintain physical activity, independence, and quality of life for a wide range of people (Hughes et al., 2016). There was a high level of evidence of improved performance in activities of daily living (ADL) in stroke patients after occupational therapy interventions at home that focused on training normal daily activities, the use of assistive technologies, and education in self-care (Wolf et al., 2015). Very often, these are older people who are expected to have problems associated with polymorbidity, leading to a loss of self-sufficiency and, in this context, the need to adapt to new conditions. As part of measures to prevent further problems, injuries, or other undesirable situations, a careful evaluation of the client's apartment/house is needed.

2 MATERIALS AND METHODS

A research strategy with elements of systematization based on the PRISMA method was used in our study. The search for relevant sources was conducted in May 2024 in the Web of Science, Scopus, and PubMed databases. Only full-version studies were included, and these were exclusively "review articles" and "research articles." In the first phase of the search, the keywords "barriers" and "facilitators" were searched in an effort to find the most relevant studies. However, when working with Boolean operators, it was found that these terms were misleading in relation to our topic, which resulted in many irrelevant studies. Therefore, it was decided to use the term "home modifications" exclusively. Searching for the term "senior" AND/OR "geriatric" was also ineffective. Based on the primary analysis, a combination of terms, the final search strategy was: "home modifications" AND "occupational therapy" AND "older adult." A further condition was the term "occupational therapy" in the title, abstract, or keywords.

The criteria for inclusion of a study in our analysis were as follows: full-text in English, professional journal published in 2013–2024, older adult population, association with occupational therapy, and focus on modifications related to safe home and fall prevention. Studies focused on specific issues, such as bariatric patients, people in the acute phase of a disease, multiple sclerosis, and traumatic brain injury, were excluded. We also searched for review articles, but they were not included in the overall analysis, except for one comprehensive review. Its inclusion was because it provided us with other important information that correlated with the aim of this study, i.e., updating the previous evidence for environmental interventions in fall prevention. Studies focusing on evaluation tools (creation of tools, validation) were also omitted. Based on keywords, 198 articles were found, which were then evaluated using the PRISMA diagram (Figure 1).

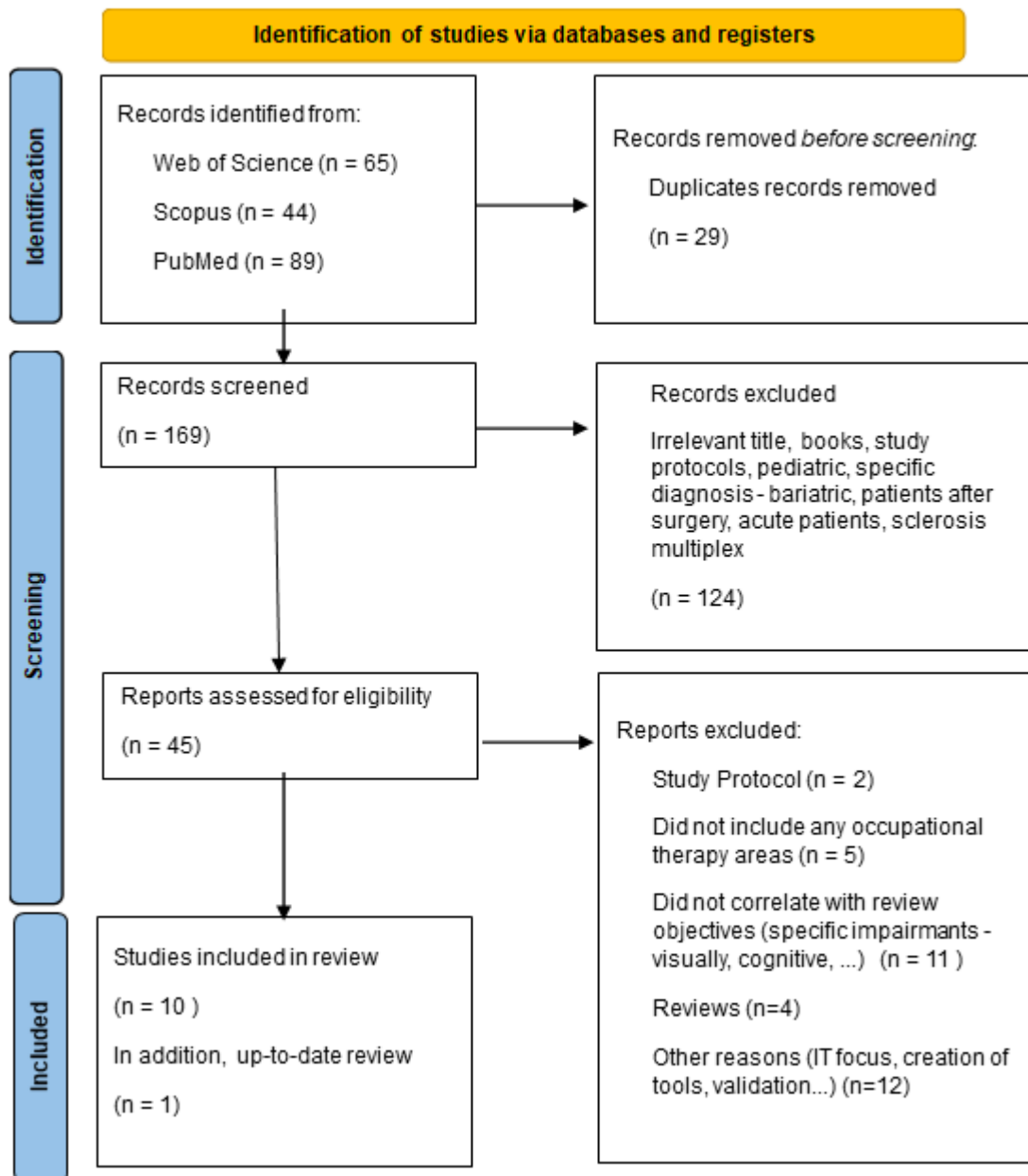


Figure 1 – PRISMA flow diagram for literature search (Page et al., 2021).

3 STARTING POINT, OBJECTIVE, TASKS

The aim is to identify the main areas of intervention for an occupational therapist to achieve a safe home for older adults and to describe the most common and significant home modifications needed to create a safe home and prevent falls based on best practices. Ten scientific papers were selected for synthesis and extraction (summarized in Table 1). In addition, a very detailed review study conducted by Australian authors Clemson et al. (2023), entitled Environmental interventions for preventing falls in older people living in the Community, was utilized. Due to its complexity and topicality, it was included as the only review article in our study (description in Table 2).

Table 1 - Description of included studies.

Author, country, title	Population, Type of survey	Study aim	Identified areas and modifications/OT intervention	Conclusions
Aclan et al. (2023). Australia, <i>Common home hazards among healthy older aged adults and potential modifications required for age-friendly housing</i>	60 and over, without significant disability (60 home environment assessments were completed); Prospective cohort study of healthy adults	To understand existing potential home hazards in healthy older adults. The research question was 'What are the common home hazards among healthy older adults, and what modifications may be required for age-friendly housing?'	23 actions or improvements to reduce potential hazards were recommended. Common areas where potential hazards were identified were bathrooms, toilets, and backyards.	If more fundamental modifications were needed, older people are more likely to consider moving.
Ainsworth et al. (2023). Australia, <i>Understanding home modification outcomes from the perspective of older people and people with a disability: informing home modification evaluation</i>	Twenty participants aged 24–93, Analysis of the 20 initial and 19 follow-up interviews, an interpretive description approach	This study investigated the home modification experience and outcomes most valued by older adults and individuals with a disability in Australia.	Valued home modification outcomes included those that enable people to experience emotional and physical health and safety, do what they want, maintain the image of the home, and plan for the future. Experiences and perceptions of modifications ranged from supportive to disruptive.	The analysis revealed changes in the perception of life before or during the adjustments and after the adjustments. These findings point to the need for therapists to understand and evaluate clients' experiences of perceiving the modification process in the home.
Bercaw (2020), USA, <i>Supporting Aging in Place: A Policymaking Blueprint for Addressing U.S. Older Adults' Unmet Home Modification Needs</i>	One group aged 65 and above and an additional focus group of older adults aged 80 and above. This study also included interviews with service providers, such as senior service agency directors. Two qualitative methods were used.	Findings yield three data sources: (1) interviews with aging services providers to understand older adults' current needs for and supports available to assist with home modifications; (2) to discuss home improvement needs and plans to continue aging in place (group 65 and above); and (3) 80 and above who are no longer aging in place - identifying the role their prior housing played in their decisions to relocate.	Difficulty entering and exiting their homes. Other types of needs: shower chairs, basic safety equipment, entry ramps, and fall prevention devices in bathrooms. Interviewees described the numerous benefits of home modifications. Relocation itself seemed to be a topic that generated anxiety for aging-in-place focus group participants.	The results point to the importance of maintaining independence and raising awareness among older adults about the possibilities and availability of aging modifications in the place of residence.
Dalvand et al. (2024) Iran, <i>The effectiveness of home modifications on the risk of falling in older adults with dementia: A randomized clinical trial</i>	44 older adult patients with dementia. A randomized clinical trial.	This study aimed to investigate the effectiveness of modifying the home environment on falls in older adults with dementia	Recommending slippers and shoes, removing clutter from home; checking necessary assistive devices; checking the arrangement of furniture; modifying the lower part of the door frame	Modifications by applying changes and reforms to the home environment reduced the risk of falling in older adults with dementia.
Grasso et al. (2023) USA, <i>The Impact of a Two-Visit Occupational Therapy Home Modification Model on Low-Income Older Adults</i>	55 years and older, with decreased performance and/or satisfaction in one or more ADLs and iADLs as determined by the COPM. The researcher used a quasi-experimental one-group pretest-posttest design.	This study aimed to determine the impact of a replicable two-visit occupational therapy home modification program on the occupational performance of low-income, community-dwelling older adults.	There were 54 distinct types of recommendations across the 12 categories on the Rebuilding Together Safe at Home Checklist. Those recommendations either support ADL performance or IADL performance.	Data analysis using paired t-tests revealed statistically significant increases in COPM performance and satisfaction ratings from pretest to posttest for the nine participants.

Lien et al. (2015). USA, <i>Assessment, and analysis of housing accessibility: Adapting the environmental component of the housing enabler to United States applications</i>	66–89 (12 participants), Mixed methods	This study aimed to explore the accessibility and usability of the home environment to further understand adaptive environmental behaviors.	Identified top ten environmental barriers.	The findings of this study shed light on the various adaptive environmental behaviors employed by functionally limited, community-dwelling U.S. older adults to achieve P-E fit.
Lytras et al. (2022) Greece, <i>Recording of Falls in Elderly Fallers in Northern Greece and Evaluation of Aging Health-Related Factors and Environmental Safety Associated with Falls: A Cross-Sectional Study</i>	150 elderly fallers (67–74 years old, median 70 yrs.), Cross-sectional study	To record both intrinsic and extrinsic risk factors and their correlation in elderly fallers in order to suggest specific guidelines for their medical care and environmental modification inside and outside the home.	Focus on rooms according to the importance of modifications: the bedroom (28.6%) and the bathroom (28%). Other areas/risk factors: psychotropic medication, poor space ergonomics, lack of basic safety standards, poor lighting conditions + Vision problems, and dizziness	Focusing therapy on the ergonomics of the internal environment can help prevent falls. Outdoor falls are mainly caused by poor construction and lack of adequate lighting.
Peng et al. (2020) USA, <i>Bathroom modifications among community-dwelling older adults who experience fall in the United States: A cross-sectional study</i>	Aged ≥ 65 years with ≥ 1 fall (n = 2,404); a cross-sectional study.	Examined factors associated with bathroom modifications among older adults with at least one fall in the United States.	Those with bathroom modifications had higher proportions of comorbidities (i.e., hypertension, heart attack, stroke...), ADL/iADL limitations, fear of falling, and repeated falls than those without bathroom modifications.	This study highlights the need to improve disparities in bathroom modifications. However, the survey did not specifically ask about the modification types. Both the fear of falling and ADL limitations had incremental impacts on having bathroom modifications.
Roslyn et al. (2023) Australia, <i>Considering the home environment and planning for the future: A qualitative exploration of the views of older adults and individuals with older relatives</i>	Groups: 55–75, 50 and over (16 participants). Middle and older aged: 67–76. Individuals with older relatives: 52–65. A qualitative descriptive method - Semi-structured interviews.	To understand the views of middle and older adults and individuals with older relatives about home safety, aging in place, and housing accessibility.	Seven themes were identified. Educational forums and tools (such as flyers or checklists) that assist older people in planning their future housing needs are recommended.	Most older adults are open to conversations about planning for aging-in-place and would like further information on home safety and home modifications.
Stark et al. (2018) USA, <i>Feasibility Trial of Tailored Home Modifications: Process Outcomes</i>	65 and older, a double-blinded, randomized, sham-controlled trial	To conduct a process evaluation to examine the implementation of a randomized controlled trial of home modifications designed to reduce the risk of falls and improve daily activity performance among community-dwelling older adults.	The standardized components of the intervention included evaluation tools, identification of functional limits and barriers, shared decision-making for intervention, selection of appropriate modifications, education, and training using modifications.	The treatment group improved daily activity performance over 12 months compared with the sham control group (F = 4.13; p = 0.024). The recommended modifications are acceptable for older adults, feasible, and can be recommended for older adults.

Table 2 - Description of included review.

Author, country, title	Population, Type of survey	Study aim	Identified areas and modifications/OT intervention	Conclusions
Clemson et al. (2023) Sydney, Australia, <i>Environmental interventions for preventing falls in older people living in the Community</i>	This included randomized controlled trials evaluating the effects of environmental interventions (such as reducing fall hazards in the home and assistive devices) on falls in community-residing people aged 60 years and over.	To update the previous evidence for environmental interventions in fall prevention.	The review covered four categories of environmental interventions.	The authors found high-certainty evidence that home fall-hazard interventions are effective in reducing the rate of falls and the number of fallers when targeted to people at higher risk of falling (fall in the past year/recently hospitalized/need support with daily activities).

From the two tables above, it is clear that only two studies included for analysis were older than five years. Therefore, our results are very up-to-date, with valuable conclusions and information that provide actionable interventions to achieve a safe (with reduced risks of falls) household for older individuals.

4 RESULTS

The results of our analysis were divided into two parts. The first focuses on areas for occupational therapist interventions in the home environment of older adults, and the second looked at specific proposed home modifications, including descriptions of high-risk areas associated with falls or other dangers within the home.

4.1 AREAS OF OCCUPATIONAL THERAPIST INTERVENTIONS IN THE HOME ENVIRONMENT OF OLDER ADULTS

The areas are very specifically and accurately summarized in a study by Clemson et al. (2023), which divides the interventions into four categories:

1. A single- or multi-intervention strategy involves identifying and assessing fall hazards, raising awareness of fall risks, finding solutions using fall reduction strategies, adapting the environment, or recommending assistive technology and environmental and behavioral safety strategies. The strategy should include a comprehensive evaluation to identify environmental hazards and set priorities, considering home environment risks to the individual with respect to their capacity. The use of an adequate rating tool validated for a wide range of potential falls is strongly suggested. The strategy should also include some form of client observation to assess the functional capacity (physical capacity, behavior, functional vision, habits, etc.) within the context of the client's home environment. In some cases, it is also advisable to ensure adequate monitoring by other healthcare professionals, who can also help introduce adaptations and adjustments. The active involvement of older adults in their assessment and prioritization of fall hazards is needed for an effective intervention.

2. Assistive technology can be a one-time or stand-alone intervention to reduce falls, focusing on performing normal daily activities and safe movement for older adults. These include mobility and walking aids, anti-slip measures on shoes, orthopedic shoes, communication and sensory aids such as glasses, hearing aids, alarm sensors and systems, and self-care aids, e.g., handles.

3. Education on fall risks in the home environment is often a single, stand-alone intervention that can be delivered using various methods, such as brochures or other written materials, videos, lectures, and checklists, including mobile applications.

4. Home modifications are a separate intervention that promotes functional independence. Within the context of home visits, the focus is on removing barriers to improve accessibility and achieve easier and safer movement within the home. The aim is to achieve independence or reduce the demands on caregivers. This intervention differs from item 1, where the primary focus was reducing fall risks.

Stark et al. (2018) mentioned interventions focused on problematic daily activities. A systematic process was used to identify and address these daily activity issues. A standardized intervention assessment program included the following components:

- Ability and home environment assessment.
- Identification of problematic areas within normal daily activities and environmental barriers with an emphasis on the priorities of the individual.
- An interventionist-generated shared decision-making tool to determine the optimal treatment prescription.
- Deciding on suitable home modifications or other aids and equipment, including installation.
- Training clients in the correct use of modifications and aids as well as other practical training.

The aim of the program was to provide environmental support for self-sufficiency in the home environment and compensation for functional disorders. An example of a specific procedure for such a targeted intervention is clearly illustrated by Stark et al. (2018), see Figure 2.

Visit	Objectives
Baseline assessment	• Complete performance-based assessment. • Identify top 10 most problematic activities. • Identify and photograph barriers in the home environment. • Assess person–environment factors for consideration in developing prescription.
1	• Present shared decision-making tool with recommendations for home modifications to resolve environmental barriers.
2	• Meet with contractor for tailoring and installation if necessary. • Finalize prescription form. • Provide training using initial modifications and adaptive equipment.
3–5	• Explain the purpose and provide training on the use of equipment. • Have the participant or caregiver perform each activity. • Ensure the participant is safe and independent. • Problem solve any areas that are difficult.
6	• Observe the participant perform each activity using the equipment. • Problem solve any remaining issues. • Review calendar–journal.

Figure 2 - Tailored home modification intervention (Stark et al., 2018).

Roslyn et al. (2023) emphasize early modification planning and appropriate education to increase the overall functional capacity of older adults to support aging in their place of residence. They reported that study participants were reasonably aware of the possible home modifications, aware of their need to achieve an age-friendly home and wanted to know more about how to achieve an age-friendly home. They also expressed a desire for better access to education in this area. The research also showed that participants often go through a personal crisis before considering major changes or modifications to their homes. Educational workshops and tools can raise awareness of available options and help people evaluate their own homes, thereby spurring change before it is too late, ideally during middle age. The results of the study also confirm the effectiveness of involving family or other professionals, such as a general practitioner, in dealing with the situation that motivated the adjustments. Both digital and paper versions of evaluation tools have proven their worth. Some study participants were well-adjusted regarding their aging process, which supported a positive outlook for future housing decisions. Those who waited for a crisis often failed to realize the need to adjust their homes. A total of seven topics represented perceptions of home safety, aging at home, and the information older people need to assess the safety of their homes: (1) experiencing and accepting the aging process, (2) the importance of the saying “no place is like home,” (3) promoting independence, (4) recognition of future housing needs, (5) recognition of domestic environmental hazards, (6) resistance to change, and (7) access to services and education.

4.2 MODIFICATIONS FOR A SAFE HOME AND PREVENTION OF FALLS FOR OLDER ADULTS

In their study, Lytras et al. (2022) reported the percentage distribution of falls within individual rooms: the bedroom (28.6%) and the bathroom (28%) were considered the riskiest. Indoor staircases caused 10.5% of falls in the surveyed population, which was not a negligible percentage. The kitchen (4.9%) and living room (3.3%) were identified as the least risky rooms. Risk factors include psychotropic medication, lack of ergonomic space, insufficient basic safety standards, insufficient lighting, vision problems, and dizziness. Outdoor falls are most often caused by poor construction or inadequate lighting. Regular eye exams, managing vertigo, improving balance and strength in the lower limbs, and reducing the fear of impending falls are critical factors in preventing falls.

Over 60% of falls occurred at night, either before bed or during the night when respondents got up and went to the bathroom or kitchen. About 40% said that poor lighting conditions or vision problems were key factors, while inappropriate footwear or being barefoot were seen as much less important as a causal factor. Most falls involved tripping over an object or slipping. In the kitchen, most falls occur due to a loss of balance while reaching for objects in higher positions, especially when climbing on a chair or other structure to reach the object. According to the

research, outdoor falls accounted for 22.4% of all falls, with the highest percentage occurring on balconies or in the yard. Table 3 presents a summary of the research by Lytras et al. (2022) with regard to the risks of falls and appropriate interventions for individual rooms.

Lytras et al. (2022) also examined the length of hospitalization relative to where the fall occurred. Falls on stairs require the longest hospitalizations, with an average (AVG) of 4.52 (standard deviation (SD) of 4.07) hospitalization days. Falls in the garden or yard $AVD = 2.63$ ($SD = 4.86$) hospitalization days, falls in the kitchen $AVG = 2.3$ ($SD = 2.36$) hospitalization days, and falls in the bathroom $AVG = 1.96$ days ($SD = 2.43$) hospitalization days (Table 3).

Table 3 - Individual rooms, risk of falls, and proposed modifications (based on the results of the study by Lytras et al., 2022)

Room	Risk	Intervention	Mean days of hospitalization for each location of the fall events (standard deviation)
Bedroom	- Dark - Stumbling over a blanket or object on the floor by the bed - Phone cable - Heating or other electrical equipment - Lamp in an inappropriate place - Poor access to lighting - Slippery floor - Carpet next to the bed	- Sufficient lighting - Bedside rails - Sufficient and free space around the bed and on the way to the toilet - Bed lamp (ideally firmly attached) - Floor without slippery floor mats	1,11 ($\pm 1,87$)
Bathroom, toilet	- Moving to/from the bath/shower - Missing handrails - Slippery surface in the bath/shower - Slippery floor - Missing seat or shower chair - Low toilet	- Installation of handrails in the bathroom or toilet area - Handrails in the shower/bath - Anti-slip floor - Anti-slip floor mats - Bathtub/bathtub/shower chair - Toilet attachment	1,96 ($\pm 2,43$)
Interior stairs	- Objects on the staircase - Poor light conditions - Slippery stairs - Inappropriate footwear	- Non-slip mats on stairs - Railings on both sides - Adequate lighting - Easy access to switches at the top and bottom of the stairs - Sturdy shoes	4,52 ($\pm 4,07$)
Kitchen	- Highly stored objects/utensils and climbing on a chair or other object - loss of balance - Carrying food from the kitchen to another room - Slippery carpet in front of the sink - Spilled liquid or oil on the floor - Inappropriate footwear	- Used objects within reach in the lower parts of the kitchen unit - Use a serving trolley to carry food to another room - Anti-slip measures at the sink - Solid non-slip shoes - Suitable electrical appliances - Appliances within reach (micro-wave, etc.)	2,3 ($\pm 2,36$)
Sitting room	- Objects on the floor - Inappropriately placed cables - Unsuitable floor mats - Slippery wooden floor combined with inappropriate footwear	- Remove items in access areas of a room - Fixed cables, e.g. in rails - Anti-slip surfaces - Removing small rugs - Sturdy shoes - A suitable higher sofa or armchair	0,00 ($\pm 0,00$)
Boiler room, garage, cellars, Balcony, terrace, yard, outdoor stairs, and other parts of the exterior near the dwelling	- Wet, slippery surfaces - Defective outdoor surfaces – cracks, potholes - Worn railing - Inappropriate footwear - Poor lighting conditions, malfunctioning lamps	- Anti-slip measures - Surface Treatment - Fixed railing - Ramp/Elevator Installation - Sturdy shoes - Sufficient lighting and switches within reach - Suitable strategies for working at heights, fixed steps	Outdoor stairs: 1.00 (± 1.41) Other outdoor spaces: 1.99 (± 2.96)

Most of these measures can also be found in a study by Dalvand et al. (2024), but with a specific focus on people with dementia. In dementia cases, access modifications were home inspection, modification of floors and floor coverings inside and outside the house, an inspection of staircases, modifications of night lighting in individual rooms and around the home exterior, installation of handrails, especially in the bathroom and toilet, modifications of kitchen appliances for comfortable and safe access; checking the railings of internal and external staircases, ensuring safe access for pet care, recommending suitable slippers and shoes, removing unnecessary items and clutter from the home, checking the essential auxiliary equipment, checking the arrangement of furniture and household items, checking the placement of chairs in the kitchen and the bathroom; and modifications or removal of the lower part of the door frame at the entrance to the bathroom or toilet. At the end of the study, the intervention and control groups showed significant differences relative to the risk of falls, and therefore, the measures were found to be effective.

Similar barriers are reported by another study from the USA, conducted on 12 people aged 66–89 years. In this study, Lien et al. (2015) identified the top ten home environment barriers: (1) wall-mounted cupboards and shelves placed too high in the kitchen and laundry, (2) stairs on the only route into the home, (3) kitchen cupboard shelves are too deep, (4) no grab bars in the shower/bath and/or toilet, (5) high door thresholds and/or steps at the home entrance, (6) high door thresholds or level change or step(s) to get to outdoor areas, (7) garbage bin only accessible via steps or other level changes, (8) exterior walkways have steps, (9) no handrails on stairs or handrails on only one side at the home entrance, and (10) faucets, switches, etc. located in high/inaccessible places in kitchen and laundry.

In order to achieve a safe home, it is also necessary to think about overall security in terms of entry into the home, i.e., identifying who is at the door before unlocking/opening the door. It is also important to determine who has access to spare keys to the home and know who to call in case of emergency. This was assessed by Aclan et al. (2023), as was the importance of appropriate strategies for changing light bulbs, cleaning gutters, or other work at heights. Establishing suitable steps to manage these items is critical.

Aclan et al. (2023) examined 60 households with occupants aged 60 and over without obvious disability. Modifications were required mainly in bathrooms (mainly the transition between the shower and the floor, anti-slip measures on floors, use of rugs, thermostatic water control solutions), toilets (removal of rugs, installation of handrails, adjusting the toilet to the appropriate height, making doors open outwards) and outdoor areas such as courtyards or gardens (suitable irrigation systems, improvement in accessibility by modifying landscaping). The home entrance may require barrier-free modifications, especially when clients have limited mobility (i.e., modify for mechanical or electric wheelchairs, etc.). Other modification areas include low armchairs or living room chairs, problematic placement of microwave ovens or other appliances, loose rugs or otherwise unstable floors in the kitchen, and installation of carbon monoxide detectors. It is important for older adults to have a first aid kit, but it needs to be checked regularly for expiration and possible replenishment. Other safety measures should include a smoke alarm, fire extinguisher, or fire blanket. In conclusion, Aclan et al. (2023) wrote, *“The need for age-friendly housing is apparent, and older people should be provided with information and education earlier (in life) to proactively plan for aging in place, rather than waiting for a health crisis.”*

The specific safety measures mentioned (Aclan et al., 2023) are summarized below:

- First aid kit within reach
- Suitable strategies for changing a bulb and working at heights
- Installing the CO detector
- Thermostatic water control
- Mobile phone within reach, event, bracelet, SOS, or other system for calling for help
- Locking the entrance door and safe identification of people at the door before opening or unlocking
- Contacts and good relations with neighbors
- Location of spare keys and a loved one with spare keys

The modifications result in not only a safer home environment but also one that provides an optimal quality of life for older adults, enabling them to carry out or participate in activities that are important to them. Similar conclusions were also drawn by the Australian study by Ainsworth et al. (2023) (Figure 3). In this study, the most modifications were made in the area of railings, floor coverings, barrier-free reconstruction of the bathroom, and installation of ramps, elevators, and barrier-free kitchens, including door extensions for automatic doors or the installation of a platform or lifting equipment in the bathroom (water lift). The study included older people and people with disabilities.

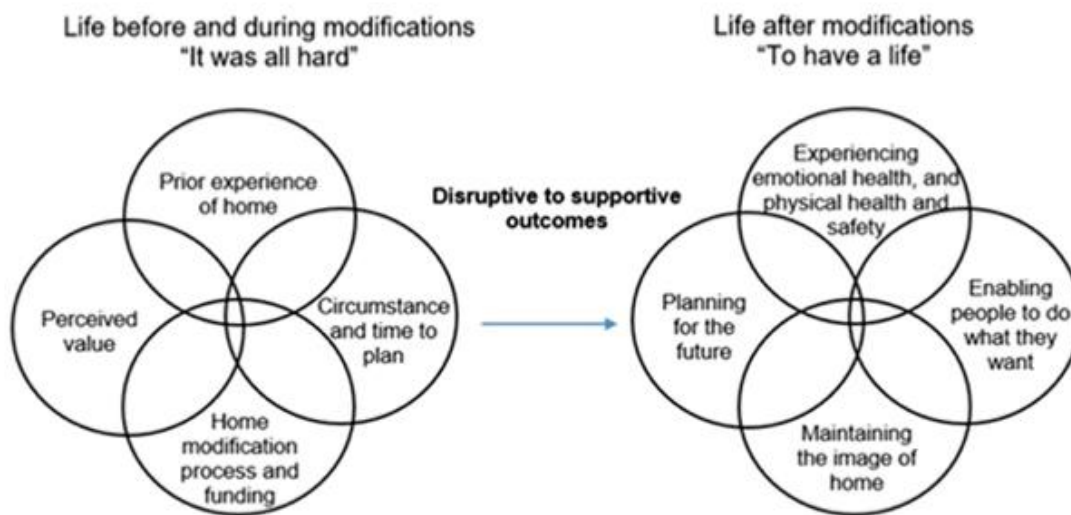


Figure 3 - Life before and during modifications to life after modifications (Ainsworth et al., 2023)

Grasso et al. (2023) investigated the impact of an occupational therapy program with a focus on home modifications involving two visits to individuals over 55 years of age with reduced capabilities and/or life satisfaction with one or more ADL or instrumental activities of daily living (iADL) using the Canadian occupational performance measure (COPM). These were low-income families. Data analysis using paired t-tests found a statistically significant increase in COPM performance and satisfaction ratings for nine of the participants. Occupational therapists gave 54 different types of referrals across the 12 categories on the Rebuilding Together “Safe at Home Checklist.” One hundred and twenty-nine recommendations related to the performance of ADLs: functional mobility (66), bathing and showering (48), hygiene and toilets (15), another 42 were related to IADLs including meal preparation and cleanup (8), safety and emergency maintenance (19) (including exterior lighting, securing doors, and heating/electrical evaluations), and home establishment and management (15) (including cleaning, item retrieval, laundry). In the nine participants who completed the research, the following areas were preferred according to COPM: bathing = 9, stair mobility = 9, toileting = 7, meal preparation = 6, bed mobility = 3, and accessing household items = 3.

Bercaw (2020) also emphasized low-income older adults, for whom even cheap modifications (e.g. handrails) may be unaffordable and certainly would not be able to afford stairlifts or other expensive modifications. In his research, Bercaw focused not only on older adults but also interviewed service providers, who stated that approximately one in three older adults have a problem getting out of or into their house, and therefore, we suggest the need for entrance ramps or other modifications to enter homes. One of the service providers surveyed highlighted that around 75% of their customers need handrails, shower chairs, and other safety equipment, while another cited the need for anti-slip mats, modifications to showers and bathtubs, or the installation of shower enclosures. All of the service providers surveyed noted that entrance ramps and fall prevention devices in bathrooms seemed to be the most common home modification needs. Peng et al. (2020) focused on bathroom modifications in people aged ≥ 65 years with one or more falls. It was found that those with bathroom modifications compared to those without modifications had higher rates of comorbidities (i.e., hypertension, heart attack, stroke, rheumatoid arthritis, osteoporosis, depression, urinary incontinence, visual, hearing impairment), ADL/iADL limitations, fear of falling, and repeated falls). An important factor associated with the implementation of these modifications was the fear of falling.

5 DISCUSSION

Most (82%) older adults have some experience of falls in the home, especially in the bedroom or bathroom/toilet (Na'emani et al., 2019). Studies independently confirm that indoor stairs are also risky (Jafarian Amiri et al., 2013, Lytras et al., 2022). Keglovits et al. (2020) identified 17 domestic environmental hazards affecting older adults living on their own. Known hazards include loose rugs, clutter, items placed too low or too high to easily reach, low toilets (making it difficult to stand up or sit down), and inadequate lighting, heating, and cooling.

Since falls are often caused by various barriers in the home environment, we focused on the concept of “barriers” in the initial search strategies for this research study. However, if we used “barriers” in this context, many researched articles describe barriers to achieving adjustments in the home, such as financial barriers, psychological barriers, etc. (Kato et al., 2021). The term “home modifications” was found to be more appropriate for our desired context since it

is defined as “*changes made to adapt living spaces to increase usage, safety, security, and independence*” (AOTA, 2016; McCullagh, 2006).

In practice, it can sometimes be difficult to convince older adults of the importance of making home modifications since they live in a home that they think suits them and that they like the way it is. While home modifications are beneficial and reduce the risk of falls for older adults, they are often reported to be unaesthetic or create a living space similar to a hospital environment (Bailey et al., 2019). The Model of Human Occupation (Kielhofner, 2008) emphasizes the very close relationships between individuals (e.g., health, habits, values, and beliefs), their environment (e.g., home, neighborhood, social context), and occupations. Each of these three domains can be a source of disability or dissatisfaction, however, importantly, each domain is potentially modifiable.

Several studies or reviews focused exclusively on IT or electronic household aids to promote socialization. Articles with this focus were not part of our analysis since it is a separate category, but it is worth mentioning, in particular, the most recent comprehensive review by Spanish authors Mendoza-Holgado et al. (2024) entitled “*Digitalization of Activities of Daily Living and Its Influence on Social Participation for Community-Dwelling Older Adults: A Scoping Review*.” The aim of the study was to identify what is known about how everyday technology can function as facilitators or barriers to occupations, such as the social participation of older adults. The participants in the research were adults over 60 years of age. The authors divided electronic aids to support social participation into seven areas: (1) home maintenance, (2) information and communication, (3) self-care, (4) maintenance and repair, (5) accessibility, (6) finances and purchasing, and (7) travel. However, cognitive deficits limit the use of electronic technologies. On the other hand, these technologies can be used for early detection of functional disorders in complex activities as an early indicator of cognitive impairment onset.

Polymorbidity and impaired sensory or cognitive functions accompany problems of older age that lead to disability. Therefore, different studies on specific problems are relevant to this issue in some respects. However, due to their number and often broad focus on populations of different ages, we did not include them in our analysis.

A lack of funding can also be a major barrier to the implementation of some home modifications, as noted by Bercaw (2020) and Grasso et al. (2023), who focused on low-income older adults. It is appropriate to divide environmental modifications into three categories (Campani et al. (2020)): (1) no-cost interventions (e.g., removal of carpets and obstacles or increase in the use of walking aids, etc.), (2) low-cost interventions (e.g., improved lighting, adding handrails and chairs with armrests, etc.), and (3) high-cost interventions (e.g., structural changes, installing elevators, etc.). In the future, we need to focus on the effectiveness of measures in the given categories, since even inexpensive modifications can achieve a significant effect on achieving a safer home for older adults. There are various options for financing or using available funds from the social or health component of the government, however, this can vary significantly from country to country. Other options are foundations and various private funds.

Interprofessional cooperation in initiating changes in the home environments of older citizens is of considerable importance (Švestková, Svěcená, 2014). We emphasize, for example, cooperation between occupational therapists and social workers in cooperation with doctors (general practitioners, geriatricians, neurologists, orthopedists, ophthalmologists, etc.) in suggesting changes that can be financed by the Czech or Slovak Republic public health insurance program. Home interventions can also be provided as part of a professional multi-component intervention (e.g., physiotherapy, occupational therapy, etc., using other approaches or concepts for overall improvement of physical or mental condition), as described by Clemson et al. (2023). Clemson et al. noted that in some cases, it is also possible to use telerehabilitation or consultation at a medical facility during hospitalization or outpatient visits. Cooperation with home care agencies or nurses also makes sense.

Ideally, an occupational therapist evaluates the home environment during a home visit since personal contact with older citizens ensures better identification of problems (both great and small) and provides optimal conditions for subsequent interventions such as personal education and practical skill training.

There are a number of tools available for evaluating the home environment, but we faced language issues for many of these tools, e.g., the Home Safety Self-Assessment Tool (HSSAT) by Tomita et al. (2011). Because of the increasing population of older adults, individual countries need to consider policies keeping older citizens in their homes while improving the age-related safety of their home environments. We need policies to address the economic consequences and support research into creating standardized home assessment tools and supporting the various specialties and community services that facilitate home assessments and modifications. Population aging has a clear impact on individuals and society, and careful analysis of these impacts is crucial. This analysis is important for healthcare professionals, policymakers, consumers, scientists, and other individuals or groups interested in the topic. A formal evaluation of the cost-effectiveness of environmental interventions for fall prevention is equally important for decision-making and program development (Clemson et al., 2023).

6 CONCLUSIONS

With the increase in the population of older adults, interest in research in this area has also increased. Many studies, including reviews, deal with the issue of frail older adults and fall prevention. The importance of our review study lies in two areas, it (1) presents a clear summary of the most important occupational therapist interventions for older adults in their home environment and (2) describes areas with the highest risk of falls and other safety threats to older adults in their home, including a summary of the most common corrective measures. We based our work on the latest studies from the last 10 years, with 80% of the studies coming from 2020–2024. This means our analysis builds on the latest knowledge and provides a very comprehensive overview of current issues. We found that most falls take place in bathrooms, toilets, bedrooms, and on stairs. Further, falls are mainly caused by loose rugs or obstacles, clutter, items placed too low or too high, a low toilet, and insufficient lighting. Occupational therapists are knowledgeable experts perfectly suited for assessing and suggesting interventions to improve safety in the home environment of older citizens. Additionally, interprofessional cooperation is very desirable for making sure that interventions are well-suited to the particular needs of the client.

7 ZUSAMMENFASSUNG

Ausgangslage: Präventionsprogramme für ältere Erwachsene sollten sich darauf konzentrieren, das Altern am Wohnort zu fördern. Ein sicherer Haushalt ohne Barrieren ist eine Voraussetzung für die Aufrechterhaltung einer hohen Lebensqualität und die Unterstützung der Selbstversorgung. Die Ergotherapeutin oder der Ergotherapeut spielt eine Schlüsselrolle bei der Beurteilung des häuslichen Umfelds und der Überwachung von Folgeeingriffen.

Ziel: Ziel dieser Übersichtsstudie ist es, die Rolle von ergotherapeutischen Interventionen im häuslichen Umfeld älterer Erwachsener zu klären und die häufigsten und signifikantesten Risiken und nachfolgenden Veränderungen der Umgebung zu beschreiben, um ein sicheres Zuhause zu schaffen und Stürze auf der Grundlage von Best Practices zu verhindern.

Methodik: Hierbei handelt es sich um eine Übersicht über die zwischen 2013 und 2024 veröffentlichte Literatur unter Verwendung der PRISMA-Methodik. Gesucht wurden die elektronischen Datenbanken Web of Science, Scopus, EBSCO und PubMed.

Ergebnisse: Von den 198 gefundenen Quellen erfüllten 10 Studien die Analyse Kriterien. Riskante Bereiche in Altenheimen und mögliche Eingriffe zur Erhöhung der Sicherheit sind übersichtlich aufgelistet. Die Bereiche mit dem größten Sicherheitsrisiko sind die Schlafzimmern, Badezimmer mit Toiletten und Treppen. Verschiedene Hindernisse, darunter Teppiche, in unangemessener Höhe platzierte Gegenstände, eine niedrige Toilette oder unzureichende Beleuchtung, wurden als einige der häufigsten Sturzursachen festgestellt.

Schlussfolgerungen: Studien weisen darauf hin, wie wichtig es ist, die Selbstversorgung zu fördern und das Bewusstsein für altersbedingte Veränderungen in der Wohnung älterer Erwachsener zu schärfen.

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