

Gerontotechnology on first aid for the elderly: an integrative review

HIGHLIGHTS

1. Gerontotechnologies are relevant to the work of health professionals.
2. Content, language, illustrations, and layout are essential attributes in gerontotechnologies.
3. Identifies the lack of specific technologies for first aid for the elderly.

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ABSTRACT

Objective: To identify gerontotechnologies developed to train older adults in first aid, with a focus on accident and emergency prevention. **Method:** Integrative literature review conducted between December 2024 and January 2025 in five databases. Eight studies published between 2019 and 2024 were included and analyzed for methodological characteristics, type of technology, validation, and contributions. **Results:** Booklets, games, educational videos, and three-dimensional models were identified, all of which aimed to prevent falls. There was a lack of technologies specifically designed for other first aid situations. Most studies were validated by experts and older adults, highlighting attributes such as content, language, and layout. A gap was identified in the application of pedagogical theories and prior investigation of thematic needs. **Conclusion:** The gerontotechnologies analyzed are relevant to health education for older adults, but it is necessary to expand the focus to other emergencies, incorporating learning theories and participatory validation.

DESCRIPTORS: Educational Technology; Health of the Elderly; Health Education; First Aid; Accident Prevention.

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INTRODUCTION

First aid consists of essential actions performed immediately after accidents such as fainting, poisoning, seizures, choking, bleeding, drowning, electric shock, accidents involving venomous animals, burns, myocardial infarction, hypertensive crises, and others¹⁻².

Quickly identifying an emergency allows for effective intervention and reduces the response time of medical teams, thereby increasing the patient's chances of survival. The purpose of these actions is to preserve life, maintain vital signs in balance, and alleviate the victim's suffering before specialized medical care arrives³⁻⁴.

Anyone can provide first aid if they have the proper training to perform the necessary actions appropriate to the person's condition in an emergency. To this end, the population needs to have a basic knowledge of first aid so that they can perform it safely and effectively⁵.

In this context, special attention should be given to the elderly, their caregivers, and family members, since the elderly are more prone to developing chronic diseases and are vulnerable to domestic accidents, considering that, in the home environment, attention to routine activities decreases; thus, these groups can benefit from first aid knowledge for immediate assistance to themselves or others, making it essential to provide health education to these individuals on this topic⁶.

The instrumentalization of health education should consider the needs of the target audience, and to this end, theories such as andragogy (teaching based on motivation and self-knowledge)⁷, multimedia learning (combination of words and images)⁸, meaningful learning (content anchored in pre-existing knowledge), and experiential learning (new learning associated with everyday situations). These approaches help adults become protagonists and autonomous in the learning process⁹.

In this context, Educational Technologies (ET) can be facilitating tools in the dissemination of information and healthcare, especially for the elderly, caregivers, and family members, regarding first aid actions¹⁰. Within the scope of ET, gerontechnologies stand out, consisting of products, environments, and services whose purpose is to improve the daily lives of older adults, providing a better quality of life, whether through support for older adults, caregivers, and/or family members¹¹. In addition, they encourage public involvement in health education initiatives, promoting the active participation of older adults and self-care in a playful and participatory manner¹².

Considering the above, this study aims to identify gerontechnologies developed for training older adults in first aid, with a focus on accident and emergency prevention.

METHOD

This study comprises an integrative literature review (ILR), whose objective is to identify, synthesize, and analyze a specific theme or subject in depth, based on previous studies¹³.

The ILR was conducted in seven distinct stages, namely: 1) formulation of the research question; 2) establishment of criteria for the inclusion or exclusion of studies/research from the literature; 3) categorization and selection of studies; 4) evaluation of the studies

included in the review; 5) interpretation of the results; and 6) synthesis of knowledge or presentation of the review.

Stage 1 involved using the PICo strategy, an acronym that stands for Population, Intervention, Comparison, and Outcome. This strategy guides professionals in constructing the research question and conducting the literature search, allowing the formulation of questions that provide the fastest and most accurate location of available scientific information¹⁴. The guiding question of this study, following the PICo strategy, was, What gerontechnologies have been developed to train older adults in first aid, with a focus on accident and emergency prevention?

In Stage 2, the criteria for including and excluding studies that comprised the RIL were established. The inclusion criteria consisted of selecting original articles, available in full, in Portuguese, English, or Spanish, and considering the importance of the timeliness of the evidence, technological evolution, clinical and scientific relevance, and the feasibility of the study, a time frame was defined for studies published between 2019 and 2024; The exclusion criteria consisted of removing duplicate studies in databases, theses, monographs, dissertations, experience reports, annals, integrative and systematic reviews, as well as those that did not reflect an approach and affinity with the topic under study.

In stage 3, studies were collected and selected for inclusion in the RIL based on searches in the Medical Literature Analysis and Retrieval System online (Medline) via the National Library of Medicine (PubMed), Web of Science, Scopus, Latin American and Caribbean Health Sciences Literature (Lilacs) via the Virtual Health Library (VHL), and CINAHL.

To guide the searches, we used the Descriptors in Health Sciences (DeCs) and Medical Subject Headings (MeSH) with the Boolean operators AND and OR: ("educational technology" OR "gerontechnology") AND (elderly) AND ("prevention OR "First aid" OR "accidents OR "emergencies"), ((educational technology) OR (gerontechnology)) AND (elderly)) AND (prevention) OR (first aid)) OR (accidents)) OR (emergency) (Chart 1).

In stage 4, after selecting the studies based on the previously established criteria and reading the titles and abstracts, information relevant to the composition of the RIL discussion was extracted: title, authorship, journal, year of publication, country, objective, nature of the study, results, and conclusions. To ensure that the relevant data from each selected study were extracted in their entirety, Zotero software was used to manage references, and Rayyan software was used to screen and review documents through a collaborative environment, allowing for accurate management and analysis of the selected studies¹⁵. Two reviewers conducted the selection of studies.

The database search, conducted from December 2024 to January 2025, identified 2,939 studies. Next, the filters available in the databases were applied according to the previously defined inclusion and exclusion criteria. Three were excluded due to duplicates identified in the databases, and 2,726 because they did not meet the inclusion criteria. Next, an evaluation was performed based on the title and abstract, and 201 articles were excluded, resulting in nine for analysis through full-text reading, thus achieving a sample of eight articles.

In stage 5, a critical analysis of the results from the selected articles and a discussion of these findings through comparison were performed, aiming to identify and highlight the results and implications of the educational technologies presented in the analyzed studies. The results were presented using a flowchart and a description of relevant

information from the articles. The flowchart was developed based on recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹⁶, with adaptations. Finally, in step 6, the findings were discussed considering the literature, and the review was summarized to present the knowledge gained.

Chart 1. Search strategy for scientific articles for the Integrative Literature Review. Manaus, AM, Brazil, 2025

Database	Platform	Descriptors/Keywords	Boolean Operators
MEDLINE (through PubMed)	National Library of Medicine	("educational technology" OR "gerontotechnology") AND (elderly) AND (prevention OR "first aid" OR accidents OR emergency)	AND, OR
Web of Science	Web of Science Core Collection	("educational technology" OR "gerontotechnology") AND (elderly) AND (prevention OR "first aid" OR accidents OR emergency)	AND, OR
Scopus	Elsevier	("educational technology" OR "gerontotechnology") AND (elderly) AND (prevention OR "first aid" OR accidents OR emergency)	AND, OR
LILACS (through BVS)	Biblioteca Virtual em Saúde	("tecnologia educacional" OR "gerontotecnologia") AND (idosos) AND (prevenção OR "primeiros socorros" OR acidentes OR emergências)	AND, OR
CINAHL	EBSCOhost	("educational technology" OR "gerontotechnology") AND (elderly) AND (prevention OR "first aid" OR accidents OR emergency)	AND, OR

Source: The authors (2025).

RESULTS

Between December 2024 and January 2025, the database search resulted in 2,939 records, of which three (3) were excluded due to duplication. After removal, 2,936 records were screened, of which 2,726 were excluded because they did not meet the inclusion criteria. This left 210 studies for title and abstract reading, of which 201 were excluded. Nine studies were selected for full-text review, and one was subsequently excluded, resulting in eight studies included in the final evaluation. The details of the searches and the final number of publications that comprised the review followed the PRISMA group recommendations and are outlined in the following flowchart (Figure 1).

Regarding the characterization of the studies, it was found that all were published in the last four years (from 2019 to 2023) and originated from national journals (Chart 1). Regarding methodological design, two studies were identified that used a descriptive approach²¹, one exploratory descriptive²³, one descriptive cross-sectional¹⁶, one randomized cluster clinical trial²², two methodological studies¹⁹⁻²⁰, and two Convergent-Care Research studies^{17,18}.

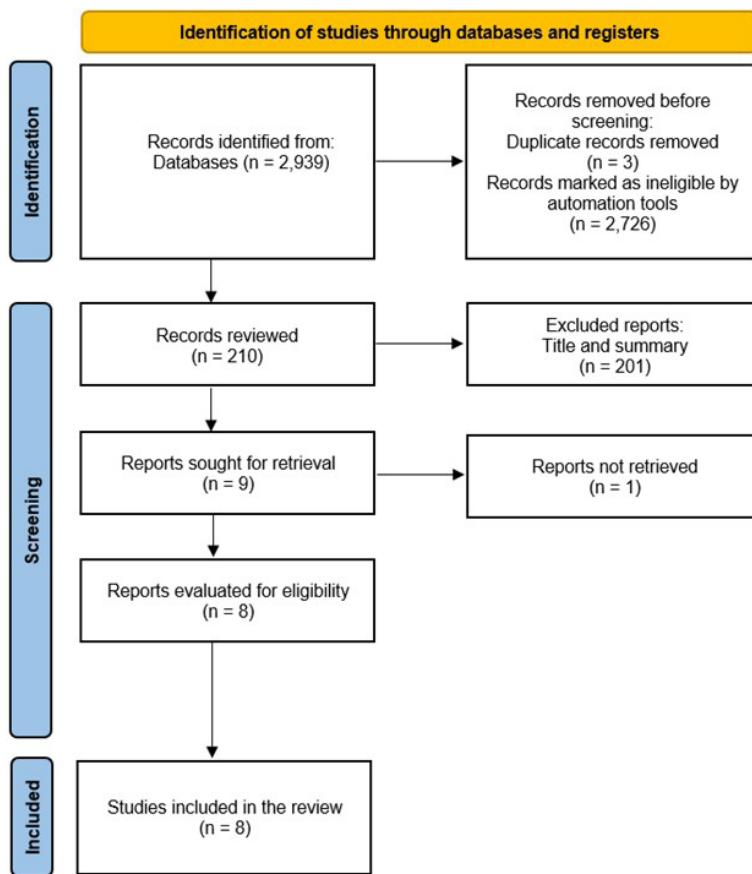


Figure 1. Flowchart of the selection of included articles. PubMed, Web of Science, Scopus, LILACS, and CINAHL databases. Manaus, AM, Brazil, 2025

Source: Adapted from PRISMA (2024).

Chart 2 presents information about the authors, year of publication, journal, and title of the studies included in the ILR.

Chart 2. Characterization of the Studies: Authors, Year, Title, Type of Gerontotechnology, and Methodology. Manaus, AM, 2025

(continue)

Authors (year)	Study title	Type de Gerontotechnology	Methodological Design
Lima et al.17	Three-dimensional Educational Technology for the prevention of accidents caused by falls in the elderly	Three-dimensional model	Descriptive cross-section
Ferreira et al.18	Gerontotechnology for fall prevention of the elderly with Parkinson	Educational games	Convergent-Care Research
Ferreira et al.19	Gerontotechnology for fall prevention: nursing care for older adults with Parkinson	Educational booklet	Convergent-Care Research
Sá et al.20	Building and validating an educational video for elderly individuals about fall risks	Educational video	Methodological study
Silva et al.21	Construction of an educational booklet for family caregivers about home care for the elderly dependent in the Amazon	Educational booklet	Methodological study
Diniz et al.22	Development and testing of the Prev'Quedas game for older adults in the community: a descriptive study	Board game	Descriptive study

Chart 2. Characterization of the Studies: Authors, Year, Title, Type of Gerontotechnology, and Methodology. Manaus, AM, 2025

(conclusion)

Authors (year)	Study title	Type de Gerontotechnology	Methodological Design
Sá et al.23	Effectiveness of an educational video in older adults' perception about falling risks: a randomized clinical trial	Educational video	Cluster randomized clinical trial
Maia et al.24	Interactive gerontotechnology for fall prevention in the elderly: a descriptive study	Three-dimensional model	Descriptive exploratory

Source: The authors (2025).

Information regarding the objectives, conclusions, and agreement indices is presented in Chart 3 below.

Chart 3. Characterization of the Studies: Objectives, Conclusions, and Concordance Indices. Manaus, AM, 2025

Authors (year)	Objective	Main conclusion	Concordance Index (Experts/Elderly)
Lima et al.17	Evaluate the three-dimensional model	Considered suitable for fall prevention	87.7% specialists; elderly qualitative reports
Ferreira et al.18	Developing educational games	Playful and innovative instrument	Not informed
Ferreira et al.19	Evaluating an educational booklet	Relevant content; applicable to seniors and caregivers	70% specialists
Sá et al.20	Construir e validar vídeo educativo	Validated video; applicable to fall prevention	Not informed
Silva et al.21	Create a booklet for caregivers	Information booklet on home care	Not yet evaluated
Diniz et al.22	Develop and test a board game	Appropriate educational strategy	93.22% specialists; 99% elderly
Sá et al.23	Evaluating the effectiveness of the educational video	Small effect: diversification of strategies recommended	Not applicable
Maia et al.24	Developing interactive gerontotechnology	Innovative tool based on evidence	97% specialists and elderly

Source: The authors (2025).

The analysis of the studies allowed for the identification of the gerontotechnologies developed in the studies. Four studies developed booklets^{17-19,21}, three studies developed educational games^{18,19,22}, two studies used educational videos^{20,23}, and two developed three-dimensional models^{17,24}. It should be noted that all studies addressed the theme of "fall prevention in the elderly" (Figure 2).

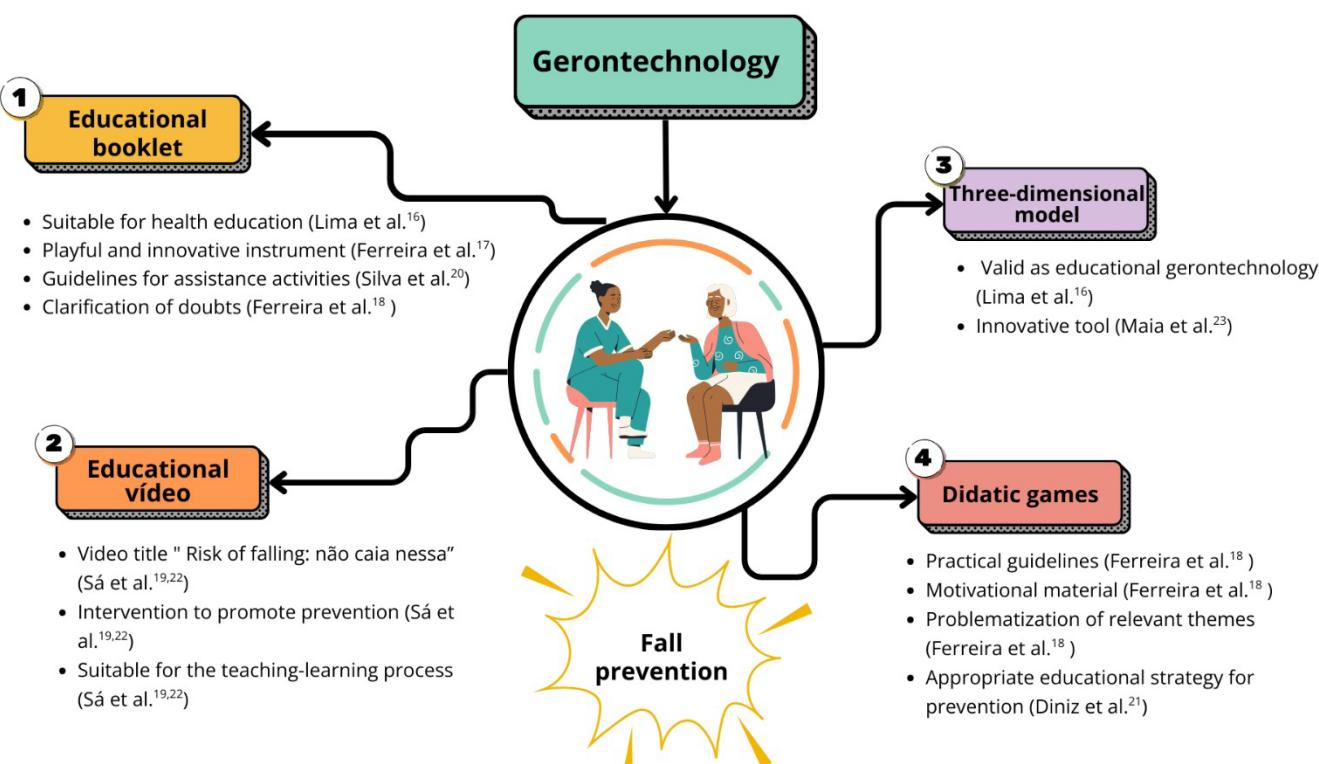


Figure 2. Gerontotechnologies identified in the analysis and conclusions of the articles. Manaus, AM, Brazil, 2025

Source: The authors (2025).

DISCUSSION

Educational technologies are tools considered relevant in the health education process, promoting a playful, dialogical, and autonomous approach to teaching and learning. Thus, this study aimed to identify gerontotechnologies focused on accident prevention education and first aid actions. Therefore, the discussion of the results obtained will be presented in the following categories: I) educational booklet; II) educational games; III) educational video; IV) three-dimensional model.

I) Educational booklet

Printed educational materials (care manuals, brochures, and booklets) are widely used by the Brazilian Unified Health System (SUS) to disseminate information and promote health. The creation and use of booklets for health education enable knowledge to be acquired through dialogic learning, as knowledge is shared through dialogue among the individuals involved in the preparation and use of the booklet²⁵.

This dialogic learning can be observed in the studies by Ferreira et al.¹⁸ and Ferreira et al.¹⁹, who developed and evaluated an educational booklet entitled "Se liga na queda" (Be aware of falls). The elderly participants' perceptions of the booklet were recorded through semi-structured interviews. Their main reports after the intervention with the booklet focused on identifying risk situations, agreeing to make preventive changes in their home environment and routine behavior, and expressing a favorable attitude towards the use of technology¹⁸.

Meanwhile, specialists (physical therapists, social workers, nurses, and psychologists) evaluated the booklet in terms of content, text comprehension, illustration, presentation,

motivation, and cultural adaptation, these being the elements considered essential for the construction of a booklet that can assist in health education. The results indicated that the booklet "*Se liga na queda*" (Watch out for falls) had a 70% agreement rate among the experts.¹⁹

In the study by Silva et al.,²¹ this dialogic learning approach is based on research conducted before the creation of the booklet, which investigated the daily needs of the elderly, caregivers, and family members. Thus, an educational booklet entitled "Educational booklet for family caregivers of dependent elderly people in the Amazon context" was also created; it should be noted that experts and elderly people have not yet evaluated it.

Another relevant factor in the studies by Ferreira et al.¹⁸ and Silva et al.²¹ refers to the approach to the experiences of participants and their needs, especially those of the elderly, caregivers, and family members, since during the interviews, participants are asked questions and can report on their daily experiences, which are anchored to the themes and information available in the booklet, thus allowing them to grasp the content through experiential learning, which, according to Uzun⁹, consists of associating everyday situations with education, with the role of the knowledge transmitter being to seek out real cases and provide support for their resolution.

II) Educational games

Educational games have been the subject of study. They are a valuable tool in the field of health education, as this ET has the potential to promote dialogue, motivation, reflection, and empathy among participants. In addition, they serve as tools that enable various topics in the field of health to be addressed and discussed²⁶.

Studies^{18-19,22} were identified regarding the use of educational games. The game developed and applied to studies consists¹⁸⁻¹⁹ of the development of two memory games called "*Caiu de maduro*" (fell ripe) and "*Não cai istepô*" (don't fall stepô). After analyzing the memory games, experts and older adults concluded that the games had relevant content for older adults, family members, and caregivers, promoting knowledge about fall prevention among this population.

The game developed²² consists of a board game called *Prev'Quedas* (Prev' Falls), which was evaluated by multidisciplinary experts (nurses, physical therapists, occupational therapists, physical educators, and computer engineers) and elderly people. The experts assessed the game in terms of mechanics, aesthetics, narrative, and technology, achieving a 93.22% agreement index. In contrast, the elderly evaluated the layout, motivational characteristics for learning, and satisfaction, resulting in a 99% agreement index.

The authors²² also emphasize that the game *Prev'Quedas* promotes knowledge about falls in various contexts, experiences, and cultures, in addition to stimulating multiple cognitive functions, and is thus considered an appropriate educational strategy for fall prevention.

A relevant factor in studies^{18-19,22} is the survey of the knowledge, experiences, and fall situations of the elderly participants, thus allowing them to express their prior knowledge before the intervention. According to authors²⁷, educational games enable knowledge to be acquired through meaningful learning, as new knowledge needs to be anchored in previous knowledge. In other words, players must already have knowledge or experience to construct new knowledge through a fun, dynamic, and interpretive activity, such as educational games.

III) Educational video

The studies^{20,23} were guided by the Cognitive Theory of Multimedia Learning, according to which the use of multimedia tools is a robust strategy because it enables the anchoring of prior and new knowledge using verbal content and images, favoring the stimulation of different sensory channels such as verbal/auditory and visual/pictorial.

The authors²⁰ developed an educational video entitled "Risk of falling: don't fall for it," addressing biological, socioeconomic, environmental, and behavioral factors associated with the risk of falling. The video was evaluated by nurses and older adults as adequate in terms of content, language, illustrations, layout, and presentation, promoting stimulation in the learning process and encouraging behavioral changes in the target audience.

However, the authors²³ continued the evaluation of the video "Risk of falling: don't fall for it," promoting a randomized controlled clinical trial in which one group of elderly people received only verbal guidance as an intervention. In contrast, the other group had access to the educational video as a form of intervention. Thus, the results indicated that the best perception of fall risks occurred in the group that received only verbal guidance; however, the authors consider that the effect size was too small to be considered clinically significant.

The authors²³ emphasize that it is essential to consider the individual nature of the learning process, as everyone has a unique way of learning. This diversity in learning styles can impact the results of educational interventions, suggesting that a diversification of strategies for older adults should be adopted to accommodate different learning styles. In addition, the application of ET should consider varied contexts; the use of educational videos can be effective in situations where verbal guidance is not feasible or in locations that are inaccessible to health professionals.

IV) Three-dimensional model

According to study²⁴, among gerontotechnologies, those with three-dimensionality stand out. It is believed that the use of three-dimensional elements enhances visual quality, leading to a corresponding improvement in information comprehension, as it provides a more realistic representation, particularly favoring health interventions for the elderly.

In this sense, studies^{17,24} dealt with the construction of three-dimensional models, and both studies sought to mimic the home environment and the extrinsic risks of falls, as well as to utilize this tool to suggest adaptations to the elderly's homes to prevent falls. The models were evaluated by multidisciplinary specialists (nurses, doctors, physical therapists, architects, physical educators, and occupational therapists) and by the elderly.

In study²⁴, the assessment carried out by specialists and elderly people had an average Concordance Index of 97%. However, it is essential to note that during the evaluation, the assessors were able to provide suggestions for improvements and offer comments regarding the TE. Thus, the experts suggested structural changes to the model (inclusion of spaces/rooms, utensils, furniture, appliances, characters, among others) and the inclusion of a manual. Thus, in study¹⁷, the average level of agreement among expert evaluators regarding the use of ET was 87.7%. In their evaluations, they made suggestions for improvements, including the addition of rooms, structural modifications, and the location and insertion of objects.

In both studies^{17,24}, the elderly took the opportunity to share experiences of fall risk with the use of the model, pointing out similarities and differences between their homes and the model. They also considered the presentation and interactive approach of the model to be attractive and unprecedented.

In addition, the studies corroborate and emphasize that three-dimensional models are considered suitable for use as gerontotechnologies. They contribute to the practice of health professionals and can be applied in various care environments for older adults, family members, and caregivers, allowing for a dialogue-based learning environment.

It should be noted that both studies point to the dimensions and weight of the models as limitations, suggesting that prototypes be constructed from lower-density materials or virtual models.

Based on these findings, this study was limited by the small number of studies focused on first aid. However, the findings reveal the need for studies focused on the development of ET that meet the daily needs of older adults, particularly in the area of first aid.

CONCLUSION

ET is a valuable tool for health education, especially for older adults. Through the analysis of studies, it is possible to infer that the most studied and evaluated gerontotechnologies were booklets, videos, educational games, and three-dimensional models. These were evaluated by experts (health professionals) and older adults in terms of content, language, illustrations, layout, and presentation, demonstrating that these are essential attributes for the development of an ET.

In this sense, there is a need and obligation to conduct the evaluation and validation stages of the gerontechnologies developed, as experts and older adults have provided several suggestions to improve the tools during this process. Conducting a study on a topic of interest would be extremely valuable in relation to the themes addressed in gerontechnologies. It was found that only one study sought to investigate which topics were of interest to the elderly, guiding the construction of the booklet based on the information collected. The other studies addressed only the subject of fall prevention; thus, no ETs were identified that address first aid actions in different contexts and emergencies.

Furthermore, another research gap refers to the lack of information regarding the learning theories that guided the production of ET (booklets, models, and educational games), since only two studies mentioned the use of the Cognitive Theory of Multimedia Learning to guide the production of gerontechnology.

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