

Experience Reports

Sensitive and creative production of educational technology for the older adults

Produção sensível e criativa de tecnologia educacional para idosos

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Abstract

Population aging is progressing rapidly in developing countries, including Brazil. The World Health Organization (WHO) classifies people over 60 years of age in developing countries as older adults. The literature indicates that 30% of individuals over 65 years of age fall annually; after 80 years of age, this percentage rises to about 50%. The probability of falling increases proportionally to the number of factors present, and knowledge of these allows for preventive interventions. This article describes the construction of a virtual game guiding fall prevention actions in the older adults as an educational technology, supported by the CTM3 method, using the Wordwall platform, in the format of a Gameshow Quiz and Questionnaire, and also the construction of the "CUIDAR 60+" logo using PicCollage. The virtual game, in a playful way, guides actions in the prevention of falls in the older adults, reaching different audiences, such as caregivers and family members, and not just the older adults themselves.

Keywords: accidental falls; self-care; older adults; health education; educational technology.

Resumo

O envelhecimento populacional progride rapidamente em países em desenvolvimento, incluindo o Brasil. A Organização Mundial da Saúde (OMS) classifica como idosos as pessoas com mais de 60 anos de idade em países em desenvolvimento. A literatura indica que 30% dos indivíduos com idade acima de 65 anos caem ao ano; após os 80 anos este percentual sobe para cerca de 50%. A probabilidade de cair aumenta proporcionalmente ao número de fatores presentes, e o conhecimento destes permite intervenções para prevenção. Este artigo descreve a construção de jogo virtual orientando ações de prevenção de quedas em idoso como Tecnologia educacional, subsidiado pelo método CTM3, utilizando a plataforma Wordwall, no formato de Gameshow Quiz e Questionário, e também a construção da logomarca "CUIDAR 60+" pelo PicCollage. O jogo virtual, de forma lúdica, orienta ações na prevenção de quedas em idosos, alcançando diferentes públicos, como cuidadores e familiares e não apenas o idoso.

Palavras-chave: acidentes por quedas; autocuidado; idoso; educação em saúde; tecnologia educacional.

INTRODUCTION

Population aging is a global demographic phenomenon, with more accelerated progression in developing countries, such as Brazil. It is a milestone in the process of social and health development, since increased longevity represents one of humanity's most significant achievements. This scenario results from structural transformations associated with improved nutrition and sanitation conditions, advances in medicine, increased access to health services, educational expansion, and increased socioeconomic well-being (Gomes; Britto, 2023; Mrejen; Nunes; Giacomini, 2023).

The World Health Organization (WHO) classifies people over 65 years of age in developed countries and over 60 years of age in developing countries as older adults (Brasil, 2009, 2010,

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2022). According to IBGE data, cited by Paradella (2018), there was an 18% increase in this age group in the last five years, with females making up the majority of this group with 16.9 million (56% of the older adults), while older men number 13.3 million (44% of the group).

Biological aging is characterized by progressive structural and functional changes that compromise motor skills and adaptation to the environment, increasing susceptibility to falls. Among the most relevant changes are the reduction in muscle strength and tissue elasticity, impaired stability and joint dynamics, and dysfunctions of the sensory, vestibular, somatosensory, and nervous systems. This set of changes compromises postural control mechanisms, negatively impacting posture, gait, and balance (Cruz et al., 2012). Falls are a consequence of postural instability and lead individuals to excessive concern about the possibility of suffering further falls (Oliveira et al., 2019).

Falls among older adults constitute a major public health issue due to their high prevalence and the associated functional, social, and economic consequences. There are factors that predispose individuals to this event, one of which is osteoporosis, the leading cause of fractures in the population over 50 years of age. Vitamin D also plays a role in neuromuscular function and fall prevention, and its deficiency reduces bone mineral density, which may lead to osteoporosis and an increased risk of fractures (Cruz et al., 2012; Domiciano et al., 2021; Radominski et al., 2017).

For older adults, the occurrence of falls has multiple clinical and psychosocial repercussions, ranging from limitations in activities of daily living and a recurrent fear of new falls to more severe outcomes, such as injuries, fractures, hospitalization, development of post-fall syndrome, the need for institutionalization, or even death. The social cost is immense and becomes even greater when the older adult experiences reduced autonomy and independence or requires institutionalization (Fabrício; Rodrigues; Costa Junior, 2004; Ramos, 2017).

In Brazil, a prevalence of falls of 25% among older adults living in urban areas was observed in the latest edition of the Brazilian Longitudinal Study of Aging (ELSI-Brasil), funded by the Ministry of Health. Conducted between 2019 and 2021, ELSI-Brasil also identified multidimensional factors associated with the occurrence of falls, including: female sex (which shows higher prevalence), age 75 years or older, fear of falling due to poor public infrastructure, fear of crossing the street, arthritis or rheumatism, diabetes, and depression (Queiroz, 2023).

Literature indicates that thirty percent of individuals in a community over the age of 65 fall annually; after the age of 80, this percentage rises to about 50%. Of these falls, 5 to 10% have serious consequences, with 2 to 6% resulting in fractures, and of these, 1 to 2% being hip fractures (Ramos, 2017).

Preventing falls is a difficult task due to the variety of predisposing factors. Therefore, among the important actions in this prevention, we can mention health education actions, which can take place through educational products. One of the educational products used is virtual games, which can be designed to reach diverse audiences, guiding actions against falls. As for intervention strategies in fall prevention, these can correct an isolated risk factor or be part of a multidisciplinary intervention effort. Prevention interventions reduce complications associated with falls and have a lower cost to the system when compared to the costs of hospitalizations, surgical interventions, and prostheses.

The Ministry of Health defines health education as a factor that enables the population to build knowledge about health through thematic adaptation, so one of the ways to integrate the family into health is through health education (Brasil, 2006; Falkenberg et al., 2014). Thus, resources that enable the construction of learning about fall prevention intervention in the population would lead to the promotion of changes in attitudes.

Educational products are pedagogical instruments that assist teaching work and can be used as an approach to promote health education in family health units, hospitals, schools and other places, as teaching-learning tools. In order to simplify the development of the Educational Product, Santos and Warren developed the CTM3 method (Santos; Warren, 2020). The CTM3 Method aims to assist in the development of educational projects (EPs) and thus maximize its reach to the specific audience. It is based on the following stages: first, the CONCEPT (C), which refers to the planning of the EP, such as defining the theme, target audience, and type of EP to be developed; followed by the THEORETICAL FRAMEWORK (T), which draws on

research databases related to the type and theme. Next, the METHODOLOGICAL FRAMEWORK (M) is structured, based on three theories: Transactional Analysis, Multisensory Application, and Neurolinguistics, justifying the number “3” that follows the letters, CTM3. Transactional Analysis utilizes one of its elements: Ego States: PARENT Ego State (referring to care and protection), ADULT Ego State (focused on reality and rationality), and CHILD Ego State (related to emotions and feelings). Regarding the Multisensory application, the five senses (sight, hearing, smell, touch, taste) are incorporated into the PE through images, sounds, words, or procedural phrases. An anchor, a neurolinguistic tool, is also included, which refers to the original experience and reinforces the desired behavior.

This article is an experience report on the development of an educational technology in the form of a virtual game developed during the Educational Resources course of the Professional Master’s Program in Health and Technology Education at the State University of Health Sciences of Alagoas – UNCISAL, supported by the CTM3 method (Santos and Warren, 2020).

METHODOLOGY

The educational technology of the present study is a virtual educational game, which was developed between September and November 2023, with the objective of guiding self-care actions related to falls in older adults. The virtual educational game is part of a group of educational resources linked to the author’s dissertation entitled “Falls in older adults: associated factors and self-protection actions” (Santos; Reis, 2025; Santos et al., 2025). This study was approved by the Ethics Committee under CAAE 76592523.0.0000.5011, in accordance with current legislation.

Thus, the virtual educational game was developed on the Wordwall platform, using customized images created by an illustrator (Figure 1), in the format of a gameshow quiz and questionnaire. In addition, during this period, the CUIDAR 60+ logo was created using the PicCollage application, conceived and designed by the master’s student author of the article (Tech Tudo, 2024).

The Wordwall platform is an educational resource used to develop learning strategies through educational games, resembling traditional games in its interface. It is designed not only to assess the content taught, but also to offer a variety of interactive and educational activities created by other users of the platform (Sales et al., 2022). The platform was chosen because it

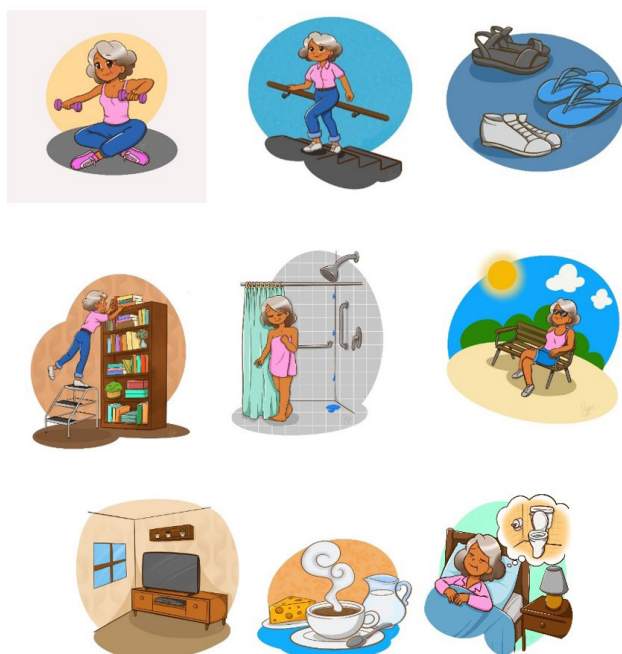


Figure 1. Illustrations used in the game.
Source: Prepared by Magalhães.

offers audio options for questions and answers, thereby reaching a wider audience. Meanwhile, “PicCollage” is an application for editing images and creating impressive photo and video collages (Tech Tudo, 2024).

Based on the virtual game, the questions were constructed using the guidelines from the Virtual Health Library’s booklet on falls in the older adults (Brasil, 2022) and data from the literature reviewed. For this reason, a platform was chosen that allowed for audio options in the questions and answers, to reach a wider audience. This is a premise of the CTM3 method, aiming to develop an educational product structured with elements that facilitate communication, making the transmission of information clearer and more accessible and expanding its reach to a broader audience.

RESULTS

The educational product developed was a virtual educational game, called the CUIDAR 60+ virtual game, which aims to guide fall prevention actions in the older adults according to database guidelines. It is available in the EduCapes repository (Santos; Reis; Santos, 2023a). Access to the game in its two formats, Gameshow quiz and Questionnaire, can also be via QR code (Figure 2) or link; and leads to the WordWall platform.

Gameshow quiz (Santos; Reis; Santos, 2023b).

Questionnaire (Santos; Reis; Santos, 2023c).

The initial screen displays the game’s name, and clicking the START option begins the game. Each subsequent screen presents a question with two or three answer options; if the wrong option is chosen, the game reveals the correct answer. Some questions include a “cheat” option where incorrect answers are eliminated. In the Gameshow format, there are drum sounds creating anticipation while waiting for the answer, and applause if the answer is correct. Audio is present in all questions and answers, justifying the choice of platform, which also reaches audiences with reading difficulties. In total, there are 12 screens, with 10 similar questions in both formats (Figure 3), in addition to the initial and final screens with author information and an END option to conclude the game. Finally, there is a score at the end based on correct answers.

As stated by Santos and Warren (2020), it is not only about having technical knowledge of the chosen topic; it is also necessary to understand and master the process of developing educational products.

Regarding the conception (C), the topic was chosen because population aging is present in developing countries such as Brazil, with an inversion of the age pyramid, according to IBGE data cited by Paradella (2018). This aging process brings with it factors that may compromise the performance of motor skills, making it difficult for individuals to adapt to their environment and predisposing them to falls. For this reason, there is a need for interventions related to behavioral changes to prevent falls and their complications, and such actions must be

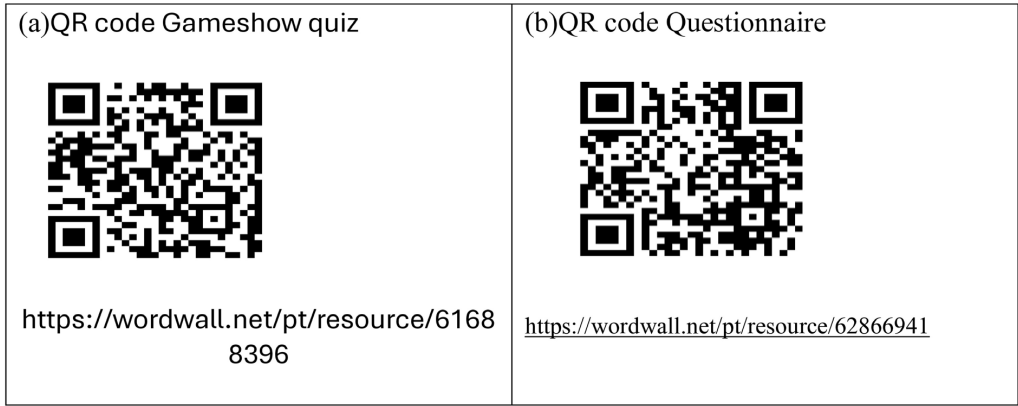


Figure 2. QR code and link.
Source: Santos; Reis; Santos (2023b); Santos; Reis; Santos (2023c).



Figure 3. Game screens.

Source: Santos; Reis; Santos (2023b); Santos; Reis; Santos (2023c).

Translation: Screen 1 (top left): “To enjoy a good walk or go to the supermarket, which type of footwear is NOT safe?”. Options: sneakers; ankle-strap sandals; flip-flops. Screen 2 (top right): “When getting up at night to go to the bathroom, what should I do?”. Options: walk slowly in the dark; sit on the bed for a moment and turn on the light; go at once, step into the hallway and hurry. Screen 3 (middle left): “When going up and down stairs: do I use the handrail?”. Options: what is a handrail?. I always hold the handrail; I never use it. Screen 4 (middle right): “Do you use rugs in your home?”. Options: Yes, of course. I love them—I have several. No. I might trip. CARE 60+. Screen 5 (bottom left): “To reach objects in a higher place, what is the BEST option for my safety?”. Options: ask for help or use a ladder; use a chair; jump or try to climb. Screen 5 (bottom right): “What is the best option for physical activity?”. Options: 30 minutes of walking, 3 times a week; one hour of soccer on Saturday; listen to music while playing cards.

incorporated into daily life. In this context, a virtual game can be an attractive resource to reach different audiences, such as caregivers and family members, and not only older adults. Thus, the virtual game is a playful, interactive, and at the same time educational tool, which becomes effective by exploring multiple elements and senses, making it an excellent educational facilitator (Silva; Castro, 2024; Melo, 2012; Oliveira, 2016).

In this way, the theoretical framework (T) was obtained through searches in the main electronic databases in the health field: Medline, Scientific Electronic Library Online (SciELO), and Google Scholar, in search of theories that comprise the methodological framework. Next, as recommended by the CTM3 method, all elements of the methodological framework (M3) were included: Transactional Analysis, which evokes the three ego states (Parent, Adult, Child); Multisensory Exploration, with the inclusion of elements capable of stimulating the five senses of the target audience—vision, smell, taste, hearing, and kinesthetic sense; and Neurolinguistics, with anchoring.

Regarding Transactional Analysis, the PARENT ego state is present in the orientation of always using the handrail, when following the rule of sitting on the bed before getting up, and when

referring to an organized house. The ADULT ego state is seen in choosing the right shoes for walking, in opting not to use rugs so as not to trip, in opting for the use of tools such as a stool or support bar to make bathing safe, in using a ladder or asking for help when picking up objects in high places; and the CHILD ego state is included in the responses in which he/she says that he/she will jump to pick up objects in high places, or even in the option in which he/she refers to “peeing on the way and running away”.

Consequently, the use of multisensory experiences sharpens the senses. VISUAL: throughout the game through figures and reading the text. OLFACTORY: included in the image of the coffee with smoke and the phrase “hot and bitter coffee”. GUSTATORY: contemplated in the image of the coffee with smoke and the phrase “hot and bitter coffee”. AUDITORY, as seen in the phrase “listening to music,” in addition to sounds and audio messages throughout the game. KINESTHETIC: some messages such as: walking slowly; sitting on the bed; peeing on the way; tripping; jumping; woman lifting weight, as illustrated in Figure 4.

The “CUIDAR 60+” logo is inserted as an anchor, one of the tools of Neurolinguistic Programming, referring to memories and emotions. This appears at some points within the game’s questions, constantly reinforcing the objective of caring for those over 60 years of age - the older adult - according to the WHO in developing countries like Brazil.

This Educational Product was validated by a committee of experts composed of three ad hoc evaluators at the IV Session for Validation of Educational Products of UNCISAL in May 2024, through the following stages: product presentation, followed by questioning by the evaluators, completion of the validation instrument, and finally, the issuance of a conclusive, favorable opinion after the implementation of the changes suggested by the judges, such as: question format and more assertive initial guidance, which were carried out. The evaluation criteria were: social relevance of the theme; creativity; audiovisual or visual quality; easy, understandable language with logical sequence; applicability; theoretical and methodological framework; perceptible educational objectives; suitability to the target audience and scope; learning potential; content and form arouse interest. After validation, the game was applied in activities with groups of older adults in a health unit, with excellent responses regarding knowledge about fall prevention.

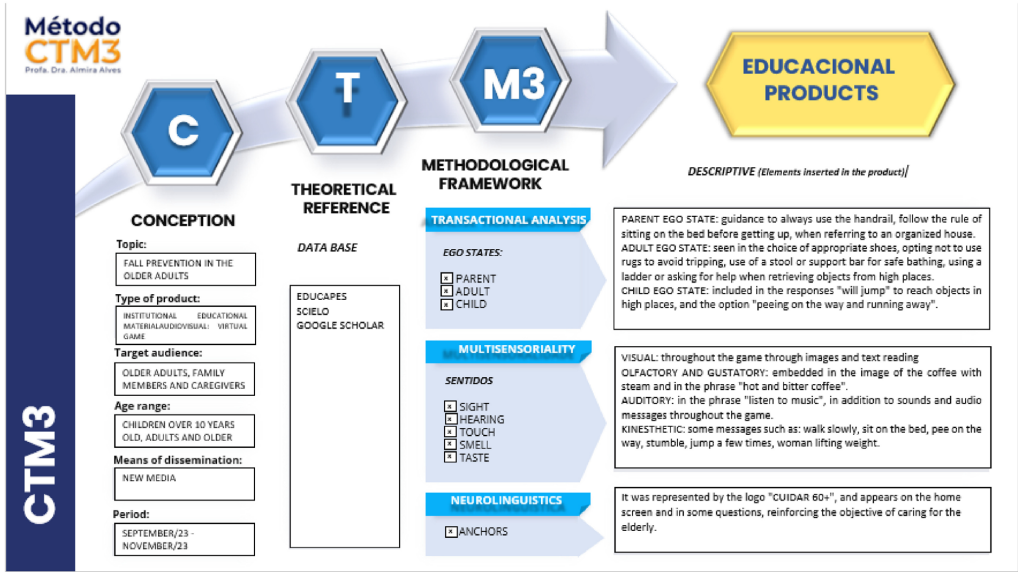


Figure 4. Graphical representation of the use of the CTM3 method in the game.

Source: adapted from Santos and Warren (2023).

DISCUSSION

Sá's (Sá et al., 2019) integrative review revealed that the technologies developed for health education for older adults were mainly software, videos, and printed materials, among other forms of technology. The growth of the older population has led researchers to develop various technologies aimed at promoting health education for this group. These resources enable the use of concepts and principles that enhance the achievement of the intended educational objectives. Fall prevention in older adults was the most frequently addressed topic in these studies, and most of them conducted experiments and demonstrated the effectiveness of the individual use of educational technologies for health education in older adults.

Silveira et al. (2010) highlight the importance of digital inclusion in continuing education, especially for improving quality of life and social interaction among older adults. Research shows that using information and communication technologies can be an effective solution for enabling older adults to continue learning and making good use of their time by learning how to use computers, smartphones, and access new opportunities.

The literature shows a consensus regarding guidance strategies aimed at preventing falls in the older population. It is recommended to inquire about falls that occurred in the past year and to analyze specific causes, identify risk factors as modifiable and non-modifiable, and promote multidimensional interventions, since isolated approaches have little effect on reducing the risk of falls (Garcia et al., 2020; Perracini, 2005).

In order to support the development of the Educational Product (EP), Santos and Warren (2020) developed the CTM3 method, thus facilitating the transmission of information by health professionals and the retention of this information by those who have access to the Educational Product—in this case, not only older adults but also family members and caregivers—highlighting the importance of EPs in their role in health education.

The CTM3 method comprises three stages: product CONCEPTION (C), THEORETICAL FRAMEWORK (T), and METHODOLOGICAL FRAMEWORK (M3), which consists of three theories: Transactional Analysis, Multisensory Application, and Neurolinguistics. Transactional Analysis, created by Eric Berne (Berger, 1999), is dedicated to the study of interpersonal interactions and the understanding of communication forms, both verbal and nonverbal. It states that human personality is structured into three ego states (Parent Ego State, Adult Ego State, and Child Ego State), and the inclusion of these helps to reach a broader audience according to individual personality. These states should be incorporated into each product, improving the effectiveness of information transmission. The "Parent" Ego State refers to norms, values, pre-established concepts, and behavior models. The "Adult" Ego State is related to logical and abstract thinking, analyzing information based on rationality. The "Child" Ego State is the first to develop in the individual and represents emotions such as joy, love, sadness, and fear, as well as encompassing creativity and artistic expression (Teixeira et al., 2024).

Similar to multisensory learning, the inclusion of means that sharpen the five senses (sight, hearing, smell, taste, and touch/kinesthetic), according to Oliveira and Braga (2013), favors greater reach and effectiveness in what is intended to be communicated, that is, it allows for the memorization of the teaching-learning process through the stimulation of various areas of the brain. According to Silva (2006), neurolinguistic programming is a way to refine human communication, valuing the subconscious aspects related to the thoughts and ideas that constitute it; this being the objective of the anchor, which is nothing more than any stimulus capable of retrieving an original idea or emotions. This justifies the stages and theories of the CTM3 Method.

CONCLUSION

The experience provided by the virtual game, as an educational resource developed based on theoretical and methodological references, promotes the memorization of information about self-care actions for fall prevention in the older adults. In addition to being directed at the older population, the resource has the potential to reach a wider audience, including caregivers and family members. Furthermore, the game can disseminate knowledge about fall prevention, as well as allow for the continued learning of the subject.

REFERENCES

- Berger, L. **Estudo do emprego de técnicas da análise transacional e da programação neurolinguística na melhoria da comunicação pessoal e organizacional**. 1999. 241 f. Dissertação (Mestrado em Engenharia de Produção) – Universidade Federal de Santa Catarina, Florianópolis, 1999.
- BRASIL. Ministério da Saúde. Secretaria de Gestão do Trabalho e da Educação na Saúde. Departamento de Gestão e da Regulação do Trabalho em Saúde. **Câmara de Regulação do Trabalho em Saúde**. Brasília: MS; 2006.
- BRASIL. Ministério da Saúde. **Quedas de idosos**. Brasília: MS, 2009. Disponível em: <https://bvsms.saude.gov.br/quedas-de-idosos/>. Acesso em: 13 out. 2024.
- BRASIL. Ministério da Saúde. **01/10 – Dia Nacional do Idoso e Dia Internacional da Terceira Idade: “A jornada para a igualdade”**. 2010. Disponível em: <https://bvsms.saude.gov.br/01-10-dia-nacional-do-idoso-e-dia-internacional-da-terceira-idade-a-jornada-para-a-igualdade/>. Acesso em: 13 out. 2024.
- BRASIL. **Lei 14.423 de 22 de julho de 2022**. Altera a Lei nº 10.741, de 1º de outubro de 2003, para substituir, em toda a Lei, as expressões “idoso” e “idosos” pelas expressões “pessoa idosa” e “pessoas idosas”, respectivamente. Brasília: Presidência da República, 2022. Disponível em: https://www.planalto.gov.br/ccivil_03/_Ato2019-2022/2022/Lei/L14423.htm#art1. Acesso em: 13 out. 2024.
- Cruz, D. T. *et al.* Prevalência de quedas e fatores associados em idosos. **Revista de Saúde Pública**, São Paulo, v. 46, n. 1, p. 138-146, 2012. DOI: <https://doi.org/10.1590/S0034-89102011005000087>. PMID:22183513.
- Domiciano, D. S. *et al.* **Vitamina D**. Comissão de Doenças Osteometabólicas e Osteoporose da Sociedade Brasileira de Reumatologia; 2021. Disponível em: <https://www.reumatologia.org.br/site/wp-content/uploads/2021/05/Normas-Tec-Vitamina-D.pdf>. Acesso em: 13 out. 2024.
- Fabício, S. C. C.; Rodrigues, R. A. P.; Costa JUNIOR, M. L. Causas e consequências de quedas de idosos atendidos em hospital público. **Revista de Saúde Pública**, São Paulo, v. 38, n. 1, p. 93-99, 2004. DOI: <https://doi.org/10.1590/S0034-89102004000100013>. PMID:14963547.
- Falkenberg, M. B. *et al.* Educação em saúde e educação na saúde: conceitos e implicações para a saúde coletiva. **Ciência & Saúde Coletiva**, Rio de Janeiro, v. 19, n. 3, p. 847-852, 2014. DOI: <https://doi.org/10.1590/1413-81232014193.01572013>. PMID:24714898.
- Garcia, S. M. *et al.* Educação em saúde na prevenção de quedas em idosos. **Brazilian Journal of Development**, Curitiba, v. 6, n. 7, p. 48973-48981, 2020. DOI: <https://doi.org/10.34117/bjdv6n7-517>.
- GOMES, I.; BRITTO, V. (ed.). **Censo 2022: número de pessoas com 65 anos ou mais de idade cresceu 57,4% em 12 anos**. 2023. Disponível em: <https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/38186-censo-2022-numero-de-pessoas-com-65-anos-ou-mais-de-idade-cresceu-57-4-em-12-anos>. Acesso em: 27 out. 2023.
- Melo, I. R. P. **O uso de jogos eletrônicos como Ferramenta de ensino: um estudo da Suíte de jogos Gcompris**. 2012. Trabalho de Conclusão de curso (Graduação) - Universidade Federal do Amapá, Macapá, 2012.
- MREJEN, M.; NUNES, L.; GIACOMIN, K. **Envelhecimento populacional e saúde dos idosos: o Brasil está preparado?** São Paulo: Instituto de Estudos Para Políticas de Saúde, 2023. 39 p. Estudo Institucional, no. 10. Disponível em: https://ieps.org.br/wp-content/uploads/2023/01/Estudo_Institucional_IEPS_10.pdf. Acesso em: 27 out. 2023.
- Oliveira, D. B. *et al.* Medo de cair e risco de quedas em idosos assistidos por uma clínica escola de reabilitação. **Archives of Health Sciences**, v. 26, n. 1, p. 19-23, 2019. DOI: <https://doi.org/10.17696/2318-3691.26.1.2019.1367>. Disponível em: <https://docs.bvsalud.org/biblioref/2019/12/1046041/artigo4.pdf>. Acesso em: 13 out. 2024.
- Oliveira, F. J. **O uso de jogos educacionais nas escolas: uma abordagem sobre o Gcompris**. 2016. Trabalho de Conclusão de curso (Graduação) - Universidade Federal da Paraíba, João Pessoa, 2016. Disponível em: <https://repositorio.ufpb.br/jspui/handle/123456789/2773>. Acesso em: 13 out. 2024.
- Oliveira, R. M.; Braga, N. P. Os cinco sentidos no marketing: a importância dos estímulos multissensoriais para despertar a emoção e gerar inclusão social. *In*: CONGRESSO DE CIÊNCIAS DA COMUNICAÇÃO NA REGIÃO SUDESTE, 18., 2013, Bauru. **Anais [...]**. São Paulo: Intercom, 2013. p. 1-14.
- Paradella, R. **Número de idosos cresce 18% em 5 anos e ultrapassa 30 milhões em 2017**. Agência Notícias IBGE, Instituto Brasileiro de Geografia e Estatística, 2018. Disponível em: <https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/20980-numero-de-idosos-cresce-18-em-5-anos-e-ultrapassa-30-milhoes-em-2017>. Acesso em: 13 out. 2024.
- Perracini, M. R. Prevenção e manejo de quedas no idoso. *In*: RAMOS, L. R.; TONIOLO NETO, J. (org.). **Geriatria e Gerontologia. Guias de Medicina Ambulatorial e Hospitalar/Unifesp-Escola Paulista de Medicina**. São Paulo: Manole, 2005.
- Queiroz, L. **No Brasil, prevalência de quedas entre idosos em áreas urbanas é de 25%**. Brasília: Ministério da Saúde, 2023. Disponível em: <https://www.gov.br/saude/pt-br/assuntos/noticias/2023/junho/no-brasil-prevalencia-de-quedas-entre-idosos-em-areas-urbanas-e-de-25>. Acesso em: 13 out. 2024.
- Radominski, S. C. *et al.* Brazilian guidelines for the diagnosis and treatment of postmenopausal osteoporosis. **Revista Brasileira de Reumatologia**, Rio de Janeiro, v. 57, p. s452-s466, 2017. DOI: <https://doi.org/10.1016/j.rbre.2017.07.001>. PMID:28838768.

Ramos, A. P. **Geriatría**: Manual de Rotinas do Ambulatório de Geriatria do Hospital do Servidor Público Estadual de São Paulo. Rio de Janeiro: Thieme Revinter, 2017.

SÁ, G. G. M. *et al.* Tecnologias desenvolvidas para a educação em saúde de idosos na comunidade: revisão integrativa da literatura. **Revista Latino-Americana de Enfermagem**, São Paulo, v. 27, p. e3186, 2019. DOI: <https://doi.org/10.1590/1518-8345.3171.3186>. PMID:31618386.

Sales, D. O. *et al.* O uso da plataforma wordwall como estratégias no ensino de química. **Brazilian Journal of Development**, Curitiba, v. 8, n. 3, p. 16959-16967, 2022. DOI: <https://doi.org/10.34117/bjdv8n3-097>. Disponível em: <https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/44942>. Acesso em: 13 out. 2024.

Santos, A. A.; Warren, E. M. C. **Esquema Método CTM3**. Alagoas: Universidade Estadual de Ciências da Saúde de Alagoas, 2023. Recurso educacional digital. Disponível em: <http://educapes.capes.gov.br/handle/capes/720507>. Acesso em: 13 out. 2024.

Santos, A. A.; Warren, E. M. C. Método CTM3 Como Dispositivo de Ensino, Aprendizagem e Comunicação em Produtos Educacionais. In: SANTOS, A. A. (org). **Educação em saúde**: trabalhando com produtos educacionais. 2. ed. Maceió: Editora Hawking, 2020.

Santos, J. R. F. *et al.* Quedas em idosos atendidos em ambulatórios da rede pública em um município do nordeste brasileiro: fatores associados e estratégias de autoproteção. **Cadernos Cajuína**, São Paulo, v. 10, n. 3, p. e1105, 2025. DOI: <https://doi.org/10.52641/cadcajv10i3.1105>. Disponível em: <https://v3.cadernoscajuina.pro.br/index.php/revista/article/view/1105>. Acesso em: 13 out. 2024.

Santos, J. R. F.; Reis, M. C. S. Desenvolvimento e validação de um instrumento para analisar fatores associados a quedas em idosos. **Cadernos Cajuína**, São Paulo, v. 10, n. 3, p. e968, 2025. DOI: <https://doi.org/10.52641/cadcajv10i3.968>. Disponível em: <https://v3.cadernoscajuina.pro.br/index.php/revista/article/view/968>. Acesso em: 13 out. 2024.

SANTOS, J. R. F.; REIS, M. C. S.; SANTOS, A. A. **JOGO VIRTUAL CUIDAR 60 +**. 2023a. Disponível em: <http://educapes.capes.gov.br/handle/capes/1179943>. Acesso em: 16 jun 2026.

SANTOS, J. R. F.; REIS, M. C. S.; SANTOS, A. A. **JOGO VIRTUAL CUIDAR 60 +**: gameshow quiz. Gameshow quiz. 2023b. Disponível em: <https://wordwall.net/pt/resource/61688396>. Acesso em: 30 dez 2023.

SANTOS, J. R. F.; REIS, M. C. S.; SANTOS, A. A. **JOGO VIRTUAL CUIDAR 60 +**: questionário. Questionário. 2023c. Disponível em: <https://wordwall.net/pt/resource/62866941>. Acesso em: 30 dez 2023.

Silva, D. S.; Castro, A. C. A implementação de jogos educativos digitais como ferramenta de aprendizagem nas turmas de 7º ao 9º ano do ensino fundamental. **Revista Foco**, Curitiba, v. 17, n. 3, p. e4753, 2024. DOI: <https://doi.org/10.54751/revistafoco.v17n3-152>. Disponível em: <https://ojs.focopublicacoes.com.br/foco/article/view/4753>. Acesso em: 13 out. 2024.

Silva, W. B. **A pedagogia dialógica de Paulo Freire e as contribuições da programação neurolinguística**: uma reflexão sobre o papel da comunicação na Educação Popular. 2006. 85 f. Dissertação (Mestrado em Educação) – Universidade Federal da Paraíba, João Pessoa, 2006

Silveira, M. M. *et al.* Educação e inclusão digital para idosos. **Revista Novas Tecnologias na Educação**, Porto Alegre, v. 8, n. 2, p. 1-13, 2010. DOI: <http://dx.doi.org/10.22456/1679-1916.15210>. Disponível em: <https://seer.ufrgs.br/index.php/renote/article/view/15210>. Acesso em: 13 out. 2024.

TECH TUDO. **Com Pic Collage, você faz arte com as suas fotos**. 2024. Disponível em: <https://www.tech tudo.com.br/tudo-sobre/pic-collage/>. Acesso em: 13 out. 2024.

Teixeira, G. M. *et al.* Desenvolvimento e validação de um vídeo educativo sobre dor total utilizando o método CTM3: um relato de experiência. **Observatório de La Economía Latinoamericana**, Curitiba, v. 22, n. 10, p. 1-15, 2024. DOI: <http://dx.doi.org/10.55905/oelv22n10-263>. Disponível em: <https://ojs.observatoriolatinoamericano.com/ojs/index.php/olel/article/view/7500>. Acesso em: 29 out. 2024.

Authors contribution

JRFS: Conception and design of the study. JRFS: Writing of the article. AAS, MCSR: Final approval of the article. JRFS, AAS, MCSR: Overall responsibility for the study. AAS, MCSR: Critical review of the text. JRFS, AAS, MCSR: Conception, Critical review of the text.

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