Original Article

Validation of the InterativaMENTE60+ game for cognitive stimulation of older adults

Validação do jogo InterativaMENTE60+ para estimulação cognitiva de pessoas idosas

Francisco Gerlai Lima Oliveira[1]
Vitória Eduarda Silva Rodrigues[2]
Izadora de Sousa Neves[3]
Maria Eduarda de Sousa Brito[4]
Francisco Gilberto Fernandes Pereira[2]
Ana Larissa Gomes Machado[2]

[1]Universidade Federal do Ceará.
Fortaleza, CE, Brazil.
[2]Universidade Federal do Piauí.
Teresina, PI, Brazil.
[3]Unidade Mista de Saúde Inhazinha Nunes.
Inhuma, PI, Brazil.
[4]Estratégia Saúde da Família de São Julião.
São Julião, PI, Brazil.

Corresponding author::
Francisco Gerlai Lima Oliveira
Rua Alexandre Baraúna, 1115. Rodolfo Teófilo
CEP: 60430-160. Fortaleza, CE, Brazil.
E-mail: gerlailima@alu.ufc.br

Conflict of interest: the authors have declared that there is no conflict of interest.

EDITOR IN CHIEF: Ana Fatima Carvalho Fernandes
ASSOCIATE EDITOR: Adriana Cristina Nicolussi

ABSTRACT
Objective: to verify the evidence of validity of an educational game for the older adults' cognitive stimulation. **Methods:** methodological study developed in three phases: content validation by expert judges; appearance validation by design judges; and evaluation by the target audience, carried out with older adults. Descriptive and inferential analysis was carried out. **Results:** the educational game is named "*InterativaMENTE60+*" and its structure contains a cover, board, tokens, dice, cards (command, observe, question and challenge) and instruction manual. The Content Validity Index was 0.84, showing clarity and appropriate language, theoretical relevance, and practical pertinence. The design judges assessed the game as suitable and the target audience's Concordance Index was 0.9. **Conclusion:** the game showed satisfactory evidence of validity, being considered adequate and valid based on its content and appearance. **Contributions for the practice:** it is a resource that can help stimulate the cognitive functions of older adults.
Descriptors: Health of the Elderly; Aging; Cognition; Educational Technology; Validation Study.

RESUMO
Objetivo: verificar as evidências de validade de um jogo educativo para a estimulação cognitiva de pessoas idosas. **Métodos:** estudo metodológico desenvolvido em três fases: validação de conteúdo por juízes especialistas; validação de aparência por juízes de *design*; e avaliação pelo público-alvo, realizada com pessoas idosas. Realizou-se análise descritiva e inferencial. **Resultados:** o jogo educativo intitulou-se "InterativaMENTE60+" e sua estrutura contém capa, tabuleiro, *tokens*, dado, cartas (comando, observe, pergunta e desafio) e manual de instruções. O Índice de Validade de Conteúdo foi de 0,84, demonstrando clareza e linguagem adequada, relevância teórica e pertinência prática. Os juízes de *design* avaliaram o jogo como adequado e o Índice de Concordância do público-alvo foi de 0,9. **Conclusão:** o jogo apresentou evidências de validade satisfatórias, sendo considerado adequado e válido com base em seu conteúdo e aparência. **Contribuições para a prática:** consiste em um recurso capaz de auxiliar na estimulação das funções cognitivas de pessoas idosas.
Descritores: Saúde do Idoso; Envelhecimento; Cognição; Tecnologia Educacional; Estudo de Validação.

Oliveira FGL, Rodrigues VES, Neves IS, Brito MES, Pereira FGF, Machado ALG

Introduction

The multidimensionality of human aging has important social impacts and is a powerful indicator for rethinking public policies, especially those related to health. The increased demand for older adults' care, including their health needs and the promotion of active ageing, will continue to be the main challenge for building an inclusive society for all age groups[1].

In Brazil, considering the population aged 60 and over, over a 12-year period (2010-2022), the aging index increased from 44.8 to 80.0, indicating that the country is undergoing a process of population aging. In 2022, the proportion of older adults reached 15.6% of the total population. In some states, such as Rio Grande do Sul and Rio de Janeiro, the number of older adults has already exceeded the number of children aged 0 to 14[2].

Human ageing can be accompanied by a decline in cognitive functions such as perception, speed of information processing, attention and, especially, memory. The decline in cognitive functions is often associated with a loss of functionality, which results in poor engagement in everyday activities[3].

As cognitive deterioration increases, so do health care costs. Currently, more than 55 million people have dementia worldwide, more than 60% of whom live in low- and middle-income countries. Every year, there are almost 10 million new cases of dementia[4]. In Brazil, it is estimated that 1.76 million people over the age of 60 live with some form of dementia. This figure is expected to reach 2.78 million by the end of 2023 and 5.5 million by 2050[5].

Although cognitive decline worsens with age, this does not mean that everyone will develop dementia. Older adults with cognitive reserve and an active lifestyle have a better chance of maintaining their cognitive functions. In this sense, cognitive stimulation plays a significant role in learning and memory, offering beneficial effects on cognitive reserve and reducing the risk of dementia. It should therefore be started as early as possible[3,6].

Among the measures that can help improve the older adult's cognition are the actions proposed in the gerontechnology area, which combine gerontology knowledge with technological strategies to promote care for the older adult and their family members or caregivers, valuing the relationships and interactions of those involved through interdisciplinary approaches[7].

Gerontechnologies can materialize as a product, such as the use of materials like games and signs to identify objects and furniture in the older adults' home. Memory stimulation activities, as long as they are constructed as meaningful activities within the older adult's daily life, have a positive effect on functionality, the execution of daily life activities and the social context, which can be seen through positive repercussions in daily life, through assimilation and accommodation in the learning process[7-8].

In this respect, board games are a suitable activity for older adults and have been shown to lead to improvements in communication and interpersonal relationships, self-efficacy and loneliness, as they are based on group learning, based on exchange, interaction and connection between participants[9].

It is necessary, however, for games to be developed on the basis of solid scientific knowledge, following rigorous stages of construction and content and appearance validation, including with the intended audience[10-11].

Methodological rigor in the construction and validation of games to promote the older adults' health is therefore essential if they are to become innovative and reliable tools, promoting cognitive stimulation in a playful and interactive way. The aim of this study was to verify the evidence of validity of an educational game for the older adults' cognitive stimulation.

Methods

Type of study

Methodological study on the development and

validation of a board game designed to stimulate the older adult's cognitive functions. The educational game was built taking into account factors such as the information organization, ease of interaction and use, with simple and understandable language. The Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines were adopted.

Stages of the study

The study was carried out in three phases: an integrative literature review with the aim of identifying similar care and education technologies, as well as finding out how they have been developed and validated, designing the prototype and building the educational game, and then validating it with expert judges and the target audience.

Data collection

Content and appearance validation with expert judges took place between February and June 2021, virtually using an electronic form sent via email, organized into sections containing: the Informed Consent Form, the educational game prototype, and the instrument with the criteria for evaluation by the judges.

A search was carried out on the Lattes Curriculum Platform using the following filters: older adults' health, gerontechnologies, educational technologies in health and cognitive stimulation. Snowball sampling was used, which is a resource used when it is difficult to identify the population[12]. When researchers who met the criteria were identified, they were invited and asked to suggest other researchers with the same criteria.

Ten expert judges with experience in the following areas participated in the content validation: health care for the older adult, gerontechnologies, educational technologies in health and cognitive stimulation of older adults through playful activities. To validate the appearance, five professionals were selected who met at least one of the following eligibility criteria: working or developing studies in the areas of graphic design, marketing, design, creative techniques and validation of instruments/games/booklets aimed at older adults[13].

For content validation, the adapted instrument[14] consisting of 21 items was used, distributed in four domains to be assessed: Language clarity and adequacy (9 items), practical relevance (4 items), theoretical relevance (3 items) and theoretical dimension (5 items). For the answers to the instrument, the following score was adopted according to the agreement level in each criterion assessed: 1- Inadequate; 2- Partially adequate; 3 - Adequate; 4 - Totally adequate; NA - Not applicable.

For the appearance validation, an instrument adapted from the American Suitability Assessment of Materials (SAM) questionnaire was used, translated into Portuguese[15], containing 23 items relating to the game's appearance, distributed as follows: Content (4 items); Literacy requirement (5 items); Illustrations (5 items); Layout and presentation (3 items); Learning stimulation/motivation (3 items) and Cultural appropriateness (3 items). The score adopted was: 0 - Inadequate; 1- Partially adequate; 2- Adequate; and NA- Cannot be assessed, according to the agreement level in each criterion assessed.

Non-probabilistic, intentional sampling was used to evaluate the target audience. A total of 30 older adults took part in this stage, as recommended[16]. The data was collected at a Basic Health Unit in the municipality of Picos-PI, between July and October 2022. Initially, participants were assessed cognitively using the Mini-Mental State Examination (MMSE), considering the cut-off points according to years of study[17].

Older adults with visual or hearing impairment (glasses and hearing aids allowed), confirmed by the participant's report, caregiver and/or health profes-

Oliveira FGL, Rodrigues VES, Neves IS, Brito MES, Pereira FGF, Machado ALG

sional, who could jeopardize the educational game's evaluation, were excluded. The evaluation instrument contained 13 items grouped into the following categories: Organization (3 items); Writing style (3 items); Appearance (3 items) and Motivation (4 items). The possible answers to the items were: positive answers (yes/easy to understand/simple); impartial answers (in parts/don't know/other); and negative answers (no/difficult to understand/complicated).

Data analysis

The Content Validity Index (CVI) was calculated to assess the agreement level between the content judges, with a CVI greater than or equal to 0.78 being considered valid[12]. To validate the educational game by the design judges, the percentage of the scores obtained in the SAM instrument was calculated. The SAM estimate percentage is interpreted as follows: 70-100% (superior material); 40-69% (adequate material) or 0-39% (inadequate material). The analysis by target audience took into account a minimum level of 75% positive responses among the participants.

Ethical aspects

The study complied with the principles set out in Resolution 466/2012 of the National Health Council in relation to research with human beings and was approved by the Research Ethics Committee of the Piauí Federal University under CAAE: 22179419.5.0000.8057 and opinion number 3,645,216/2019.

Results

The judges' panel for validating the educational game's content was made up of 10 teachers/researchers. All were nurses, mostly female (80%), with a mean of 16.3 (± 6.78) years of training and 14.4 (± 8.15) years working in the field. In terms of qualifications, 80% had a doctorate and the rest had a master's degree.

In relation to the appearance validation, the experts' panel was made up of five judges. Of these, 60% were professors and the others graphic designers/freelancers, predominantly male (60%), with a mean of 17.4 (± 10.0) years of training and 17 (± 7.69) years working in the field. In terms of qualifications, 80% had a doctorate and the others only a degree.

The target audience was 30 older adults, half of whom were female and the other half male, predominantly aged between 66 and 70 (33%) and with primary education (83%). All the participants lived in the urban area of the municipality of Picos-PI.

In the content validation stage, the values assigned to each statement, the values for each item domain and the overall instrument analysis were analyzed. Table 1 shows that the CVI values were all higher than 0.7 (70%) for all the items. As for the evaluation by domain, 82% of the items were considered adequate for clarity and suitability of language, 90% for practical relevance, 77% for theoretical relevance and 88% for theoretical dimension. In the overall assessment, the educational game obtained 84% of responses and was judged to be adequate and validated by the expert judges, with an overall CVI of 0.84.

Table 1 – Judges' evaluation of content (n=10). Picos, PI, Brazil, 2023

Domains	CVI*
Language clarity and appropriateness	0.82
1. The game is suitable for working on the older adults' cognitive functions.	0.90
2. The instructions on how to play are clear and understandable.	0.70
3. The trail is clear, understandable, and suitable for the older adults.	0.90
4. The information presented is scientifically correct.	0.90
5. The writing style corresponds to the knowledge level for older adults.	0.80
6. The question cards are appropriate and understandable for older adults.	0.70
7. The letters are suitable and understandable for older adults.	0.90
8. The challenge letters are suitable and understandable for older adults.	0.80
9. The illustrations are expressive and sufficient.	0.80

(the Table 1 continue in the next page...)

Practical relevance	0.90
10. The game is consistent with the older adult's cognitive needs.	0.90
11. From an educational point of view, the game is consistent with its objectives and encourages the older adults to participate.	0.90
12. The game can be replicated in institutions that work with older adults.	0.90
13. The game provides interactivity and cognitive stimulation for the older adults.	0.90
Theoretical relevance	0.77
14. The game is suitable for use by health professionals in a variety of contexts where the older adults are involved.	0.70
15. The game covers the content needed to prevent older adults' cognitive decline.	0.80
16. It is suitable for circulation in the scientific environment in the gerontology field.	0.80
Theoretical dimension	0.88
17. The game is easy to understand.	0.80
18. It presents proposals for activities that stimulate the older adults cognitively.	0.90
19. It works as a health education tool for the older adult population.	0.80
20. The illustrations are self-explanatory.	1.00
21. You would use the *InterativaMENTE60+* game with the older adults.	0.90
Global CVI	0.84

*CVI: Content Validity Index

Of the 21 items evaluated, three did not reach the minimum value recommended by the literature, which were in the domains of language clarity and appropriateness and theoretical relevance, namely: 1.2 "The instructions on how to play are clear and understandable"; 1.6 "The question cards are appropriate and understandable for older adults" and 3.1 "The game is suitable for use by health professionals in a variety of contexts where the older adults are involved".

The judges made comments and suggestions which were taken on board by the researchers in order to make the game's instructions clearer and more comprehensible, including the participants' number. Considering the education level, the texts on the cards were adapted to a simpler language with an increase in font size and a reduction in longer texts. The colors were standardized, the characters were redesigned to represent different ethnicities, some images were removed and a question involving simple calculation was included.

In relation to the appearance validation, the data shown in Table 2 shows that two judges classified the material as not acceptable, justified by some suggestions regarding changes to the structure and pre-sentation of some characters, which were accepted: some of the game's characters were given new physical characteristics that brought them closer to the 60s age group, reducing the text size on the cards and increasing the size and style of the fonts to make them more readable, checking the relationship between the figure/letter and the background of the cards, simplifying the game's instructions, changing the illustration that represents the command cards, making the instructions clearer and more understandable, including characters that are culturally representative for the various audiences, including adding a character who uses self-help equipment.

Table 2 – Judges' appearance assessment according to the Suitability Assessment of Materials instrument (n=5). Picos, PI, Brazil, 2023

Judge	SAM* score	Percentage (%)	Material Classification
1	35	76.0	Upper
2	18	39.1	Not acceptable
3	32	69.5	Adequate
4	39	84.7	Upper
5	16	34.7	Not acceptable
Mean	28.0	60.8	Adequate

*SAM: Suitability Assessment of Materials

After the stages of the educational game's content and appearance validation, in which the material was reviewed and adjusted, the application was continued with the target audience. As can be seen in Table 3, there were no negative responses to any of the items assessed by the older adults. Of the 13 items evaluated, 9 had 100% positive agreement and four items had unbiased responses; however, there were no suggestions for these aspects. The mean total agreement index was 0.95.

Table 3 – Validation by the target audience (n=30). Picos, PI, Brazil, 2023

Item	Positive Answers	Impartial Answers	Concordance Index
1 Organization			
1.1 Did the game's drawings attract your attention?	28	2	0.93
1.2 Is the presentation sequence of the game's subjects appropriate?	30	0	1.00
1.3 Is the game's structure organized?	30	0	1.00
2 Writing style			
2.1 The rules on how to play the game are: Easy to understand/Difficult to understand/Don't know.	27	3	0.90
2.2 The content is: Clear/Confused/Don't know.	30	0	1.00
2.3 The text and image are: Interesting/Uninteresting/Don't know.	30	0	1.00
3 Appearance			
3.1 The illustrations are Simple/Complicated/Other	30	0	1.00
3.2 Do the illustrations help you understand the game?	30	0	1.00
3.3 Do the game steps seem organized?	30	0	1.00
4 Motivation			
4.1 In your opinion, will any older adult who plays this game understand what it's about and improve their memory or attention?	22	8	0.73
4.2 Did you feel motivated to play the game to the end?	30	0	1.00
4.3 Does the educational game cover subjects that are necessary for the older adults to maintain or improve their thinking?	25	5	0.83
4.4 Did the educational game stimulate you to use brain functions such as memory, thinking, calculation, and orientation in time and space?	30	0	1.00
Overall Mean Concordance Index			0.95

After content and appearance validation by expert judges and evaluation by the target audience, the final version of the educational game was named "*InterativaMENTE60+*". To manufacture the game, the board and tokens should ideally be made from resistant and durable materials such as Medium-Density Fiberboard (MDF) or thin wood, the cards and dice can be made from sulphite paper of at least 180g and the manual from A4 paper. The educational material consists of: a cover, a board, 6 tokens, a die, 15 command cards, 15 observe cards, 14 question cards, 3 challenge cards and 1 instruction manual. Figures 1A and 1B show some parts of the game. On request, a link to the complete material can be provided.
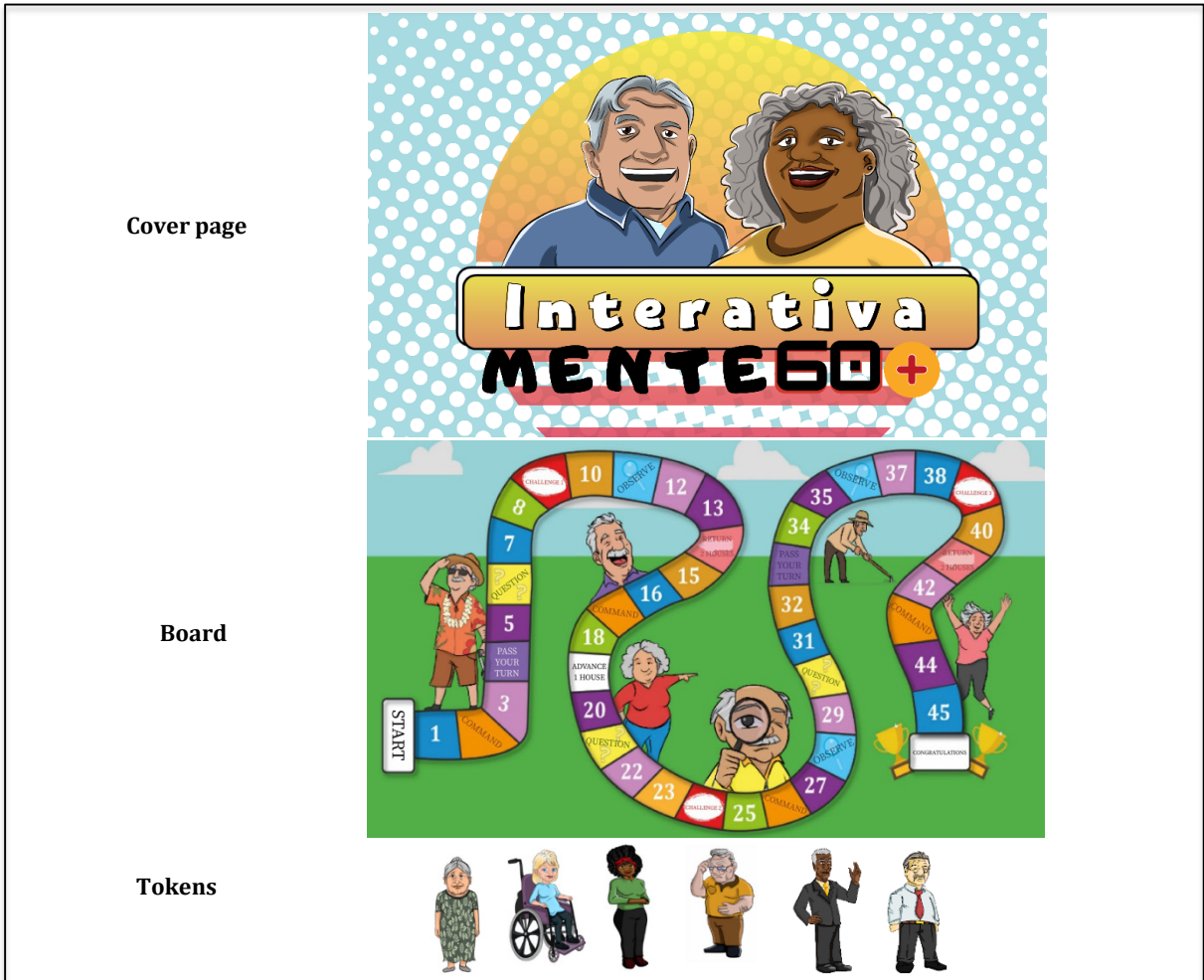

Figure 1A – Cover, board, and tokens of the Educational Game "*InterativaMENTE60+*". Picos, PI, Brazil, 2023

Figure 1B – Card examples from the "*InterativaMENTE60+*". Picos, PI, Brazil, 2023

Discussion

The "*InterativaMENTE60+*" educational game innovates in a playful approach with the aim of cognitively stimulating older adults through questions, situations and illustrations associated with various older adults' daily activities, favoring memory, attention, language, orientation in time and space, executive functions, among others.

An overall CVI of 0.84 was obtained, similar to other studies that have also validated educational games and obtained scores higher than 0.80[18-19]. The content and appearance judges agreed on the relevance of the items in the board game, demonstrating sa-

tisfactory agreement in the CVI and SAM score values. These results are in line with the minimum criteria recommended to consider the items as valid[20].

This process of validating the board game enables the technology's[21] effectiveness and accuracy to be gauged, allowing for greater confidence in the technology's use in the various practice contexts[11]. Thus, by carrying out this process and achieving a CVI value considered appropriate, the board game has become suitable for use as intended[10].

It should be noted that the expert judges who evaluated the board game in terms of its content are nursing professionals with a master's or doctorate degree and have experience in scientific work and/or publications in the area of older adults' health care, gerontechnologies, health education technologies or older adults' cognitive stimulation through recreational activities, which corroborates the importance of selecting judges with experience in the research area of interest, ensuring that their suggestions and opinions are aligned with the topic, allowing the technology to be validated without bias[22].

Technical considerations relating to content and appearance are fundamental to achieving the game's objective. When it comes to materials aimed at older adults, it is imperative to consider possible sensory and cognitive impairments related to ageing. Heeding the judges' suggestions about making the game's instructions clearer and more comprehensible and keeping the language simple, font size appropriate, text appropriate and colors standardized will make comprehension as easy as possible, even when older adults have lower literacy levels[23].

The judges' suggestion to include characters from various ethnic groups is related to representativeness, as people are motivated by references with which they identify, and it is essential that when developing games for older adults, the creation of narratives that do not reproduce stereotypes is encouraged[24].

Similar recommendations have been taken up in other validation studies of games for older adults,

in which the judges proposed correcting the writing, with an emphasis on spelling, cohesion and textual coherence, replacing words that might be unfamiliar to the target audience, clarity in the information and appropriateness of the images[11,18,25].

A crucial stage was the educational game's evaluation with the target audience, which showed a predominance of positive responses. It can be inferred that the "*InterativaMENTE60+*" game is suited to the older adults' socio-cultural level, being attractive and capable of instilling enthusiasm and motivation for participation. It is worth pointing out that this stage is of great importance and is commonly carried out in studies involving gerontechnologies such as educational games[26-27].

It should be noted that educational materials must not only be attractive and entertaining, but must also take into account the older adults' specificities and the subject in question, in order to ensure that the educational process is truly transformative[28]. In this context, educational games are playful and efficient strategies that contribute to cognitive stimulation, promote health and improve the quality of life of the older adults and their families[29].

It should also be noted that the use of an educational game as a technological, creative and recreational resource, as well as for collective participation, enables the target audience to reflect on the game's proposal in order to understand the information shared[27]. In this case, the proposed game can promote cognitive stimulation through the exchange of knowledge, experiences, skills, and routine situations, thus ensuring successful ageing.

The act of playing should not just be seen as a way for the older adult to pass the time; on the contrary, the practice of games is a way of constructing a valuable and playful time, providing feelings of well-being, autonomy and freedom, as well as contributing to individual enrichment in terms of development, and also providing benefits to groups through the social interactions that are generated[30].

It is hoped that intervention studies on cog-

nitive stimulation for the older adult population will be carried out in various contexts and that the use of board games such as "*InterativaMENTE60+*" will be increasingly encouraged by health professionals, caregivers, and family members.

Study limitations

One limitation is that the board game was only validated in the Primary Health Care setting and that the participants were chosen for convenience, which makes it difficult to generalize the results to different contexts and socio-educational and cultural conditions. Another limitation is the cost of making the materials for a larger-scale application.

Contributions to practice

The gerontechnology developed and validated has the potential to be applied in the healthcare sector, helping to stimulate the older adults' cognitive functions, and making a significant contribution to improving their quality of life. It is hoped that the "*InterativaMENTE60+*" game will be used in the various older adults' care contexts.

Conclusion

The educational game entitled "*InterativaMEN-TE60+*" showed satisfactory validity evidence, being considered suitable and valid based on its content and appearance, as well as helping to stimulate the older adults' cognitive functions. It is capable of providing enthusiasm, social interaction and, above all, helping to maintain cognitive functions, having a significant impact on promoting the older adult's independence and autonomy.

Authors' contribution

Conception and design or analysis and interpretation of data; Manuscript writing or relevant criti-cal review of the intellectual content; Final approval of the version to be published; Responsibility for all aspects of the text in ensuring the accuracy and integrity of any part of the manuscript: Oliveira FGL, Rodrigues VES, Pereira FGF, Machado ALG. Conception and design or analysis and interpretation of data; Final approval of the version to be published; Responsibility for all aspects of the text in ensuring the accuracy and integrity of any part of the manuscript: Neves IS, Brito MES.

References

1. United Nations. Department of Economic and Social Affairs, Population Division. World population ageing 2020 highlights: living arrangements of older persons [Internet]. 2020 [cited Apr 8, 2024]. Available from: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Sep/un_pop_2020_pf_ageing_10_key_messages.pdf

2. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2022. População por idade e sexo [Internet]. 2023 [cited Mar 11, 2024]. Available from: https://biblioteca.ibge.gov.br/visualizacao/periodicos/3102/cd_2022_populacao_idade_sexo_br.pd

3. Gómez-Soria I, Iguacel I, Aguilar-Latorre A, Peralta-Marrupe P, Latorre E, Zaldívar JNC, et al. Cognitive stimulation and cognitive results in older adults: a systematic review and meta-analysis. Arch Gerontol Geriatr. 2023;104:104807. doi: https://dx.doi.org/10.1016/j.archger.2022.104807

4. World Health Organization. Dementia [Internet]. 2023 [cited Apr 8, 2024]. Available from: https://www.who.int/news-room/fact-sheets/detail/dementia

5. Zorzetto R. O peso da demência. Rev Pesq FAPESP [Internet]. 2023 [cited June 9, 2024];24(329):12-9. Available from: https://revistapesquisa.fapesp.br/wp-content/uploads/2023/07/Pesquisa_329.pdf

6. Collins JM, Hill E, Bindoff A, King AE, Alty J, Summers MJ, et al. Association between components of cognitive reserve and serum BDNF in healthy older adults. Front Aging Neurosci.

2021;13:725914. doi: http://dx.doi.org/10.3389/fnagi.2021.725914

7. Ilha S, Casarin F, Pires LC, Huppes B, Zamberlan C. (Geronto)Technologies of care for old people with Alzheimer's disease and their families: contribution of awareness/training workshops. Rev Bras Geriatr Gerontol. 2020;23(3):e200129. doi: http://doi.org/10.1590/1981-22562020023.200129

8. Gomes ECC, Souza SL, Marques APO, Leal MCC. Treino de estimulação de memória e a funcionalidade do idoso sem comprometimento cognitivo: uma revisão integrativa. Ciênc Saúde Coletiva. 2020;25(6):2193-202. doi: https://dx.doi.org/10.1590/1413-81232020256.24662018

9. Chen MF, Tsai CC. The effectiveness of a thanks, sorry, love, and farewell board game in older people in Taiwan: a quasi-experimental study. Int J Environ Res Public Health. 2022;19(5):3146. doi: http://dx.doi.org/10.3390/ijerph19053146

10. Bernardi CS, Argenta C, Zanatta EA. Id jog caregiver in action: board game development for informal caregivers of the elderly. Esc Anna Nery 2023;27:e20220146. doi: https://dx.doi.org/10.1590/2177-9465-EAN-2022-0146en

11. Silva CRDT, Felipe SGB, Carvalho KM, Gouveia MTO, Silva Júnior FL, Figueiredo MLF. Construction and validation of an educational gerontotechnology on frailty in elderly people. Rev Bras Enferm. 2020;73(Suppl 3):e20200800. doi: http://dx.doi.org/10.1590/0034-7167-2020-0800 e20200800

12. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para a prática da enfermagem. Porto Alegre: Artmed; 2019.

13. Sá GGM, Santos AMR, Galindo Neto NM, Carvalho KM, Feitosa CDA, Mendes PN. Building and validating an educational video for elderly individuals about fall risks. Rev Bras Enferm. 2020;73(Suppl 3):e20200010. doi: https://dx.doi.org/10.1590/0034-7167-2020-0010e20200010

14. Leite SS, Áfio ACE, Carvalho LV, Silva JM, Almeida PC, Pagliuca LMF. Construction and validation of an Educational Content Validation Instrument in Health. Rev Bras Enferm. 2018;71(Suppl 4):1635-41. doi: https://dx.doi.org/10.1590/0034-7167-2017-0648

15. Sousa CS, Turrini RNT, Poveda VB. Translation and adaptation of the instrument "Suitability Assessment of Materials" (SAM) into Portuguese. Rev Enferm UFPE on line. 2015;9(5):7854-61. doi: http://dx.doi.org/10.5205/reuol.6121-57155-1-ED.0905201515

16. Beaton D, Bombardier C, Guillemin F, Ferraz MB. Recommendations for the Cross-Cultural Adaptation of the DASH & Quick DASH Outcome Measures [Internet]. 2007 [cited Jan 10, 2021]. Available from: https://dash.iwh.on.ca/sites/dash/files/downloads/cross_cultural_adaptation_2007.pdf

17. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr. 2003;61(3-B):777-81. doi: https://dx.doi.org/10.1590/S0004-282X2003000500014

18. Nogueira IS, Dias JR, Lopes LP, Labegalini CMG, Hammerschmidt KSA, Baldissera VDA. Validação de jogo educativo sobre prevenção de quedas em pessoas idosas da comunidade: aliando extensão e pesquisa. Rev Conexão UEPG [Internet]. 2023 [cited Feb 17, 2024];19:e2322218. Available from: https://revistas.uepg.br/index.php/conexao/article/view/22218

19. Viana LS, Oliveira EN, Vasconcelos MIO, Fernandes CAR, Dutra MCX, Almeida PC. Development and validation of an educational game about drug abuse and the risk of suicide. SMAD, Rev Eletr Saúde Mental Álcool Drog. 2023;19(2):16-25. doi: https://dx.doi.org/10.11606/issn.1806-6976.smad.2023.188483

20. Almanasreh E, Moles R, Chen TF. Evaluation of methods used for estimating content validity. Res Soc Adm Pharm. 2019;15(2):214-21. doi: https://doi.org/10.1016/j.sapharm.2018.03.066

21. Teixeira E. Interfaces participativas na pesquisa metodológica para as investigações em enfermagem. Rev Enferm UFSM. 2019;9(1):1-3. doi: https://doi.org/10.5902/2179769236334

22. Silva IR, Silva TP, Lins SMSB, Silva LJ, Leite JL. Nurse researchers and nursing assistants: construction and projection of polymorphous identities. Rev Bras Enferm. 2019;72(Suppl 1):204-12. doi: https://doi.org/10.1590/0034-7167-2017-0871

23. Rodrigues VES, Oliveira FGL, Machado ALG, Beleza CMF, Pereira FGF. Construction and validation of care-educational gerontechnologies: integrative review. Rev Bras Geriatr Gerontol. 2021;24(4):e210144. doi: https://dx.doi.org/10.1590/1981-22562021024.210144.en

24. Minó NM, Mello RMAV. Representação da velhice: reflexões sobre estereótipos, preconceito e estigmatização dos idosos. Oikos: Fam Soc Debate. 2021;25(1):273-98. doi: https://dx..org/10.31423/oikos.v32i1.9889

25. Melo POC, Guedes TG, Abreu WJC, Feitoza AR, Barbosa AS, Mendes RCMG, et al. Board game as an information device on HIV/AIDS for aged individuals. Cogitare Enferm. 2022;27:e79013. doi: http://dx.doi.org/10.5380/ce.v27i0.79013

26. Melo POC, Abreu WJC, Teixeira E, Guedes TG. Educational technology on HIV/AIDS for prevention for older adults: semantic validation. Online Braz J Nurs. 2021;20:e20216510. doi: https://dx.doi.org/10.17665/1676-4285.20216510

27. Farias AA, Castro CAL, Lima JRS, Almeida GKFC, Magalhães YC, Almeida WRM. Desenvolvimento de jogo digital como estratégia de melhoria na cognição e motricidade de idosos. Contrib Cienc Soc. 2023;16(2):931-43. doi: https://dx.doi.org/10.55905/revconv.16n.2-029

28. Coutinho ACO, Nery RV, Borges RCS, Caldato MCF, Reis DLA, Reis CAS, et al. A Casa dos 7 Erros": Utilização de tecnologia educativa para prevenção de acidentes domésticos. Braz J Develop. 2020;6(2):5697-706. doi: https://dx.doi.org/10.34117/bjdv6n2-027

29. Ferreira JM, Hammerschmidt KSA, Heideman ITSB, Alvarez AM, Santos SMA, Fabrizzio GC. Gerontotechnology for fall prevention: nursing care for older adults with Parkinson. Rev Esc Enferm USP. 2021;55:e03748. doi: https://doi.org/10.1590/S1980-220X2020018403748

30. Nakamura A, Hildebrand HR. Brincar na velhice - um ócio lúdico e valioso. Rev Kairós-Gerontol. 2020;23(2):273-96. doi: http://dx.doi.org/10.23925/2176-901X.2020v23i2p273-296