



Gerontechnology for fall prevention: nursing care for older adults with Parkinson

Gerontotecnologia para prevenção de quedas: cuidado de enfermagem ao idoso com Parkinson
Gerontecnología para la prevención de caídas: cuidados de enfermería
en adultos mayores con la enfermedad de Parkinson

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ABSTRACT

Objective: To assess the contribution of gerontechnologies in nursing care to older adults with Parkinson's disease, aiming at the prevention of falls. **Method:** Convergent Assistance Research, through the development and evaluation of gerontechnologies focused on the prevention of falls in older adults with Parkinson's Disease. Clinical evaluation, interviews and workshops with older adults were carried out, as well as analysis and judgment of the materials developed by ten judges certified in gerontology by the Brazilian Society of Geriatrics and Gerontology. **Results:** Older adults need at least six years of study to understand the educational gerontechnology development. The objectives related to the content, understanding of the text, illustration, presentation, motivation and cultural adaptation were achieved. **Conclusion:** The educational gerontechnology developed has relevant content, which can be used by older adults, family members and caregivers, to generate clarification of questions on the theme of fall prevention for older adults with Parkinson's Disease.

DESCRIPTORS

Multimedia; Nursing Care; Aged; Parkinson Disease.

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INTRODUCTION

Educational practice is an inherent task for nurses, who can encourage older adults to reflect on their routine and behaviors, assuming a transforming role in the health and disease process. In order to meet this practice and encourage self-care, gerontechnology can be used as a strategy, being considered a broad field of educational technologies aimed at older adults, which involve the application of gerontology studies in order to develop and disseminate technological objects. In addition, they are tools capable of providing information, favor communication, create new perspectives on technologies to support older adults and they can strengthen nurses' care actions⁽¹⁻³⁾.

The proposal of gerontechnology converges to a scenario of world population aging, as according to the World Health Organization⁽⁴⁾, it is expected for 2020 that there will be 1.1 billion older adults in the world and that number will rise to 3.1 billion in 2100. For Brazilian older adult population, it is estimated that it will be 29.9 million in 2020, reaching 72.4 million in 2100.

With the increase in the older adult population, it is necessary to develop products and services that meet the needs and capabilities of this public⁽⁵⁾. The natural phenomenon of the aging process implies important changes in the health condition of the older adult with a decline in physiological function and a predisposition to multiple pathologies associated with chronic non-communicable diseases (NCDs), since they are among the main diseases that affect older adults⁽⁵⁻⁶⁾.

Among NCDs, Parkinson's disease (PD) stands out as the second most prevalent neurodegenerative disease in people over 50 years old, and its incidence increases with aging. The characteristic signs of the disease are: tremor at rest, stiffness, bradykinesia, and changes in posture, gait and postural instability⁽⁷⁾.

With the advancement of PD and prolonged use of medication, fluctuations in motor functions may occur, causing greater vulnerability to accidents due to falls. Older adults who fall may present increased dependence for daily living activities (DLA), reduced autonomy, loss of quality of life, institutionalization, social isolation, loss of mobility, and even death⁽⁸⁻⁹⁾.

Therefore, falls occur, which are considered a public health problem in Brazil and worldwide. The Unified Health System – *Sistema Único de Saúde* (SUS) spends more than R\$ 51 million (Brazilian currency *Reais*) each year to treat fractures resulting from falls⁽¹⁰⁾. In an ecological study with a time series component from 2008-2012, with data obtained from SUS Hospital Information System (HIS-SUS), 181 thousand cases of femur fractures were recorded in people aged ≥ 60 years old, an average of 36,200 cases per year, with a burden for the health sector of R\$ 58.6 million in hospitalizations⁽¹⁰⁻¹¹⁾.

Considering the financial burden to SUS, as well as the psychological one to older adults and their families, it is

necessary to adopt strategies to promote health and prevent injuries aiming to avoid falls. In this regard, gerontechnologies can bring numerous benefits to the human living process, especially for health care, as the application of these strategies is configured as a tool for educational practices, prevention of comorbidities and improvement of older adults' quality of life⁽¹²⁻¹³⁾.

The use of gerontechnologies in the context of health and nursing education fosters and expands the actions performed by nurses in their care relationship with older adults with PD. Studies indicate that gerontechnologies can instill innumerable benefits in the care process, since they contribute to health education, envision new perspectives in the teaching-learning process, mediated by interactions by the nurse (speaker), the older adult and family members (reader) and the educational material (object of speech). Thus, the effectiveness of gerontechnologies has the potential to inform patients/family members/caregivers about the disease and its clinical evolution, and also to guide them on how to exercise care⁽¹²⁻¹³⁾.

To ensure its effectiveness, educational technologies need to be evaluated to increase their effectiveness and suitability for those who will use it. Evaluation is a fundamental tool for researchers and professionals in the production and use of health technologies. Technologies that, when appropriate, provide greater security when implementing actions in care practices⁽¹⁴⁾.

In view of the above, the objective of this study was to evaluate the contribution of gerontechnologies, memory games and booklets, in nursing care for older adults with PD, aiming at the prevention of falls. The technologies to be evaluated were developed in an earlier stage, which are three in number and were made from a master's thesis entitled "Educational Gerontechnologies for Older Adults with Parkinson's Disease: health promotion for fall prevention"⁽¹⁵⁾.

METHOD

This is a qualitative research, using the principles of Convergent-Assistance Research (CAR). The CAR was chosen because, during the development and application process, it maintains a close connection with the care practice, with the objective of solving problems, making changes and/or introducing innovations in the care practice situation⁽¹⁶⁾.

The study setting was a Mutual Aid Group for People with Parkinson's Disease (MAD Parkinson), located on the coast of the state of Santa Catarina. The research participants were nine elderly people who attended MAD Parkinson and participated in the elaboration of the gerontechnologies developed during the group meetings and ten professionals from the Brazilian Society of Geriatrics and Gerontology (*Sociedade Brasileira de Geriatria e Gerontologia* – SBGG), listed on the website of that institution (named in this work as judges), who performed content and legibility assessment.

For the inclusion of judges, the criteria were: having a degree in gerontology and being registered on the SBGG website, having e-mail contacts available on the electronic databases Google, Scientific Electronic Library Online (SciELO) and Scopus. As exclusion criteria: members of the SBGG with a degree in gerontology who were not listed on the same website, whose email contacts were not available on electronic databases.

Older adults who are members of MAD Parkinson, had participated in the meetings for six months and who agreed to participate in the study, were included. The exclusion criteria were: older adults with a score below four on the clock test and not diagnosed with PD.

All selected judges were invited to participate in the study, through two invitation letters via email. The data collection period was from August to October 2017. A total of 169 individuals were selected by SBGG. Of these, 112 emails were found in the electronic databases, all were invited individually, through electronic contact in two attempts, the second being occurred 15 days after the first attempt. Of the 112, 20 responded to the survey and ten agreed to participate. A questionnaire for the sociodemographic characterization of the judges was applied, highlighting the variables of gender, age and profession.

Regarding the gerontotechnologies developed and evaluated in this stage of the study, the first one was an educational booklet "*se liga na queda*" ("beware the fall", in free translation) that presented: information/concepts about PD and falls; interactive activities, care and the importance of family and caregiver in preventing falls in the process, in addition to memorization games.

The second gerontotechnology evaluated was a memory game, entitled "*não cai istepô*" ("don't fall *istepô*", *istepô* is a regional expression for an annoying person). The name of the game was chosen as a tribute to the natives, who use this expression in the city where the study was developed. The game was developed based on gait and memory, identified as emerging needs in the assessment carried out with older adults with PD studied. For this purpose, reused material was used, old floppy disks, which were coated in EVA, and then images produced by a graphic designer related to PD and fall prevention were fixed. The finished game featured 36 pieces, 18 pairs of images that lead older adults to reflect on the prevention of falls.

The third gerontotechnology evaluated was the memory game "*escorregou de maduro*" ("slip as a ripe fruit"), the proposal for the name of that game was given by the older adults themselves when they remembered the expression "*caiu de maduro*" ("fell as a ripe fruit"). The game consists of 36 old compact discs (CD) coated with EVA (reused material), these 18 CD contain only images, aiming at the prevention of falls and 18 CD have images and conducts related to health promotion to prevent falls. In this game, the player's objective is to find the piece correlated to the image and learn a new behavior to avoid falls.

The judges' assessment was based on the guidelines in the "Guide to Creating and Evaluating Patient Materials"⁽⁹⁾, which favors the understanding of the study subject and improves their ability to adhere to prevention and treatment. For that, the instrument "Suitability Assessment of Materials" (SAM) was used, translated and adapted to Portuguese⁽¹⁷⁾ and a Gerontotechnology assessment instrument was elaborated in the dissertation⁽¹⁵⁾.

The Gerontotechnology Evaluation Instrument contained the evaluation of the material regarding: scientific accuracy, contents, literary presentation, illustrations, comprehensive material, legibility and printing characteristics of the educational material, quality of information and space for personal opinions⁽¹⁵⁾. On the other hand, SAM is an American instrument that presents six categories as a checklist, with 22 items, with a scoring scale from zero to two. It must be applied after reading the text, since: two are considered the superior material (excellent); one adequate; and zero not adequate, according to the objective criteria included in the educational technology assessment instrument: content, text comprehension, illustration, presentation, motivation and cultural adaptation⁽¹⁷⁾.

The data were inserted into the Microsoft Excel 2010 program and organized into tables and charts, adding the scores for each item of the instruments, the suggestions and opinions of the judges, analyzing the scores of each instrument, and following the recommendations of the judges, for reformulation of the proposed materials. After that, the following indexes were interpreted: Flesch-Kincaide Readability Index (FKRI), Flesh Reading Ease Index (FREI) in a Microsoft Word 2010 tool, to the gerontotechnology assessment instrument, in order to assess reading gerontotechnology⁽¹⁸⁾.

The readability index was chosen since it is considered an indicator of comprehension and ease of reading, evaluating that the larger the size of words and phrases, the more complex the reading will be for older adults. As they are Brazilian older adults, it was relevant for the study to consider their educational level, since less than 30% have a higher or secondary level⁽¹⁹⁻²²⁾.

The FREI evaluated the degree of legibility of the texts in the percentage scale from 0 to 100 and the FKRI uses as limits the values of 0 to 35 and considers years of education required to understand a certain text. The value on the percentage scale is proportional to the ease of reading, and it is recommended that the percentages be between 60 to 70%. For this research, it was considered that educational technologies should score above 70% as acceptable⁽¹⁹⁻²¹⁾.

For that, their respective formulas were followed: for FKRI = $((0.39 \times \text{average words per sentence}) + (11.8 \times \text{average syllables per word})) - 15.59$. And for FREI: $\text{FREI} = 206.835 - ((1.015 \times \text{average sentence length}) + 0.846 \times (\text{number of syllables per 100 words}))$. Finally, all texts were selected and evaluated by the Automatic Grammar Reviewer to Portuguese, a text analysis tool from Microsoft Office Word 2010, which evaluated both FREI and FKRI⁽²³⁻²⁴⁾.

This study followed the guidelines and regulatory standards for research with human beings established by Resolution No. 466/2012. Opinion issued by the Universidade Federal de Santa Catarina, CAAE number: 2434981390000121.

RESULTS

Ten participating judges evaluated gerontechnologies, four being men and six women, with ages ranging from 36 to 76 years old. As for training, they were: three physical therapists, three social workers, two nurses and two psychologists. As for the work area, six are lecturers, all had experience with older adults with an average of 17.6 years, all members and holders of gerontology titles from SBGG, and all had experience in evaluating educational materials. All had Geriatrics/Gerontology publications, Elaboration/Validation of educational material, accessibility, and all are authored in scientific articles with themes related to Older Adults Health/Gerontology/Geriatrics published in journals classified by the Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Capes*).

The result of SAM in the sum of the points attributed to each item of the instrument categorized gerontechnology as to the adequacy of the educational material for older adults. The calculation was performed using the total sum of scores, divided by the total number of items in the questionnaire. For evaluation terms, the 70% agreement index between the judges was considered, the material evaluated with the instrument as excellent or adequate, with emphasis on simple and objective reading, daily illustrations and specific guidelines for the target audience.

At the end of the SAM evaluation, a gerontechnology evaluation instrument was used, which had 47 items and three open questions, whose objective was to classify the educational technology in line with the value that suited the judge's opinion according to the following valuation: 1 totally disagree; 2 Agree with some aspects of the statement; 3 Agree with most of the statement; 4 Totally agree; N/A does not apply.

According to the judges' reports and based on the data obtained from the gerontechnology instruments, they are effective tools for the teaching-learning of older adults with PD. The interpretation made from the FKRI and FREI indexes obtained a recommendation of the need for six years of studies to understand the material proposed in FKRI. On the other hand, the interpretation of the FREI considered that the material presented 85% of ease of reading, concluding that it is suitable for older adults.

The content evaluation performed by the judges was positive for the booklet and the memory games. They indicated the material as excellent, considering adding to the practical guidelines, mainly due to the playful and interactive form of the material. These educational technologies, as they are easy to understand, can provide older adults motivation to follow the proposed guidelines when using the material. In addition, it is believed that based on the fact that the construction of these gerontechnologies presented herein

comes from a research process that sought to problematize the needs of older adults and professionals in the prevention of falls, this study reached its target audience, as can be seen in the summary chart of the results below.

Chart 1 – Content evaluation and eligibility indexes of educational gerontechnology, according to judges.

	SAM	FKRI	FREI
Judges' evaluation	70%	6 years of study	85%

Note: SAM: *Suitability Assessment of Materiais*; FKRI: Flesch-Kincaide Readability Index; FREI: Flesh Reading Ease Index.

Source: Authors (2020).

DISCUSSION

According to International HelpAge⁽²²⁾, Brazil occupies the 56th place in the global ranking, ranging from 1-96 places on the assessment of the social and economic well-being of older adults. The main related factors are: low levels of security; dissatisfaction with public transportation and lack of education. This data was evidenced in the research, in which only two older adults had a higher education course and this one is extremely important for the evaluation and development of gerontechnology adapted to the educational level of most older adults.

Concerning gerontechnologies, aiming to promote the health of older adults and prevent diseases, the focus should be on the development of technologies that will contribute to gerontological care, with a view to promoting health, enabling individuals to become protagonists in their care process and develop personal skills to change conduct in face of the facts of their daily lives^(13,25). Reflecting on nursing care from a technological perspective allows nurses to glimpse new possibilities of humanized, innovative care, capable of transforming daily life, improving the quality of life of older adults, as well as their physical-psychological-emotional well-being, promoting health when preventing falls⁽²⁵⁻²⁶⁾.

However, for the effectiveness of gerontechnology, it is necessary to evaluate it. In this study, the evaluation of the judges revealed that educational technologies are educational material of content and valid for preventing falls in older adults with PD, with an attractive and motivating appearance to play and/or read. Despite the result, at FKRI, the need for older adults to have six years of studies to use these materials and 85% of ease of reading, as indicated by the FREI, the material was assessed as adequate for older adults.

The interest and need of professionals working in gerontology to use educational technology is evident⁽²⁷⁾. Demands are changing and breaking paradigms as suggested by the judges, and gerontechnologies meet this challenge, being an interdisciplinary field that increasingly gains space from sociology to nursing in order to stimulate its use and improve quality of people⁽²⁾.

It is noteworthy that the prevention of falls should consider the lifestyle and environment of the older adults, considering that each of them experience their care process differently and the risks are different for the elderly with PD. When this factor is neglected by health professionals and even family members/caregivers, the results become small⁽²⁸⁾.

Thus, while working to promote health and encourage the development of personal skills, it is possible to assist in the empowerment process of older adults, acting in their care process and providing them with the opportunity to focus on defined objectives and lead them to effective results in preventing falls. The look at a proposal of educational activities runs through the theme of information transmission, as they break with the paradigm of the treatment of older adults centered on the disease, since they aim to improve the quality of life and not only to increase the life estimate⁽²⁹⁾.

This empowerment favors horizontal learning, where each subject has different knowledge and everyone is equally valued. It helps older adults with PD to develop critical awareness, the product of gerontotechnology goes beyond traditional care, such as a simple transfer of information^(28,30). In addition, gerontotechnologies are contributing tools to assist in the care provided by family members and caregivers, they ease the teaching-learning process among those involved, favor the exchange of knowledge, build new knowledge through the knowledge of the other, encourage the socialization of older adults with PD, strengthen the bond between all those involved, reflecting on the improvement of the care received and older adults' adherence to prevent falls⁽²⁵⁾.

Thus, this research recommends that nursing continue to invest in gerontological care focused on educational technologies and that they are built together with the older adults, with the aim of clarifying their doubts and serving as a foundation for family members/caregivers. Therefore, it is essential that they are based on the interdisciplinary precepts of gerontechnologies, associating different knowledge in search of the peak of gerontological care: older adults with PD living with quality, dignity and, consequently, improving their general health status and preventing falls⁽²⁵⁾.

Considering the complexity of constituting a group of renowned and titled judges by a nationally and internationally recognized institution, SBGG, combined with the demand for activities of these professionals, the low adherence of the qualified ones to meet the evaluation requests of this study stands out. In many cases, there was no success in virtual communication, in others, their contacts were not available on electronic bases, others did not have enough time to participate in the study, considering the limitation of the short time to complete the research.

Furthermore, the diversity of the older adults' Brazilian population is considered as a limitation. Thus, the material prepared is adequate for the public participating in the study, and possibly needs changes to make it adequate for older adults in other contexts. In addition, older adults who have

reduced visual acuity may have difficulty reading, and it is suggested to increase the font size for better viewing.

CONCLUSION

The educational gerontotechnologies developed have relevant content, which can be used by the older adults, family members and caregivers, in order to generate clarification of questions on the theme of fall prevention for older adults with PD. They include: 1) the educational booklet "*se liga na queda*" has information/concepts about PD and falls, interactive activities, care actions and the importance of family and caregiver about preventing falls in the process, in addition to memory games; 2) memory game "*não cai istepô*", named after the natives of the study region, it was elaborated based on gait and memory, identified as emerging needs in the evaluation carried out with studied older adults with PD, using reused material (old floppy disks, coated in EVA, with fixed images produced by a graphic designer related to Parkinson's Disease and falls prevention); it has 36 pieces, 18 pairs of images that lead older adults to reflect on the prevention of falls; 3) memory game "*escorregou de maduro*", the proposal of the name of that game was given by the older adults themselves when they remembered the expression "*caiu de maduro*", it is composed of 36 pieces produced in a sustainable way (old compact discs coated with EVA), 18 CD contain only images, aiming at the prevention of falls and 18 CD present images and behaviors related to health promotion to avoid falls. The objective is to find the piece correlated to the image and learn a new behavior to avoid falls.

The effectiveness of educational gerontotechnologies for older adults with PD has been proven, especially regarding the incentive to prevent falls, self-care, clarifying doubts, providing knowledge about PD, signs and symptoms, bringing new concepts and care to avoid falls. These technologies developed in the form of educational material are of fundamental importance for the prevention of falls, aiming at health promotion. Through the use of ludic and easy to understand activities, they become more attractive to acquire information/knowledge, raising awareness of changing habits and/or conduct, in addition to encouraging self-care.

As a contribution and implications of this study, the encouragement of nursing care using the precepts of educational technologies as contributory methodologies for nursing professionals stands out. It aims to provide innovative and thought-provoking possibilities for the development of personal skills, breaking paradigms of nursing care and the nurse-client relationship.

Moreover, gerontotechnologies can be used as instruments, which complement the activities of health professionals, aimed at teaching and preventing falls, in addition to clarifying the pathophysiology of PD. They can also be used for and by caregivers and family members, solving doubts and serving as a tool supporting the care process.

RESUMO

Objetivo: Avaliar a contribuição de gerontotecnologias no cuidado gerontológico de enfermagem ao idoso com Doença de Parkinson, visando à prevenção de quedas. **Método:** Pesquisa Convergente Assistencial, mediante a construção e a avaliação de gerontotecnologias focadas na prevenção de quedas em idosos com Doença de Parkinson. Realizaram-se avaliação clínica, entrevistas e oficinas com idosos, bem como análise e julgamento dos materiais desenvolvidos por dez juízes titulados em gerontologia pela Sociedade Brasileira de Geriatria e Gerontologia. **Resultados:** Os idosos necessitam de no mínimo seis anos de estudo para compreender a gerontotecnologia educacional desenvolvida. Os objetivos relacionados a conteúdo, compreensão do texto, ilustração, apresentação, motivação e adaptação cultural foram alcançados. **Conclusão:** A gerontotecnologia educacional desenvolvida tem conteúdo relevante, podendo ser utilizada pelos idosos, familiares e cuidadores, a fim de gerar esclarecimento de questões sobre a temática prevenção de quedas para os idosos com Doença de Parkinson.

DESCRITORES

Multimídia; Cuidados de Enfermagem; Idoso; Doença de Parkinson.

RESUMEN

Objetivo: Evaluar la contribución de las gerontecnologías en los cuidados de la enfermería gerontológica de los adultos mayores con Parkinson, con el objetivo de prevenir las caídas. **Método:** Se trata de una Investigación Convergente Asistencial, a través de la construcción y evaluación de gerontecnologías enfocadas en la prevención de caídas de adultos mayores con Parkinson. Se llevó a cabo una evaluación clínica, además de entrevistas y talleres con los adultos mayores, así como el análisis y el juicio de los materiales desarrollados por diez jueces graduados en gerontología por la Sociedad Brasileña de Geriatria y Gerontología. **Resultados:** Las personas mayores necesitan al menos seis años de estudio para comprender la gerontecnología educativa. Se cumplieron los objetivos relacionados con el contenido, la comprensión del texto, la ilustración, la presentación, la motivación y la adaptación cultural. **Conclusión:** La gerontología educativa desarrollada tiene un contenido relevante que puede ser utilizado por los mayores, los familiares y los cuidadores con el fin de obtener claridad en el tema de la prevención de caídas de los adultos mayores con la enfermedad de Parkinson.

DESCRIPTORES

Multimedia; Atención de Enfermería; Anciano; Enfermedad de Parkinson.

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