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Gerontotechnology for fall prevention of the elderly with Parkinson

Gerontotecnologia para prevenção de quedas dos idosos com Parkinson

Gerontotecnología para prevención de quedas de los ancianos con Parkinson

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ABSTRACT

Objective: to develop the gerontological nursing care process among the elderly with Parkinson's disease, aiming at the promotion of health through the creation of gerontotechnologies for fall prevention. **Method:** Convergent Care Research was used as a methodological route. Data were collected from February to October 2017, with the participation of nine elderly people with Parkinson's disease. An educational booklet, a memory game called "não cai istepô", a memory game called "caiu de maduro" were developed through clinical evaluation through scales, recorded semi-structured interview and workshops. **Results:** the application of gerontotechnology resulted from the elderly in self-care, empowerment and knowledge through play, revealing interest in behavior change, independence and learning, as well as serving as a facilitator of care. **Conclusion:** the gerontotechnologies presented as a playful and innovative instrument for the nursing gerontological care process.
Descriptors: Educational Technology; Aged; Health Promotion; Accidental Falls, Parkinson Disease.

RESUMO

Objetivo: desenvolver o processo de cuidado gerontológico de enfermagem junto aos idosos com doença de Parkinson, visando à promoção da saúde por meio da criação de gerontotecnologias para prevenção de quedas. **Método:** utilizou-se como trajeto metodológico a Pesquisa Convergente Assistencial. A coleta de dados ocorreu de fevereiro a outubro de 2017, e contou com a participação de nove idosos com a doença de Parkinson. As gerontotecnologias: cartilha educativa, jogo da memória: não cai istepô; jogo da memória: caiu de maduro foram desenvolvidas mediante avaliação clínica através de escalas, entrevista semiestruturada gravada e oficinas. **Resultados:** a aplicação da gerontotecnologia resultou por parte dos idosos em autocuidado, empoderamento e conhecimento através do jogo, revelando interesse em mudança de conduta, independência e aprendizagem, além de servir como instrumento facilitador do cuidado. **Conclusão:** as gerontotecnologias apresentaram-se como instrumento lúdico e inovador para o processo de cuidado gerontológico de enfermagem.
Descritores: Tecnologia Educacional; Idoso; Promoção da Saúde; Acidentes por Quedas; Doença de Parkinson.

RESUMEN

Objetivo: desarrollar proceso de cuidado gerontológico de enfermería junto a los ancianos con Enfermedad de Parkinson visando la promoción de la salud, a través de la creación de gerontotecnologías para prevención de caídas. **Método:** se utilizó como trayecto metodológico la Investigación Convergente Asistencial. La recolección de datos ocurrió de los meses de febrero a octubre de 2017, contó con la participación de nueve ancianos con la Enfermedad de Parkinson. Las gerontotecnologias: cartilla educativa, juego de la memoria: "não cai istepô" y "caiu de maduro" fueron desarrolladas mediante evaluación clínica a través de escalas, entrevista semiestructurada grabada y talleres. **Resultados:** la aplicación de la gerontotecnología resultó por parte de los ancianos en: autocuidado; empoderamiento y conocimiento, revelando interés en cambio de conducta, independencia y aprendizaje, además de servir como instrumento facilitador del cuidado. **Conclusión:** las gerontotecnologías se presentaron como instrumento lúdico e innovador para el proceso de cuidado gerontológico de enfermeira.
Descriptores: Tecnología Educacional; Ancianos; Promoción de la salud; Accidentes por caídas; Enfermedad de Parkinson.

INTRODUCTION

Population aging has been prominent in Brazil and the world. The Brazilian elderly population represents 14.3% of the total population, with 29.3 million elderly people. According to this setting, projections indicate that in 25 years there will be a significant increase in this population, representing twice the current rate[1-4].

With the change in the national and world picture, which is more aged, the health problems of the elderly become great challenges for the health models in force. The main health problems of the elderly are from chronic noncommunicable diseases (CNCD), among them Parkinson's Disease (PD). PD is the second most prevalent neurodegenerative disease, affecting two elderly people in every 100 people over 60 years of age, and with a higher prevalence among men.

PD is characterized by neuronal death in the black substance, which leads to the reduction of dopamine, generating motor alterations, such as stiffness, bradykinesia, tremor and changes in gait, balance, posture and cognitive changes represented by changes in processing speed, executive functions, attention, mental flexibility and memory, directly influencing the Activities of Daily Living[5-12].

Hypokinesia, the reduction of movements, is a clinical characteristic of PD that begins unilaterally, and as the disease progresses, it leads to bilateral impairment. PD can still lead to fatigue; autonomic symptoms; pain; freezing of gait; and dementia. This set of signs of PD symptoms results in a decrease in quality of life with loss of independence and autonomy that can lead to falls, causing social isolation; reducing the potential for self-care; and thus cause impairment in the Activities of Daily Life (ADL)[6,13-14].

This goal addresses the needs of the elderly with PD, which, due to the reduction of the speed of muscular contraction, causes the reduction of the protection reflex and of the response to the stretching of the muscle, resulting in the loss or reduction of the balance. These factors, added to the biological changes, increase the disposition for falls, that can bring countless repercussions to the life of the elderly from fractures, loss of social life, hospitalizations and even death[15-17].

To promote fall prevention, the teaching-learning process provides the elderly with the perspective of acquiring new experiences, as well as sharing existing ones, which equips the elderly to look at their habits, living conditions, dependence and self-care behavior. Given this, it is necessary for nurses, family members and caregivers to encourage the promotion of elderly health by reinforcing adherence to healthy habits, as well as the importance of knowledge exchange[18].

Through the use of gerontotechnologies of an educational nature based on health promotion actions, it is possible to reveal other forms of care and education based on the development of personal skills, empowerment and self care[19-20]. Gerontecnologias are defined as the study of technology and aging that seeks to ensure good health, seeking to meet the needs arising from the aging process[21]. It is known that there are technologies aimed at the elderly public with PD, but there is a shortage related to the development of the technologies derived from their needs.

Gerontotechnologies can be used as important tools to aid in the loss of capacity for decline and also act in disease prevention involving physical and cognitive abilities and can contribute to the prevention of primary and secondary consequences of the disease[21]. In addition to allowing reflection on the topics, based on their reality and on others, they encourage reasoning, provide the exchange of knowledge, leading the subject to obtain greater autonomy and empowerment, constituting himself as an agent of change of his reality, corroborating for fall prevention[19-20].

OBJECTIVE

To develop a gerontological nursing care process among the elderly with PD, aiming at the promotion of health through the creation of gerontotechnologies to prevent falls.

METHOD

Ethical aspects

The present study followed the guidelines and norms regulating human research established by Resolution 466/2012[22]. Opinion was issued by the *Universidade Federal de Santa Catarina*, CAAE (*Certificado de Apresentação para Apreciação* Ética - Certificate of Presentation for Ethical Consideration) number: 24349813,9,0000,0121.

Type of study and Theoretical-methodological framework

The methodological approach was based on the principles of the Convergent Care Research (CCR), based on the need found by the researcher, based on the needs of elderly people with PD to change their habits related to falls prevention.

Methodological procedures

The emerging topics of data collection subsidized the development of three gerontotechnologies (educational booklet, memory games "*não cai istepô*" and "*caiu de maduro*"). This material aimed at promoting health avoiding falls was presented to the elderly of the study in two workshops, consisting of the second stage of this research. The first workshop was considered a test workshop, based on the emerging needs of the elderly about falls. It presented duration of approximately 2 hours, counted with nine elderly, being organized in two moments: 1) expository moment about the imminent risks of falls and their correlation with PD; 2) moment of interaction and socialization, through the application of the memory game with 24 pieces of COMPACT DISC (CD), being 12 pairs, coated in Ethylene Vinyl Acetate (EVA). Game was chosen by favoring the involvement of the elderly in the educational activity, in a playful, creative and low-cost production[23].

The second workshop lasted 1h30min. It was performed with nine elderlies, and it developed in two moments: 1) presentation of some topics in the booklet for fall prevention, developed by the researcher with the topic *fall prevention* and *PD*. This booklet has 56 pages in booklet form and bases the actions of the games developed. The purpose of this gerontotechnology is to provide pertinent information to the elderly about the pathology, relevant information on how to prevent falls, health promotion actions, as well as to stimulate memory and cognition.

Then, the second moment began: games that could be played in doubles or trios. Two sets of memory games were elaborated, the first one titled: "*não cai istepô*", as a way of simple homage to the natives of the city of Florianópolis, who have this expression in their vocabulary. The game was elaborated based on the tests and scales, according to the emerging needs in the evaluation performed with the elderly with PD.

In this game, 36 pieces were used, with 18 pairs of images that led the elderly to reflect on falls. In this aspect, the choice between the nurse and the designer was fundamental, considering that the goal of the game was to build knowledge about the topic and not mere entertainment among the elderly. In this way, it was possible to construct a gerontotechnology that contemplated the needs of the elderly with PD and the recommendations of the literature on the subject, besides the aesthetics recommended by the studies on development[24-25].

The second memory game "*escorregou de maduro*" had as mention the expression "*caiu de maduro*" (in Portuguese, this expression means when someone falls by accident for no apparent reason), making the name light and fun. The game was made by 36 CDs coated with EVA. Of these, 18 CDs had only images related to fall prevention and 18 CDs presented images and conduits/recommendations in a letter inside a produced EVA cover. The letters were elaborated with topics pertinent to the promotion of health with a view to fall prevention. Gamification made it possible to train the skills and domains of the elderly, with creation of mental images allusive to actions to prevent falls and promote health. In this game, the objective of the elderly was to find the part correlated to the image and to reflect on their habits to avoid falls.

Study setting

The study site was a Mutual Help Group for People with Parkinson's Disease from a university in Southern Brazil.

Data source

Elderly people with the following inclusion criteria participated in the study: registered in the mutual aid group; with a score above 4 in the clock test; and who experienced falls. Participants in the study who did not have the medical diagnosis of PD and elderly individuals with a score below 4 on the test were not included in the study due to their brain injury screening function, which would make the development of the research impossible[26].

Collection and organization of data

Data collection with the elderly ranged from February to October 2017, being divided into two stages: the first to base the clinical evaluation with the use of scales for cognitive test: Mini-Mental State Examination (MMSE) and Clock-Drawing Test; for balance and gait test: Tinneti's Assessment Tool; for functional test: Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), besides semi-structured interview[27-28].

Data analysis

Workshop data and interviews were transcribed in full and analyzed according to the thematic analysis, which consisted of three stages: pre-analysis, material research and treatment of results/inference/interpretation of the speeches exposed by the elderly, combined with the study subject. Simultaneously with the unveiling of the material, the analysis was carried out with the purpose of assembling words and expressions that showed similarities between them, making possible the formulation of the categories of analysis[27].

RESULTS

Data on the sociodemographic and cognitive characterization of the elderly with PD participants are presented in Chart 1.

The data on functional and PD-related scores of the elderly participants:

Chart 1 – Presentation of sociodemographic and cognitive characterization of the elderly with Parkinson's Disease, Florianópolis, Santa Catarina, Brazil, 2019

Elderly	Aged	Gender	Occupation	Marital status	Income	Schooling
ELD1	68	M	retired	married	1,000.00	In. Elementary School
ELD2	70	M	retired	widower	1,900.00	C. Elementary School
ELD3	74	M	retired	married	3,000.00	In. Elementary School
ELD4	68	M	retired	Widower	2,800.00	In. Elementary School
ELD5	70	F	retired	Married	2,300.00	In. Elementary School
ELD6	71	F	retired	Widower	1,800.00	In. Elementary School
ELD7	73	F	retired	Widower	2,800.00	C. Sup.
ELD8	69	F	retired	Married	1,900.00	In. Elementary School
ELD9	70	F	retired	Widower	1,000.00	In. Elementary School

Chart 2 – Presentation of the functional scores related to Parkinson's Disease of the elderly interviewed, Florianópolis, Santa Catarina, Brazil, 2019

Elderly	MMSE	Clock-Drawing Test	Tinetti's Assessment	ADL	IADL
ELD1	27	4	12	24	22
ELD2	26	4	14	3	21
ELD3	27	4	20	30	21
ELD4	28	4	22	0	27
ELD5	28	4	25	0	27
ELD6	26	4	17	2	14
ELD7	27	4	15	2	22
ELD8	26	4	16	2	14
ELD9	28	4	24	0	27

Note: MMSE - Mini-Mental State Examination; ADL - Activities of Daily Life; IADL - Instrumental Activities of Daily Living.

Chart 3 – Construction of the codes identified in the interviews after application of educational gerontotechnology performed with the elderly with Parkinson's Disease (ELD1, ELD2, ELD3, ELD4, ELD5, ELD6, ELD7, ELD8, ELD9), Florianópolis, Santa Catarina, Brazil, 2019

RESULTS (CODES)	Excerpt from interviews (elderly)
Avoiding and learning not to fall	*For us is fundamental, I think the thing we should do is avoid ... always think before: I'll do? I'm going up I will not fall I will not harm myself? Ask yourself* [...]. (ELD2) *Am I go up? So always very cautious, because we can break the bone and at our age is serious, it generates suffering for us, for the family* [...]. (ELD5) *I already dropped a few times, one day it was because I rang the phone and went to pick my daughter's call* [...].*Now I've learned a little not to fall any more* [...]. (ELD1) *I put grab bars in the bathroom* [...]. (ELD7) *I learned that we should have a handrail and remove the carpets* [...]. (ELD5) *I put a railing on my staircase from home* [...]. (ELD4) *I learned about handrails and exercise at the gym...* (ELD8) *I learned today that we can not have a house full of rugs, and I learned about gym and stretching.* (ELD1) *Good tips.* (ELD9)
Helping people/to pay attention	*People at this age have to pay close attention, always pay attention.* (ELD1) *Now I know, have to take it easy, do not care if it's taking too long, these things help us.* (ELD7) *I have already fallen, December 1st I fell and broke my arm. Now I always take care not to fall any more.* (ELD4) *These things help us, it's important, I want this little book because for us it's a document that helps a lot* [...]. (ELD6) *Draw attention to care.* (ELD8) *The experience was very good, the time passed quickly and I learned many tips.* (ELD1) *I'll take more care to get things done.* (ELD2) *Helping us ... important be careful not to climb on the bench.* (ELD7)
I liked it because it reminds me my childhood/a different thing	*It was good, I remembered the time I played with my kids.* (ELD2) *I liked it because we go back to childhood* [...]. (ELD3) *I enjoyed participating, I felt good.* (ELD1) *It is interesting, exercises memory.* (ELD9) *Very good, it's a different thing, we need it.* (ELD4) *Play helps memory.* (ELD8) *One more memory boost.* (ELD6)
Learning from the game	*I learned from the game to avoid falls.* (ELD4) *What you're going to do, where you're going to store things, you have to stay in easy places to be able to pick up later.* (ELD6) *In this activity, I learned that we should pay more attention to carrying out things* [...]. (ELD8) *It helped to improve my memory.* (ELD8) *Memory is good for Parkinson's.* (ELD6) *I remembered the activities I must carry out.* (ELD8) *I think this is going to help me not fall any more.* (ELD9) *It was good, we think about what we do. We know what is right and what is wrong.* (ELD9) *It was really cool, time passed quickly and I already know how to avoid falls.* (ELD3)

Chart 4 - Definition of the subtopics and topics from the codes generated in the interviews after the application of educational gerontotechnology, Florianópolis, Santa Catarina, Brazil, 2019

Codes	Subtopics	Topics
Avoiding and learning not to fall	Learning/Self-care	Self-care
Helping people/to pay attention/I liked it because it reminds of childhood/a different thing	Feeling of inclusion / Feeling of wellbeing/ Memories/Distraction	Empowerment
Learning from the game	Learning/Educational Technology	Knowledge through play

After the development and application of educational gerontotechnologies through booklets and games, the researcher sought to analyze the contributions of the insertion of this activity for the elderly. In this way, the data obtained with greater meaning were classified in codes, according to Chart 3 and then proceed with the analysis phase and definition of the subtopics and topics.

With the identification of the codes, the researcher sought to define the pre-categories, classifying them into sub-themes and themes for the analysis of the application of educational gerontotechnology, through the game of attitudes, as shown in Chart 4.

DISCUSSION

The results after the application of gerontotechnology were recognized by the elderly (ELD1, ELD2, ELD3, ELD4, ELD5, ELD6, ELD7, ELD8, ELD9) as self-care, empowerment and knowledge.

Self-care emerged among the elderly from the outset, seeing their concern for themselves and their interest in learning to avoid falls. Self-care consists of actions that the subject realizes for himself, for his own benefit, in order to guarantee the maintenance of life, health and well-being[29]. This set of actions

involves decision making, being spontaneous and intentional. Thus, it is evident that self-care is an educational activity initiated and executed by the subjects and has as purpose the execution of actions, which assists in a specific way in human integrity, function and development[30-31].

In the case of the elderly with PD, gerontotechnologies are contributory tools for the process of encouraging independence, autonomy and self-care, as they favor relevant information for fall prevention and PD. They also corroborate that the family and caregiver can break paradigms about PD and fall prevention, and work with the elderly in their entirety. Thus, care becomes light and dynamic, reducing the emotional, social and physical overload that falls on them[32-34].

Among the complications of patients with PD, we can highlight gait disturbances, and the elderly who fall account for 38% to 68%[35]. Based on this demand, it is necessary to apply measures to prevent falls of this public, focused on the difficulties and limitations imposed by the disease.

Physiotherapy and physical activity contribute fundamentally to the improvement of motor symptoms[36] such as postural instability, autonomic symptoms and rigidity of the elderly with PD, offering benefits for their well-being and contributing to fall prevention. There are also other essential measures aimed at health education aimed at the qualification of self-care of the elderly with PD aiming at improving their quality of life.

In this sense, games can be seen as the first step for health education actions, since they enable learning and serve as an encouragement for lifestyle change, promoting health and preventing injuries, which leads to a change in CNCD. They modify the teaching-learning process, as it allows through the acquired knowledge self-care of the elderly with PD and the change in their daily life, as well as offer of moments of relaxation and joy through playful games that favor cognitive stimulation and collaborate for stress relief caused by pathology symptoms[23,32,37-38].

Encouraging the elderly with PD for self-care is a challenge, considering the signs and symptoms of pathology, which may compromise their independence and autonomy. However, planting health promotion actions with the encouragement of self-care leads the nursing to perform an interactive, constructive and empowered nursing care. Through play it is possible to create a link between the health professional and the elderly, as well as among the elderly themselves, giving a new meaning to the entire process of health education established here through this gerontotechnology.

During the evaluation of educational gerontotechnology, participants of the research reported that they brought information that made possible to become agent of transformation of their life. In the meantime, it is necessary to reflect on the important role of nurses in promoting empowerment as something challenging and involving several nursing actions. Therefore, within the process of self-determination, we present the empowerment that can be considered: a conquest of freedom; advancement and overcoming of domination, on the part of the one who empowers and not a simple donation or act of benevolence, making the empowered a change agent to evolve and strengthen[39].

Gerontotechnology contributes to provide the elderly, family and caregivers with a differentiated care, since it made possible the reflection about their own aging and their health condition. Gerontotechnology is a tool that facilitates care, since it enables co-responsibility and co-participation of the subjects in care. This contributes to the elderly increase their self-esteem and feel empowered and responsible for the behaviors to prevent their falls[40].

In this sense, the elderly in understanding the health/illness process, becomes more autonomous and improves their quality of life, which allows the nursing to develop a care guided in the dialogical learning, to which the elderly with PD finds sense in a way to live healthy self/autonomous/personalized, and nursing reaches its goal. The consolidation of the elderly with PD in this moment and context is constituted by means of care elaborated according to their needs, glimpsed with respect, dignity, stimulus to self-care and empowerment[20,41].

Educational gerontotechnology enabled the elderly to reflect on their prior knowledge about the presence of falls, which led to new possibilities and attitudes towards new learning. Educational games are considered tools that provide the development of the construction of health knowledge, and for the participating subjects as fun, stimulating, innovative means that allow the participation of the subjects in the collective construction of knowledge, through the exchange of information and reflections[37].

Through games, it is possible to obtain new knowledge and provide development of promotion and prevention actions, health problems control and transformative actions of their daily life horizontally, breaking with traditional directive and vertical education[23].

Games allowed the elderly to recognize the complexity and importance of care encompassing the comprehensiveness of care. Furthermore, they were recognized as subjects capable of changing and creating a new perspective and improvement in the quality of life. These are tools capable of making the subject a player that is the transforming agent of his praxis, leading participants to reflect, generating critical discussions and constructing different concepts based on the reality of the subject, which may even modify social practices[37].

Thus, it is based on the assumption that the elaborated educational gerontotechnologies are capable of instrumentalizing nursing care, so as to encourage the interest of the elderly in the educational process[23]. In addition to enabling fall prevention, especially the elderly with PD, since it stimulates the construction and reconstruction of knowledge, linked to the studies, indicate that the most frequent site of falls (64%) is the elderly's home. The predominantly preventable causes are the use of loose rugs in the house, absence of support bars, shoes without strips behind[42-43].

Study limitations

The limitations of the study were the scarcity of publications on the subject and the lack of dissemination of such topics in the Brazilian nursing literature. They constituted a gap in knowledge

and even a challenge, since many studies are based only on PD, not covering the interactive forms of care[41].

In addition, it is considered as a limitation the diversity of the Brazilian elderly population. Thus, the material elaborated is adequate for a given group of elderly people with PD, since this will most likely require alterations to become adequate for the elderly in other contexts.

Contributions to Nursing, Health or Public Policy

The product elaborated stands out as contributions to nursing, since gerontotechnologies are tools that favor the teaching of the elderly and corroborate so that the family/caregiver has access there is a quality material, with relevant information on fall prevention with health promotion. Moreover, they enable innovation in nursing care, with interactive, attractive and motivating tools for health education. This research also collaborates to reduce the knowledge gap on gerontotechnology, an emerging issue in the society.

CONCLUSION

The increase in life expectancy and the high prevalence of PD in Brazil and worldwide evidences the need to develop other forms of care for the elderly. The nurse, as facilitator of the protagonism in care for the elderly, needs to be up to date and recognize the demands of health and the resources of the gerontotechnologies, that brings a dynamic and innovative care. In this way, nurses must fully understand the way they do gerontological nursing and promote self-care with empathy, scientific knowledge and innovation.

Therefore, it is necessary that actions of health promotion are directed to the emerging public. Since the actions must contain guidelines that reach the objectives of the elderly, the nurse must know the specificities of the elderly, promoting a more qualified assistance that meets the demands.

The insertion of gerontotechnology is still a challenge, as it is a recent and innovative topic, which may prevent or impose barriers to its use in nursing care. However, it brings a new way of looking at the care process, regardless of its field of action, since it is a tool that complements care in Geriatrics and Gerontology. Added to this, it provides innovation and improvement of intrumental strategies for care enabling transformations in daily practices. Finally, it is suggested the need to carry out other studies that guide the development of gerontotechnologies, considering PD a challenge for health care, as well as the occurrence of falls.

ERRATUM

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