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Original Article

THE EFFECTIVENESS OF A HOME EXERCISE PROGRAM FOR SEDENTARY ELDERLY WITH NINTENDO WII®

EFETIVIDADE DE UM PROGRAMA DE EXERCÍCIOS DOMICILIARES PARA IDOSOS SEDENTÁRIOS COM O NINTENDO WII®

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RESUMO

A atividade física é um meio que promove mudanças nos hábitos e estilo de vida dos idosos, que dessa forma, podem controlar ou retardar o aparecimento de doenças crônicas, bem como prolongar as funções físicas e manter sua independência na realização das atividades da vida diária. Diante disso, o presente estudo objetivou verificar a efetividade de um programa de exercícios domiciliares nas dimensões físicas e psicológicas em idosos utilizando o Nintendo Wii®. Trata-se de um delineamento experimental composto por 24 idosos, que foram divididos em dois grupos: experimental e controle. Os grupos foram avaliados antes e após o período de intervenção. Os resultados apontaram redução no tempo dispendido no teste *Timed Up and Go* (experimental, pré: 11,8 ± 3,3 s e pós: 11,4 ± 6,1 s; controle, pré: 11,6 ± 2,5 s e pós: 11,9 ± 2,4 s) e trilhas (experimental, pré: 3,9 ± 1,8 min e pós: 3,4 ± 1,3 min; controle, pré: 3,5 ± 1,3 min e pós: 3,4 ± 1,1 min), apenas para o grupo experimental (p < 0,05) e foram observados escores mais elevados nas respostas do questionário de satisfação com a vida para as questões: "*a minha vida está próxima do meu ideal*" (experimental, pré: 5 ± 2 s e pós: 6 ± 2; controle, pré: 5 ± 2 e pós: 5 ± 2) e "*se eu pudesse viver a minha vida de novo eu não mudaria quase nada*" (experimental, pré: 5 ± 2 e pós: 6 ± 2; controle, pré: 5 ± 2 e pós: 5 ± 2), somente no grupo experimental (p < 0,05). Baseado nas respostas dessa pesquisa, se conclui que a intervenção por meio do videogame foi efetiva no que concerne às variáveis agilidade, atenção e satisfação com a vida.
Palavras-chave: Envelhecimento. Realidade virtual. Promoção da saúde.

ABSTRACT

The physical activity promotes changes in the habits and lifestyle of the elderly; therefore, they can control or delay the onset of chronic diseases, as well as prolong the physical functions and maintain their independence in the activities of daily living. Therefore, the present study aimed to verify the effectiveness of a home exercise program in physical and psychological dimensions in the elderly using the Nintendo Wii®. Thus, an experimental design was conducted, composed of 24 elderly individuals, who were divided into two groups: experimental and control. The groups were evaluated before and after the intervention period. The results showed a reduction in time spent on the *Timed Up and Go* test (experimental, pre: 11.8 ± 3.3 s and post: 11.4 ± 6.1 s; control, pre: 11.6 ± 2.5 s and post: 11.9 ± 2.4 s) and trails (experimental, pre: 3.9 ± 1.8 min and post: 3.4 ± 1.3 min; control, pre: 3.5 ± 1.3 min and post: 3.4 ± 1.1 min), but only for the experimental group (p <0.05) and higher scores were observed in the satisfaction of life questionnaire answers to the following questions: "*my life is close to my ideal*" (experimental, pre: 5 ± 2 s and post: 6 ± 2; control, pre: 5 ± 2 and post: 5 ± 2) and "*if I could live my life again I would not change almost anything*"(experimental, pre: 5 ± 2 and post: 6 ± 2; control, pre: 5 ± 2 and post: 5 ± 2), for both comparisons, only in the experimental group (p <0.05). Based on the answers of this research, we conclude that the intervention through video game was effective regarding the variables: agility, attention and satisfaction with life.
Keywords: Aging. Virtual reality. Health promotion.

Introduction

Only 17.4% of the Brazilian population aged 15 years old or over was classified as physically active in 2015[1]. Another reason for concern is that the elderly are the most physically inactive[2]. Physical inactivity speeds up one's functional inability and loss of quality of life, besides increasing the number of non-communicable chronic diseases (NCDs) such as obesity, systemic hypertension, type II diabetes mellitus, among other pathologies and consequences[3].

Coupled with the NCDs mentioned in the above paragraph, it is worth noting that the aging process causes biopsychosocial changes that may lead to a condition of greater vulnerability in the elderly[4]. Thus, several diseases may onset and generate limitations. It is in such a context that professionals from the many areas of knowledge are inserted, aiming to promote the seniors' health and help them age healthily and actively, as set forth by public health policies[5].

In line with Pereira, Giacomini and Firmo[6], old age is a new experience for every person, with symbolic, social and cultural dimensions, and to believe that everyone will be able to live in the same way is to fail to comprehend that old age, in its natural process, has a number of ways to be experienced, depending on paths chosen and on the determinants of this process in the course of aging. Aging, in its turn, is a gradual process characterized by changes in the physiological functions of human beings, which cause decline in motor capacity, flexibility, aerobic capacity, muscle strength, and other changes[7].

It has been also reported in the literature that part of the elderly are exposed to high levels of functional impairment, dependence and loneliness[8]. However, aging should not be synonymous with inactivity or disease[9]. From this perspective, it should be understood as a natural and evolutionary process, and it is expected that this concatenation occurs with satisfaction and quality of life[10].

On the other hand, physical inactivity speeds up the decline of the muscle system (a condition also called sarcopenia) and, as a consequence, reduces one's capacity to generate strength, thus causing an increased risk of falls, which are directly associated with mortality and morbidity in old age[11]. In this sense, research has been turned to physical activity as a means to transform the life styles and habits of the elderly in order to control or delay the onset of chronic diseases[2].

To delay or prevent these changes deriving from the aging process, researches on aging has been seeking tools that can maintain or improve the performance of motor and cognitive functions throughout life, such as activities proposed using a video game to stimulate agility and balance[12], as well as cognitive functions such as attention and memory[13], in addition to stimulating social relations[14]. In this context, video games have been highlighted as a technological method for motor and cognitive training[15]. Evidence suggests that this type of intervention has a positive effect on the cognition of seniors when it comes to processing speed, attention, spatial memory, cognitive control, intelligence, motor and visual coordination, and global cognitive functioning[12]. In this regard, research using electronic means and methods such as video games can be a non-pharmacological tool of easy access by the population[13].

It is worth stressing that the use of electronic means is a safe strategy, since the elderly stay at home most of the time due to lack of proper public transport, dependence on other people to come and go for fearing falls, as well as to the violence in big cities[16]. Therefore, to test new strategies for health promotion in this age group of the population, the provision of home exercise programs, such as virtual rehabilitation activities, is seen as a chance for one to exercise[17].

Complementarily, the benefits of using Nintendo Wii® in the rehabilitation of people with neurological disease sequels, just as in the elderly population, include postural correction, training for balance improvement, increase locomotion capacity, range of movement in the upper and lower limbs, agility, attention and motivation, and this method has been proving effective as a therapeutic instrument[14,18]. Moreover, resorting to Nintendo Wii® has a positive effect on cognition, physical function and psychosocial responses in seniors[19]. Thus, this instrument is a viable resource for the elderly to perform physical activities in safe environments and, consequently, for the improvement of the quality of life in this age group of the population. In this sense, it is noted that the main objective of the present research was to assess balance in a more straightforward way by using baropodometry as instrument.

Finally, in line with the indispensability of fostering strategies for health promotion in the third age, this study aimed to verify the effectiveness of a home exercise program for sedentary seniors with Nintendo Wii®.

Methods

Participants

This study presents an experimental design composed of 24 elderly individuals registered at the Physiotherapy Clinic School of the University Center of Maringá (Unicesumar) and has, as inclusion criteria, the following elements: **a)** male and female seniors; **b)** age between 65 and 80 years old; **c)** sedentary individuals, information verified by means of the cutoff point of the International Physical Activity Questionnaire (IPAQ); whereas the exclusion criteria were: **a)** mental diseases or central nervous system degenerative diseases, which were identified through the Mini-Mental State Examination (MMSE); **b)** no availability to participate in the research.

All the elderly were informed as to objectives, justification and procedures carried out, in accordance with prior collective meeting and individual instructions. Besides, there was compliance with resolution 466/2012 of the Brazilian National Health Council and with the Declaration of Helsinki. After all clarifications, every participant signed a free and informed consent form. The study also complied with all legal and ethical aspects and was approved by the Unicesumar's Research Ethics Committee, under number: 2067.718.

Procedures

Contact with the patients was made through records stored on the database of the Unicesumar's Physiotherapy Clinic School, which provided the seniors' contact details, and, with that, phone calls were made by the main researcher, who explained all the theoretical foundation of the research and eventual benefits that the participants could have. A total of sixty-three elderly individuals from the metropolitan area of Maringá, Paraná, Brazil, were contacted. Eleven declined to participate in the study, claiming lack of time, nine said that they did not like electronic games, and seventeen did not meet the inclusion criteria for the study. In this way, twenty-six elderly individuals were selected for the conduction of the tests. However, two of them suffered falls and were then unable to perform the protocol. Consequently, twenty-four finished the present study, being randomly allocated in the experimental group (n=12) or in the control group (n=12). Data were collected between November 2016 and August 2017. Collection happened in this order: 1) filling of questionnaires (presented in this same section in topics below); 2) body weight and height measurements; 3) balance test by baropodometry; 4) agility test (Timed Up and Go), and 5) attention test (trails). Group allocation (experimental or control) was done through participant randomization (not intentional), using Microsoft Excel® 2013. Data collections were carried out by the same team of researchers before, during and after the intervention period. Sample size calculations showed that seven seniors (Augmon et al. [12]) in each group would be enough to identify the following statistical differences for the main dependent variables: effect size of 0.5, 1-β error probability of 0.8, and $p < 0.05$.

Sociodemographic profile and health conditions

The characterization of the elderly participating in the study was done by means of the filling of a semi-structured questionnaire made up of information referring to sex, age, education, ethnicity, marital status, presence of chronic, degenerative diseases, and use of controlled medication.

International Physical Activity Questionnaire (IPAQ)

To identify physical activity level, the short version of the IPAQ, adapted by Matsudo et al.[20], was used. This questionnaire was employed in order to facilitate the understanding of the participants on how to fill it and record the calculation of weekly physical activity hours. The short IPAQ is commonly used in Brazilian researches[20], as it can be applied by the assessed individuals themselves, as well as in the form of an interview, that is, with questions made by the researchers themselves. Thus, one can assess different physical activity domains (work, locomotion, leisure and domestic activities). The classification of the IPAQ physical activity level followed the recommendations proposed by Matsudo et al.[20].

Mini-Mental State Examination (MMSE) and Satisfaction with Life Scale

Prior to the study, the volunteers were handed a copy of the MMSE questionnaire and the satisfaction with life scale. The researchers explained all questions in order to make the volunteers familiar with them, as well as to minimize any bias in the answers obtained.

For cognitive assessment, the MMSE questionnaire, proposed by Folstein et al.[21], was adopted. To be excluded, the elderly should score below the cutoff point for their level of education. This measure was incorporated for a greater reliability of answers[22]. The suggestions proposed by Bruck et al.[22] for a homogeneous MMSE application were incorporated. The MMSE consists of a 30-item questionnaire and assesses seven cognitive function categories. Total score can reach 30 points, which are distributed as follows: temporal orientation, spatial orientation, immediate memory, attention and calculation, delayed word recall, language and constructional apraxia. The reproducibility of the MMSE was assessed in a previous study by Lobo et al.[23] that confirmed the application validity of said questionnaire in the elderly population.

In its turn, the satisfaction with life scale is composed of five self-report items, whose content assesses the satisfaction level of individuals with their living conditions. The answer key is a 7-point Likert scale on which people check a number that corresponds to how much they agree or disagree with the sentences presented. Anchors “1” and “7” receive correspond to “disagree completely” and “agree completely” values, respectively, whereas the other intermediate values represent different levels of agreement/disagreement with the items. Closer to number “1”, the checked answer indicates disagreement, and closer to “7”, the answer means agreement with the sentence. It is also worth stressing that said scale has high internal consistency (α=0.91)[24]. The answers indicate that higher percentiles mean greater satisfaction with life[24].

Balance assessment by baropodometry

To assess the balance variable, the elderly stayed in orthostatic, bipodal and static position. They stepped on the platform barefoot, with their arms alongside the trunk, eyes open and then eyes closed. In all cases, the device was calibrated with a time of 10 seconds for the execution of the procedures, following all of the manufacturer’s instructions. A rubberized baropodometry platform, Footwork brand, was used, weighing 3 kg, measuring 4mm x 5 mm, with the following specifications: active surface of 400 x 400 mm, dimensions of 575 x 450 x 25 mm, frequency of 150Hz, maximum pressure of 100 N/cm² per captor, analog conversion of 16 bits, 2704 captors measuring 7.62 x 7.62 mm, and polycarbonate coating. All participants were instructed beforehand about data collection procedures and had their measurements taken in triplicate, so that eventual outliers were minimized, using median as registry parameter.

Agility assessment

To assess agility, the Timed Up and go (TUG) test, developed by Podsiadlo and Richardson[25], translated and adapted for Brazil, was used. This test verifies the time the assessed subject takes to perform some functional maneuvers. In a practical way, it consists of observing patients sitting on a chair with standard specifications (found in specialized stores), resting their backs on the chair, who are then instructed to stand, walk fast for 3 meters (straight line drawn on the floor) and, finally, return to the chair, sitting in the initial position. Independent adult individuals with no balance issues execute the test in 10 seconds or less. On the other hand, dependent people as to basic transfers perform the test in 20 seconds or less, and those who need more than 20 seconds to complete it are considered dependent for many everyday activities, as well as for mobility, with problems in the latter suggesting a need for proper intervention.

Trail Test

The trail test is composed of two parts, A and B. In this test, the assessed individual must draw lines connecting, consecutively, numbered circles in part A. In part B, he or she must draw lines connecting, alternately, circles with letters and numbers in an increasing sequence. Thus, the test involves, in addition to selective and alternating attention, complex visual tracking and motor skill (Part A) and executive processes (Part B). Among executive processes, inhibitory capacity and cognitive alternation seem to be the most requested ones in the task execution. It is worth mentioning that the test assesses time spent[26]. The present study used only part B of the trail test, following studies that state that this part discriminates cognitive decline better compared to part A[27].

Intervention

The elderly in the experimental group were visited in their homes for training with the video game. The console was installed on the television of their homes and, subsequently, the whole functioning process of the video game was explained to family members. Bowling (Wii Sports®) was the chosen game, for the understanding that the actions executed simulate agility, balance and attention. The console stayed in the seniors' houses for two months, and after this period all instruments indicated in the present study were reassessed. During the intervention time, the participant was instructed to fill in a schedule provided by the researchers with the number of weekly hours they used the device. Additionally, they were asked to write down eventual difficulties while using the video game. Every five days, the professionals would visit their homes for 50 minutes each visit to talk and check the elderly's compliance with the intervention method and to clarify possible doubts related to the game. As for the control group, there was no intervention, but the seniors received phone calls and text messages every week (each 1x a week) from the researchers and were informed about the importance of physical activity for health promotion.

Statistical analysis

First, the Kolmogorov-Smirnov test was used to test normality, and Levine's test determined data homogeneity. After this confirmation ($p > 0.05$), parametric statistics was employed. Descriptive statistics was carried out after mean and standard deviation calculations for all variables of the present study. Moreover, to test data randomization, a t test was performed previously for independent samples for age and BMI in order to verify eventual differences between the two groups: experimental and control. The results for this analysis pointed $p > 0.05$. Groups and moments were compared by two-factor analysis of variance (group and intervention phase, that is, before and after the respective period). A

Bonferroni test was used as *post hoc* on the occasion when difference was found through the analysis of variance, with 5% level of significance. Sphericity assumption was considered by means of Mauchly's test and the application of Greenhouse-Geisser correction, if necessary. In addition, when time effect was observed, a paired t-test was employed for the values of each group (moments before and after intervention). Complementarily, effect size was calculated by eta-squared (η^2), being classified in accordance with Cohen[28], i.e., < 0.2 (small); 0.2 ≥ to < 0.8 (moderate) and ≥ 0.8 (large). Cohen's *d* was calculated as well, as proposed by Rhea[29], for sedentary individuals < 0.50 (trivial); ≥ 0.50 to < 1.25 (small); ≥ 1.25 to < 1.9 (moderate) and > 2.0 (large), in the condition in which differences were observed in statistical analyses. The analyses were conducted on Statistica 12.0 (StatSoft, Inc., Tulsa, United States of America).

Results

The present study brought only descriptions of statistical analyses that showed significant differences. This condition was adopted to leave this section more concise and didactical. Table 1 displays the general characteristics of the sample.

Table 1. General characteristics of the elderly sample participating in the research

	Experimental group	Control group	*p* value
Age (years)	71.5 ± 5.7	68.2 ± 4.5	$p > 0.05$
Body weight before (kg)	66.4 ± 15.4	67.1 ± 11.7	$p > 0.05$
Body weight after (kg)	66.3 ± 15.6	67.4 ± 11.8	$p > 0.05$
Height before (cm)	150 ± 1	160 ± 1	$p > 0.05$
Height after (cm)	150 ± 1	160 ± 1	$p > 0.05$
BMI before (kg/m²)	27.6 ± 5.6	26.4 ± 2.9	$p > 0.05$
BMI after (kg/m²)	27.5 ± 5.7	26.6 ± 2.9	$p > 0.05$

Note: data expressed by mean and standard deviation; BMI = body mass index
Source: The authors

For age, no difference was found before the intervention period ($p > 0.05$). Likewise, no differences were found for body weight, height and BMI during the eight weeks of study ($p > 0.05$). Figure 1 presents the elderly's practice time during the eight weeks of intervention with Nintendo Wii®.

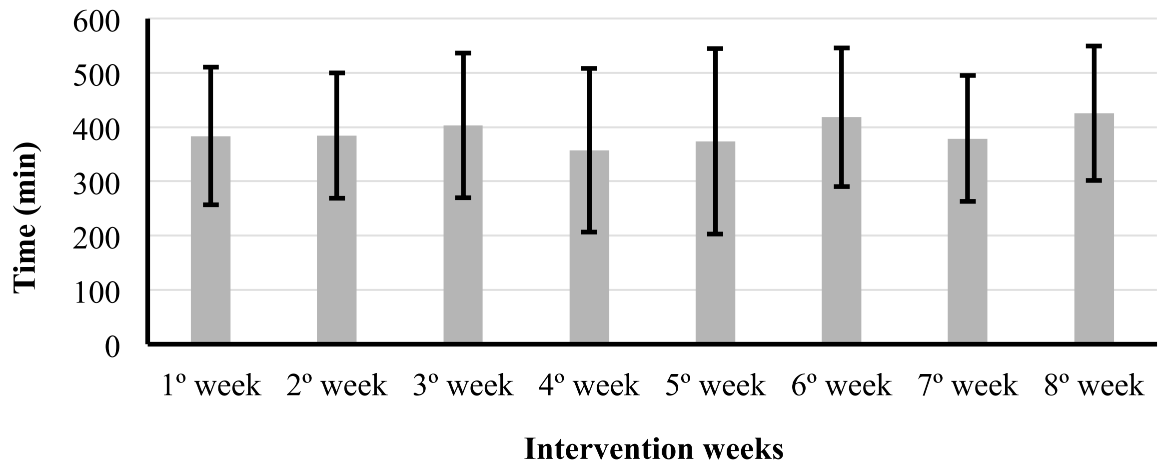

Figure 1. The elderly's weekly practice time with Nintendo Wii®
Note: Data expressed by mean and standard deviation. No significant differences ($p > 0.05$) were found by one-factor analysis of variance (ANOVA) with repeated measures
Source: The authors

For play time on Nintendo Wii®, no differences were observed during the eight intervention weeks ($p > 0.05$). Table 3 shows variables related to the baropodometry test.

Table 2. Variables related to the baropodometry test

Variables	Experimental group		Control group		Interaction
	Before	After	Before	After	Group x moment
Left forefoot (Kpa)	38.0 ± 9.7	37.2 ± 8.7	46.6 ± 9.9	46.4 ± 9.9	$p = 0.031$
Left rearfoot (Kpa)	43.2 ± 15.6	40.2 ± 16.9	47.8 ± 11.4	47.7 ± 11.4	$p > 0.05$
Right forefoot (Kpa)	36.3 ± 15.2	38.9 ± 14.0	47.7 ± 12.6	47.6 ± 12.6	$p > 0.05$
Right rearfoot (Kpa)	46.7 ± 14.7	47.1 ± 14.7	45.7 ± 9.3	45.7 ± 9.5	$p > 0.05$
Right side (Kpa)	48.0 ± 6.5	50.6 ± 5.2	47.0 ± 5.1	47.1 ± 5.2	$p > 0.05$
Left side (Kpa)	52.0 ± 6.5	43.7 ± 5.9	53.0 ± 5.1	52.9 ± 5.2	$p > 0.05$
Center of gravity (Kpa)	43.7 ± 5.9	44.33 ± 4.7	47.9 ± 7.0	48.1 ± 6.9	$p > 0.05$

Note: Data expressed by mean ± standard deviation
Source: The authors

For the left forefoot, there was difference between the two groups ($F_{1,22} = 5.25$; $p = 0.031$; $\eta^2 = 0.192$, small), with higher values for the control group compared to the experimental group ($p = 0.031$). For the other variables, no difference was found ($p = > 0.05$). Figure 2 displays the total time in minutes spent on the trail test before and after the intervention period for both groups (experimental and control).

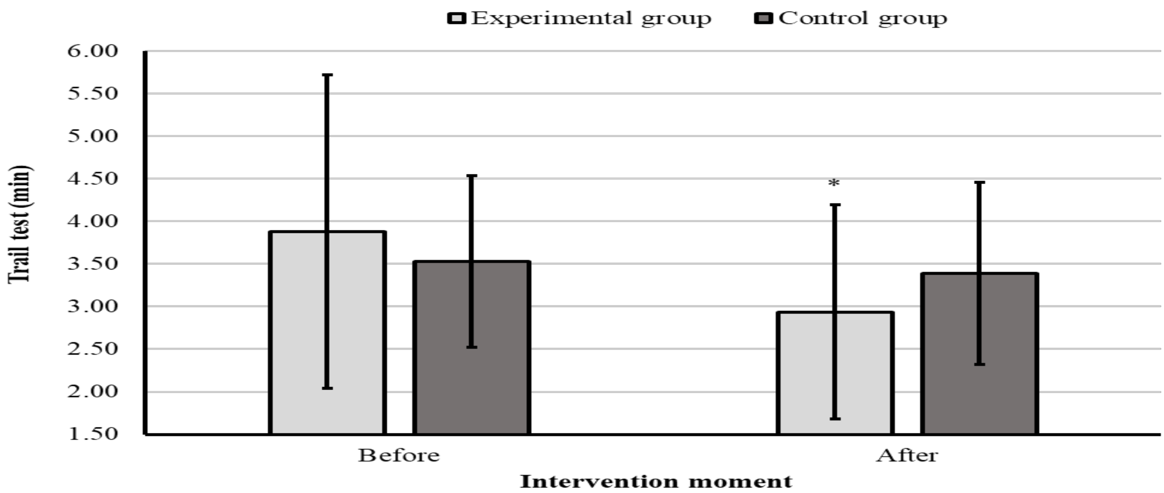

Figure 2. Total time spent on the trail test before and after the intervention period for both groups.
Note: Data expressed by mean and standard deviation; *= significant differences were observed as to time (moments before and after, which represent intra-group difference) for the experimental group, using paired *t* test ($p = 0.041$)
Source: The authors

About the trail test, neither group effects nor interaction were detected ($p > 0.05$). However, time effect was found ($F_{1,22} = 5.01$; $p = 0.035$; $\eta^2 = 0.185$, small), with higher values in the trail test before, compared to the same test after the intervention period ($p = 0.035$). On the other hand, the t test showed differences only for the experimental group ($t_{11} = 2.31$; $p = 0.041$; $d = -0.27$, trivial), with lower values after the intervention period compared to the values obtained before said period. Figure 3 presents total time in minutes spent on the Timed Up and Go test, before and after the intervention period for both groups (experimental and control).

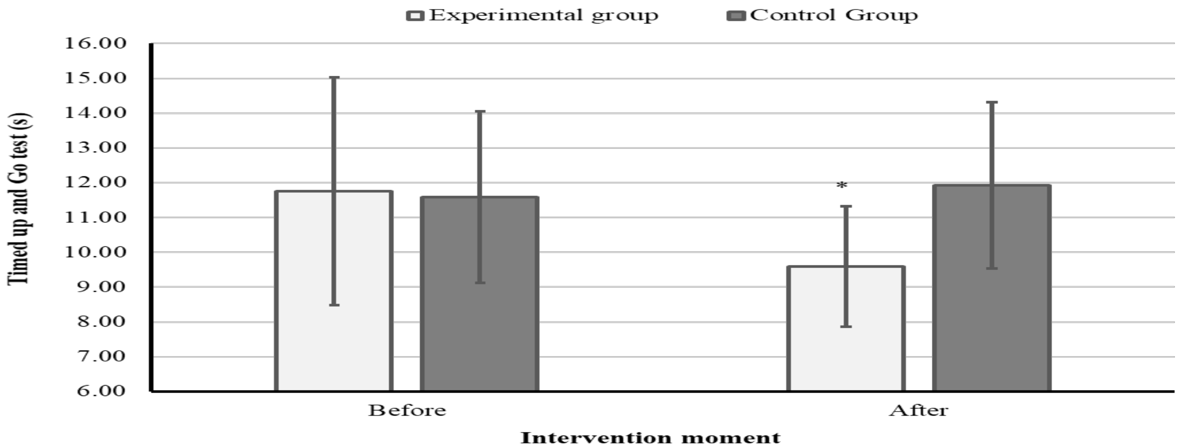

Figure 3. Total time spent on the Timed up and Go test before and after the intervention period for both groups

Note: Data expressed by mean and standard deviation; * = significant differences were observed as to time (moments before and after, which represents intra-group difference) only for the experimental group, using analysis of variance (ANOVA) tested by Bonferroni *post-hoc* ($p = 0.021$)

Source: The authors

Concerning the Timed Up and Go test, no group and time effects were identified. Nevertheless, interaction was found ($F_{1,22} = 7.09$; $p = 0.014$; $\eta^2 = 0.243$, moderate), with the Bonferroni test indicating lower values after the intervention period for the experimental group ($p = 0.021$). Table 3 brings variables related to the satisfaction with life questionnaire.

Table 3. Variables related to the satisfaction with life questionnaire

Questions	Experimental group			Control group		
	Before	After	*p* value	Before	After	*p* value
1	5 ± 2	6 ± 2	$p = 0.026$	5 ± 2	5 ± 2	$p > 0.05$
2	6 ± 2	6 ± 1	$p > 0.05$	5 ± 2	5 ± 2	$p > 0.05$
3	6 ± 2	6 ± 1	$p > 0.05$	5 ± 2	5 ± 2	$p > 0.05$
4	5 ± 1	5 ± 1	$p > 0.05$	5 ± 2	5 ± 2	$p > 0.05$
5	5 ± 2	6 ± 2	$p = 0.002$	5 ± 2	5 ± 2	$p > 0.05$

Note: Data expressed by mean ± standard deviation

Source: The authors

Only time effect was observed ($F_{1,22} = 5.65$; $p = 0.026$; $\eta^2 = 0.204$, moderate), with higher values after the intervention period, compared to values before the respective period ($p = 0.026$) for question 1 of the satisfaction with life questionnaire. On the other hand, the *t* test indicated differences only for the experimental group ($t_{11} = 2.54$; $p = 0.027$; $d = 0.32$, trivial), with higher values after the intervention period compared to the answers provided before said period. For the fifth question, group effects were not observed. However, time effect ($F_{1,22} = 5.85$; $p = 0.024$; $\eta^2 = 0.210$, moderate) and interaction effect ($F_{1,22} = 11.46$; $p = 0.002$; $\eta^2 = 0.342$, moderate) were identified, with the Bonferroni test indicating higher values for the experimental group after the intervention period, compared to the values observed before this period ($p = 0.002$). For the other questions, that is, 2, 3 and 4, no group, time or moment effects were found ($p > 0.05$).

Discussion

The main findings of this study show that: **a)** no significant differences were found as to weekly practice time during the eight intervention weeks with Nintendo Wii®; **b)** no differences were detected for the baropodometry test after the intervention period in both groups; **c)** there was significant reduction in the trail and Timed Up and Go tests after the intervention period only for the experimental group; **d)** there was significant improvement in the answers of the satisfaction with life questionnaire for questions: "*my life is close to my ideal one*" and "*if I could live my life again, I would change almost nothing*". Based on these aspects, it can be stated that, overall, the hypothesis of this study was confirmed.

Therefore, this research suggests the feasibility and effectiveness of using a video game with sedentary seniors, in their homes, with partial, controlled supervision, aiming at improving physical and cognitive aspects. Previous studies have already identified the effectiveness of virtual rehabilitation with Nintendo Wii® in the elderly to improve balance and pleasure through exercise[12,30]. Recent studies show a trend in using new technologies with the senior population[17,31], since, in modern society, the utilization of technological tools in everyday activities that the elderly perform is necessary. Corroborating with the answers of the present study, Chao et al.[19] report evidence that supports Nintendo Wii® as a safe and viable tool to encourage older adults to engage in physical activities.

As for BMI, no differences were found for both groups. The absence of differences for the experimental group may be explained by the game chosen, that is, bowling, which requires few movements and, probably, has promoted low energy expenditure during the process. However, this result was to be expected in the control group, since the elderly were sedentary. Raynor, Cardoso and Bond[16] report that video game practice with Nintendo Wii® improves physical fitness and reduces the BMI, as long as it is performed for long periods and is combined with a healthy diet, following as example points discussed in the Food Guide for the Brazilian Population[32]. For weight loss, one should consider a negative energy balance, as well as the regular practice of physical activities, or, otherwise, the lean mass may reduce, an unfavorable condition for seniors, since this deficit would increase the risk of falls[34].

Physical activity with the aid of Nintendo Wii® was performed in a self-selected way, that is, according to the interest of the participants, in the course of eight weeks of intervention. On average, time spent on physical activity was 400 minutes per week, and there was no difference within this period, a factor that indicates consistency in the Nintendo Wii® practice by the elderly.

In its turn, improved balance is a relevant variable to minimize risk of falls and, on the other hand, a decline in this variable increases significantly said risk in seniors[17]. However, there is some disagreement in the selection of protocols or scales for an effective balance assessment in older people[12,31]. The present study used baropodometry for balance assessment in the elderly, an unprecedented element, in the understanding of the authors, in this type of experimental design. Baropodometric assessment is considered an accurate and objective instrument to measure plantar pressure parameters. The absence of differences for the experimental group suggests that bowling (game used) was not effective in improving the variables observed in the baropodometry. Hypothetically, this absence may be related to the little movement and/or lack of stimuli in the lower limbs during the game.

Attention is an extremely important aspect for the cognitive functions of the elderly, as many home and outdoor accidents happen due to lack of attention[35]. Satisfactorily, the experimental group took a shorter time in the trail test. This response favors the practice of physical activity via Nintendo Wii® in seniors. Similar responses have been identified in previous studies[36,37] and reinforce the relevance of exercise, since attentional processing is higher in active seniors than in sedentary ones[38].

About the Timed Up and Go test, the elderly in the present study showed significant reductions in time spent in seconds after the intervention period. In this regard, another piece of evidenced shows a 42% reduction in time in seconds after the intervention period by using bowling for rehabilitation[31]. Thus, it is highlighted that the method employed is feasible to improve the locomotion capacity of sedentary seniors.

Considering the answers in the satisfaction with life questionnaire, Fernandes et al.[39] point out that physical activity is an important means of health promotion and quality life and brings benefits to one's physical, psychological and social life. In this circumstance, it allows the elderly to rediscover new and better ways to live autonomously and independently. Finally, it is worth noting that the utilization of video game in geriatrics and gerontology allows the elderly to exercise their cognitive functions playfully and dynamically, as well as to turn their attention away from their old-age condition, disease or inability[35,36].

Some limitations need to be highlighted: **a)** small sample size, which requires the conduction of new studies with larger groups of seniors by sex; **b)** absence of protocols to measure dynamic balance, which is fundamentally important to detect fall rates in the elderly. Therefore, the abovementioned variables in items a and b are valid to be tested in future studies. However, in order to test the effectiveness of virtual rehabilitation, periodization models should be used in order to test responses as to body composition. On the other hand, the strengths of the present study deserve to be underscored: **a)** performance of physical activity in safe places for the elderly; **b)** no evidence of injury; **c)** possibility of exercising in a pleasant way; **d)** progress in the elderly's locomotion; **e)** encouragement towards actions that improve the physical domain of quality of life.

Conclusion

The findings of this study indicate that video game intervention in sedentary seniors was efficient in improving attention, agility and satisfaction with life, and did not show changes in static balance compared to the control group. The utilization of new technologies with older people is valid, and new strategies and actions that promote the health of this population in an interdisciplinary context need to be adopted.

Video games in therapeutically environment are commonly used by health professionals. The proposal in this research was to provide the experience in homes, which can be a place to be explored by health professionals. In this context, and because the intervention proved effective, it is expected that such results can be taken into account by health professionals as a strategy for the promotion of a healthier aging, as well as to encourage the family members of seniors to propose activities combined with new technologies as a way to exercise.

Practical applications

Considering the improved functional responses and the subjective wellbeing of the elderly, future studies should seek to foment public policies to insert older people that apprehensive about new technologies. The utilization of technological recourses adapted to the reality of the elderly can be a viable instrument for the health promotion of this age group. Likewise, studies that sought to compare the effectiveness of different games could contribute satisfactorily to the biopsychosocial parameters of older people (group virtual rehabilitation). In addition, another point that is worth being investigated is the responses concerning virtual rehabilitation in seniors by employing different periodization models (periodized model vs non-periodized model).

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