Original Article

Board game for the upper limbs rehabilitation in institutionalised elderly from Portugal: a quasi-experimental pilot study

Uso de um jogo de tabuleiro na reabilitação dos membros superiores de idosos institucionalizados em Portugal: um estudo piloto quase-experimental

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ABSTRACT | INTRODUCTION: Using games as a rehabilitation strategy has significantly impacted cognitive variables in the elderly; however, its impact on physical indicators is not consensual. **OBJECTIVE:** To measure the effect of a training program with a board game on upper limb coordination and handgrip strength of institutionalized elderly. The elderly's perception of playing a board game as a rehabilitation strategy was also characterised. **MATERIALS AND METHODS:** A longitudinal quasi-experimental study was carried out, including 10 institutionalized elderly people without significant changes in cognition (6CIT 0-7) and upper limb mobility. This group was initially evaluated (T0) for handgrip strength (HGS) and coordination of the upper limbs (EUROFIT test battery), repeating the assessment after 2 weeks of conventional therapies (T1), and also again 2 weeks after attending conventional therapies plus an additional 2 hours of a board game program (T2). The perception of the elderly about their experience with the game was also collected. The evolution between T0-T1 and T1-T2 was compared using the Wilcoxon test. **RESULTS:** Only between T1 and T2 were significant changes in EUROFIT (p=0.005) and HGS for both members (p=0.005; p= 0.007). A greater relevance of game-based program for teamwork, stimulating reasoning, and agility of the upper limbs was perceived. **CONCLUSION:** The board game is a potential tool to complement conventional therapy, and the experience is well perceived by the elderly participants (ClinicalTrials.gov IDIPL10062019).

KEYWORDS: Aged. Recreation therapy. Upper extremity.

RESUMO | INTRODUÇÃO: A utilização do jogo como estratégia de reabilitação tem revelado um especial impacto nas variáveis cognitivas no idoso, não sendo consensual o seu impacto em indicadores físicos. **OBJETIVO:** Medir o efeito do treino com um jogo de tabuleiro na melhoria da coordenação dos membros superiores e na força de preensão palmar em idosos institucionalizados. Foi também caracterizada a percepção dos idosos sobre o jogo como estratégia de reabilitação. **MATERIAIS E MÉTODOS:** Foi conduzido um estudo quase-experimental, longitudinal, incluindo 10 idosos institucionalizados sem alterações significativas na cognição (6CIT 0-7) e na mobilidade dos membros superiores. Este grupo foi inicialmente avaliado (T0) quanto à Força de preensão manual (FPM) e quanto à coordenação dos membros superiores (Bateria de testes EUROFIT), repetindo a avaliação após 2 semanas de terapias convencionais (T1), tendo sido novamente reavaliados 2 semanas após frequentarem as terapias convencionais mais 2 horas adicionais de um programa com um jogo de tabuleiro (T2). Foi ainda coletada a perceção dos idosos sobre a experiência com o jogo. Foi comparada a evolução entre T0-T1 e T1-T2 usando o teste de Wilcoxon. **RESULTADOS:** Apenas entre T1 e T2 ocorreram mudanças significativas na EUROFIT (p=0.005) e na FPM para ambos os membros (p=0.005; p= 0.007). Os idosos destacaram uma maior relevância do jogo no trabalho em equipe, no estímulo de raciocínio e de agilidade dos membros superiores. **CONCLUSÃO:** O jogo de tabuleiro é uma potencial ferramenta para completar a terapia convencional, sendo a experiência considerada muito positiva pelos idosos participantes (ClinicalTrials.gov IDIPL10062019).

PALAVRAS-CHAVE: Idoso. Terapia recreativa. Membros superiores.

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Introduction

Population aging is a global reality, and Portugal stands out as one of the countries with the highest values in Europe. In 2050, Portugal is expected to be the fourth country in the European Union with the highest percentage of elderly people (25%).[1]

The aging population in Portugal is characterized by high levels of institutionalization, estimating more than 55,000 elderly people living in 1500 care centres, which represents 3.2% of elderly people.[2] To help characterize this scenario, it is important to clarify that 85% of these residents are over 75 years of age[2], which means that this is an extremely aged population. Characterization data of the elderly population in Portugal also reveal a significant incapacity of the population aged 65 and over. In this context, about 50% of this population reveals that they have much difficulty or cannot perform at least one of the activities of daily living (ADL's).[3] For example, about 14% have difficulty bathing/dressing themselves, activities that are highly dependent on the function of the upper limbs.[3]

Regular rehabilitation is beneficial to the functional abilities of the elderly, helping to maintain independence in carrying out ADL's.[4] Conventional rehabilitation processes have shown significant results in the elderly, both in strength gains and improved mobility and coordination.[5] However, promoting the adherence and motivation of this population in long rehabilitation processes is a real challenge.[6] In order to improve the level of motivation during rehabilitation, the choice of strategies should be focused on activities that promote challenge, fun, and socialization.[7] For example, it is generally agreed that rehabilitation programs increase the potential for long-term rehabilitation.[8] Games or gamification components have been accepted as an effective method to improve the elderly's motivation and adherence to rehabilitation processes.[9] Despite the popularity of digital games, board games have shown to be effective in promoting personal interactions, involving and motivating the relationship with family members, tutors, or health professionals, while learning takes place (motor, cognitive, etc.).[10]

The proper design and implementation of rehabilitation programs focused on maintaining the functionality of the upper limb in the elderly is a priority, and its management depends on the selection of appropriate monitoring indicators. For example, authors Ibrahim et al.[11] report a plan to monitor a geriatric intervention plan based on the fortnightly assessment of handgrip values in an elderly sample. Accordingly, coordination deficits are also an excellent indicator of functionality and a predictor of cognitive impairment.[12]

Despite the importance of these indicators in the functionality of elderly people, most of the studies that implemented board games in this community are focused on the impact on cognitive variables.[13-15] Moreover, there is not enough literature reporting values on the impact of this strategy on important physical indicators, such as upper limb coordination or handgrip strength, already mentioned. These indicators have been widely studied only when associated with the implementation of technological games, which are not always adjustable in terms of the cost and profile of digital literacy for all elderly people.[16] Thus, the present study proposes measuring the effect of training with a board game on the coordination of upper limbs and handgrip strength (HGS) in institutionalized elderly compared with the effect of a conventional rehabilitation program. This study considered the hypothesis that including a board game as a complementary rehabilitation strategy in the elderly would improve the variables under study. Additionally, it is intended to characterize the perception of the elderly with involvement in the game.

Materials and methods

A longitudinal quasi-experimental pilot study was performed using a convenience sample consistent with the "Standard Protocol Items: Recommendations for Interventional Trials" (SPIRIT). It belongs to a study protocol registered in the ClinicalTrials.gov platform with IDIPL10062019 on November 6, 2019. Elderly people institutionalized in a Long-Term Care (LTC) facility located in the central region of Portugal (city of Coimbra) were invited to participate in this study.

After explaining the procedures, elderly people who (i) accepted to participate in the study, (ii) had a score of 0-7 on the Six-item Cognitive Impairment Test (6CIT), and (iii) had preservation of upper limbs mobility (allowing horizontal reach and the simple manipulation of a cup) were considered eligible. Individuals with severe vision impairment were excluded. The necessary procedures to guarantee anonymity, privacy, data confidentiality, and obtaining informed consent and voluntary participation in the study were ensured. The institution's administration approved this study in a proper meeting.

Procedures

The evaluation of all participants was performed by a single researcher with a physiotherapist background, previously trained to implement the selected instruments. Participants were assessed on a baseline moment (T0), followed by a reassessment after two weeks of conventional treatments (T1) (Table 1). For the next two weeks, during 2 hours a week, participants had access to a board game entitled Board Game TA!TI!. This Game was implemented as a complementary strategy to conventional treatments. The game-based protocol consists of 2-hours per week, played in pairs (2 players at a time) based on reasoning established by a multidisciplinary team (Physiotherapist, Occupational Therapist, and Psychomotor Therapist). In part, the time spent on Board Game TA!TI! was adapted to each pair's difficulties and motivation (Table 2). By the end of this period, all participants were reassessed (T2). Conventional treatments and the execution plan of the Game are respectively described in tables 1 and 2. The implementation process occurred from March to May 2021.

Table 1. Description of participants' conventional treatments program from T0 to T2

Conventional Treatments (T0-T2)			
Description	Individual/Group	Time per session	Weekly frequency
Physiotherapy	Individual	45	3
Balance and gait training	Individual	20	3
Mobility class	Group	45	2
Outdoor walk	Group	60	1
Artistic expression	Group	60	1
Bingo	Group	20	1
Sensorial stimulation	Individual	20	2

Source: The authors (2021).

The board game used in this study (Board Game TA!TI!) was specifically developed for upper limb coordination and rhythm, including training with multiple cognitive stimuli. This game was chosen based on its previous results as a performance measure for upper limbs.[17] It includes a board, a deck of cards for the Simple Game (to play with a single hand), a deck of cards for the Double Game (to play with both hands simultaneously), one dice for the Simple Game planning, cards for the Double Game planning, one bell, and two cups. The board must be placed on a table centered with the player's trunk to play this game. The evaluator chooses a dice's face to determine the sound the elderly must pronounce on each cup's position. A 5-card set with different symbols and different cup positions is presented. (Image 1).

Image 1. Board Game TA!TI! components for the unilateral challenge

Source: The authors (2021).

Initially, the player interacted with the Game through a single hand play. However, previous training was performed to allow the elderly to understand the Game's dynamic and rules. As a result, the Game was always performed by two players. The cards give information about the symbols the player must search for on the board and interact with by placing the cup on them. The cup should be in the position that is assigned in each play (faced up or faced down). At the same time, the player must pronounce the sound determined by the dice (TA, TI, SHIU).

The elderly also trained the bilateral challenge. The previous procedure was repeated but used the cards for the Double Game, in which the players must use both hands and 2 cups. Their positions are determined by the Double Game's planning cards (Image 2).

Image 2. Board Game TA!TI! components for the Bilateral Challenge

Source: The authors (2021).

Table 2. Game-based program's description fromT1 to T2 – using Board Game TA!TI!

Board Game TA!TI! **(T1-T2)**				
Pairs	Week 1 (min/ss)		Week 2 (min/ss)	
	Unilateral Challenge	Bilateral Challenge	Unilateral Challenge	Bilateral Challenge
P1+P2	60 30	30	60	60
P3+P4	30 30 30	30	30 30	30 30
P5+P6	45 45	30	60	60
P7+P8	60 30	30	60	60
P9+P10	60 30	30	60	60

Source: The authors (2021).

Assessment Protocol

Different instruments were implemented during the present study, but the sociodemographic data questionnaire was only implemented at T0 and evaluated the elderly's perception during Board Game TA!TI! at T2. The cognitive assessment, upper limb coordination, and handgrip strength were repeated at T0, T1, and T2.

Sociodemographic Data Questionnaire – Sociodemographic information was collected regarding age (open answer); gender (female or male); marital status (single, married, widowed, divorced/separated, or stable union); education level (does not know how to read/write, knows how to read and with no education degree, primary school, elementary school, secondary school, high school, or higher education).

Cognitive Assessment – The 6CIT was implemented for the participants' cognitive assessment. 6CIT is considered a sensitive and valid test for diagnosing and tracking cognitive changes in the elderly, showing a higher sensitivity level when compared to the Mini-Mental State Examination.[18] The test consists of 6 simple questions that address domains such as temporal localization (year, month, and day), memorization of 5 items (name and address), ability to verbalize countdown (20 to 1), and reversible naming of the months of the year (December to January). In addition, it assesses orientation, learning, memory, and calculation.[19] The Portuguese version of this test showed good internal consistency and reproducibility.[20] The score of this instrument is inversely assigned, and the questions are weighted. Therefore, the results can vary from 0 to 28. Scores from 0-7 indicate no cognitive changes, while scores equal to or higher than eight are related to cognitive impairment.

Upper limbs coordination assessment – Upper limbs coordination assessment was achieved using the Plate Tapping test. This test is part of the EUROFIT Physical Fitness Test Battery.[21] Two paper discs measuring 20 cm in diameter each and fixed horizontally at 60 cm (their centers are 80 cm apart), and a 10 x 20 cm rectangular paper plate located between the two discs were placed on the table to operationalize this test. The height of the table had to be adjusted to everyone's height (it must be at the same height as the individual's umbilical region). For the assessment, the subject is instructed to stand in front of the table with his feet slightly apart. He must place one of his hands (the one he prefers) in the center of the plate and make a back-and-forth movement as fast as possible between the two discs with the other hand, passing over the hand fixed on the plate. At the "Ready... Go!" command of the examiner, the subject must quickly perform 25 cycles, tapping both discs without stopping before the examiner's "Halt!" command. The examiner counts aloud the number of cycles performed.

The test must be performed three times, and the best result is registered. Some rules are crucial for the test to have adequate performance, mainly: the hand placed on the rectangular plate must remain in the same position during the entire test, and the subject must effectively touch the two discs on each cycle. If a disc is not touched, a supplementary tap must be added to reach the required 25 cycles (a total of 50 taps on the discs). The time taken to complete the 25 cycles is recorded in decimal seconds, representing the final score.[21]

Hand Grip Strength

- Handgrip strength (kg/F) is an important functionality biomarker in the elderly.[22] It was measured using the Kern Map dynamometer (1.2 version) and consisted in the implementation of a standard methodology: the elderly should remain in a sitting position with his feet flat on the floor, and his tested upper limb with the elbow flexed at 90°, shoulder in adduction, and forearm in a neutral position. For everyone, three maximum grips were performed with a 5-second duration. The best performance was registered, and results were collected for both hands.

Elderly's perception of the Board Game TA!TI! evaluation – Due to the importance of self-report measures[23], the authors of this study developed a brief list of criteria that they consider to be most relevant to evaluate the elderly's perception of the Board Game TA!TI! regarding the domains it covers. At the time of the final assessment (T2), the participants assessed six statements about their perception of the experience, namely the skills they trained (e.g., important activities for my health, important activities for my emotional well-being), their difficulties (e.g., I am able to identify activities in which I felt more capable), and the importance of this type of activities (e.g., I felt that I trained my arms' agility). Each statement was assigned a score from 0 ("I don't agree") to 5 ("I totally agree"). This kind of assessment is a way to monitor the quality and involvement of players in these activities.

Statistics Analysis

At first, participants were characterized regarding their sociodemographic variables, using frequency and percentage values. Mean values and standard deviations (x±SD) were also calculated for the cognitive characterization variables (6CIT) and the elderly's perception during the questions. Then, to analyze the upper limbs' coordination and the handgrip strength's evolution between T0 and T1 and between T1 and T2, the magnitude of differences was calculated, and the statistical difference was tested using the Wilcoxon Test ($p<0.05$).

Results

Twenty-three elderly people were eligible for the study, as they met the inclusion criteria. However, from the entire eligible sample, only ten elderly people were included, namely, those that confirmed by an interview that the involvement in the study did not limit them from participating in other important activities in the community or institution. From the entire group (n=10) of elderly included, all completed follow-up throughout the study.

Sociodemographic and cognitive characterization

The sample of this study consists of 10 elderly participants, of which nine are female. Most subjects are widowed (70.0%) and know how to read and write without formal education (40.0%) or have completed basic primary education (40.0%) (Table 3). The age ranges between 81 and 92 years, with a mean age of 86.70 ± 3.43 years.

Table 3. Sample caracterisation in terms of gender, marital status, and formal education

		Frequency	Percentage (%)
Gender	Female	9	90.0
	Male	1	10.0
Marital Status	Married	1	10.0
	Widowed	7	70.0
	Divorced	2	20.0
Formal Education	Basic primary education	4	40.0
	Read and write without formal education	4	40.0
	High school	2	20.0

Source: The authors (2021).

The total score on the 6CIT is 4.00 ± 2.49 for the participants. According to the predicted inclusion/exclusion criteria, these results represent a specific profile of cognitive functioning. Items 5 and 6 (attention and memory) demonstrated more errors (Table 4).

Table 4. 6CIT: total score e score per item, per participant, mean and standard deviation values

6CIT Item	1	2	3	4	5	6	Total
P 1	4	0	0	0	0	0	4
P 2	4	0	0	0	2	0	6
P 3	0	0	0	0	0	6	6
P 4	0	0	0	0	4	2	6
P 5	0	0	0	0	0	0	0
P 6	0	0	0	0	2	0	2
P 7	0	0	0	0	2	4	6
P 8	0	0	0	0	2	4	6
P 9	0	0	0	0	0	0	0
P 10	0	0	0	0	4	0	4
x ± DP							4.00 ± 2.49

Source: The authors (2021).

Evolution in the coordination of the upper limbs

The results in the EUROFIT battery demonstrated that there are no significant differences in the upper limb coordination during the conventional treatment period (T1-T0). By comparison, only when the Board Game TA!TI! was added to the conventional treatment (T2-T1), there were statistically significant improvements ($p < 0.01$) in the battery execution speed (Table 5; Graph 1).

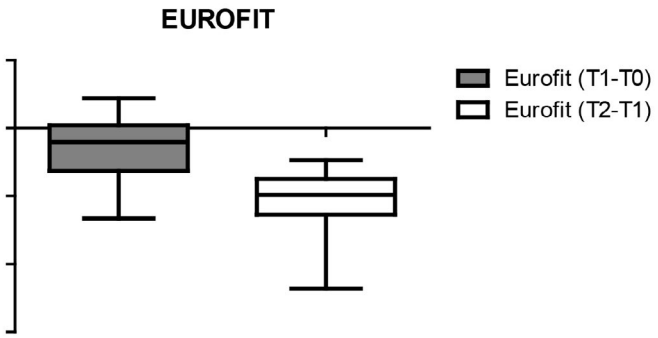
Table 5. Characterization and comparison of the evolution in the EUROFIT battery results between T0 and T1 (Conventional Treatment) and between T1 and T2 (Conventional Treatment and Board Game TA!TI!)

EUROFIT	T0	T1	T2	T1-T0 Conventional Treatment	T2-T1 Conventional Treatment+Board Game TA!TI!
P1	321	322	247	+001	-75
P2	601	501	409	-100	-92
P3	813	680	444	-133	-236
P4	431	445	398	+014	-47
P5	568	544	446	-024	-98
P6	605	554	441	-051	-113
P7	1167	1211	1043	+044	-168
P8	494	494	380	000	-114
P9	322	297	224	-025	-73
P10	418	401	302	-017	-99
p-value				0.11	0.005**

Wilcoxon Signed Ranks Test; *p<0.05; ** p<0.01.

Source: The authors (2021).

Graph 1. Comparison of the evolution in the EUROFIT battery results between T0 and T1 (Conventional Treatment) and between T1 and T2 (Conventional Treatment and Board Game TA!TI)

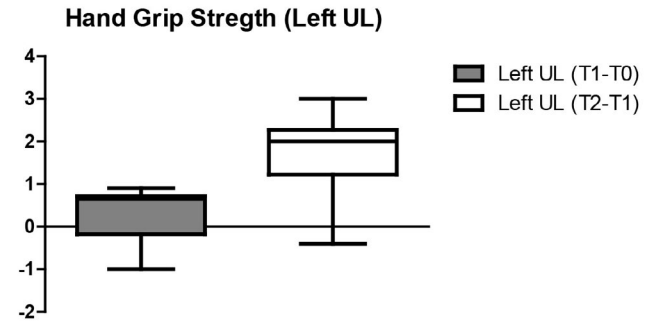


Source: The authors (2021).

Evolution of Hand Grip Strength

Analyzing the effect of the conventional treatment (T1-T0), the HGS results do not show statistically significant changes in any of the upper limbs. However, comparing these data with data related to the period of time in which the elderly participated in conventional treatment and in a game-based TA!TI! protocol (T2-T1), statistically significant differences were found for the right upper limb ($p < 0.01$) and for the left upper limb in 90% of the participants ($p < 0.01$) (Table 6; Graphs 2 and 3).

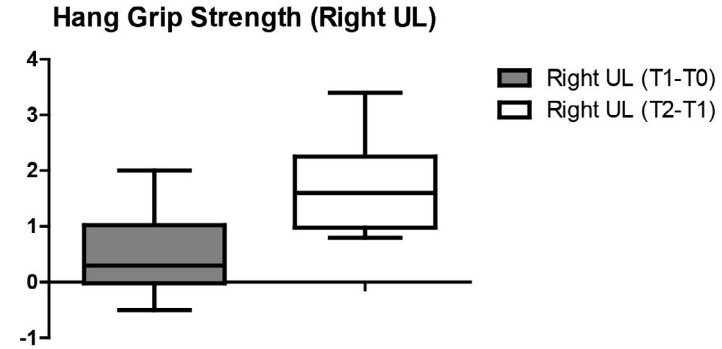
Graph 2. Comparison of the evolution in the handgrip strength between T0 and T1 (Conventional Treatment) and between T1 and T2 (Conventional Treatment and Board Game TA!TI!i), in the Left Upper Limb. – the scale of the figure must match the FPM values



UL, Upper Limb

Source: The authors (2021).

Graph 3. Comparison of the evolution in theof handgrip strength between T0 and T1 (Conventional Treatment) and between T1 and T2 (Conventional Treatment and Board Game TA!TI!), in the Right Upper Limb



UL, Upper Limb

Source: The authors (2021).

Table 6. Characterization of the evolution in the handgrip strength between T0 and T1 (Conventional Treatment) and between T1 and T2 (Conventional Treatment and Board Game)

Hand Grip Strength	T0		T1		T2		T1-T0 Conventional Treatment		T2-T1 Conventional Treatment+ Board Game	
	RUL	LUL	RUL	LUL	RUL	LUL	RUL	LUL	RUL	LUL
P1	17,4	15,7	17,9	16,5	21,3	18,4	0,5	0,8	3,4	1,9
P2	14,7	9,6	14,7	10,2	15,6	11,2	0.0	0,6	0,9	1
P3	15,4	17,1	15,3	16,7	17,7	18,0	-0,1	-0,4	2,4	1,3
P4	9,4	6,0	9,4	5,9	10,4	8,1	0	-0,1	1	2,2
P5	15,1	15,6	16,5	16,0	17,5	18,1	1,4	0,4	1	2,1
P6	11,2	7,5	12,1	8,2	13,4	11,2	0,9	0,7	1,3	3
P7	5,5	5,5	5,6	6,2	6,4	5,8	0,1	0,7	0,8	-0,4
P8	12,5	12,8	13,2	13,7	15,2	15,8	0,7	0,9	2	2,1
P9	20,0	16,2	19,5	15,2	21,7	17,7	-0,5	-1	2,2	2,5
P10	19,5	15,5	21,5	16,2	23,4	17,6	2	0,7	1,9	1,4
p-value							0.07	0.15	0.005**	0.007**

Wilcoxon Signed Ranks Test; *p<0.05; ** p<0.01.

LUL, Left Upper Limb

RUL, Right Upper Limb

Source: The authors (2021).

Elderly's perception about the experience with Board Game TA!TI!

The highest mean values were identified in questions about the importance of: playing in a group (4.0±0.83), playing to work reasoning and thinking (4.4 ±0.49) and playing to train the agility of the upper limbs (4.1±0.83) and activities important to my health (4.0±0.77).

Table 7. Elderly's perception about the experience with the TA!TI! Board Game

	Important activities for my health	Important activities for my emotional well-being	I can identify activities in which i felt more capable	I felt that i worked on my reasoning and thinking skills.	I felt that i worked the agility of my arms	I realized the importance of playing in a group
P1	4	5	3	4	4	5
P2	4	2	4	5	5	3
P3	4	3	3	5	5	4
P4	3	2	0	4	3	4
P5	3	1	1	4	3	3
P6	5	4	4	5	5	5
P7	3	3	0	4	3	3
P8	5	3	3	4	4	4
P9	4	3	0	4	4	5
P10	5	3	4	5	5	5
Mean	4.00	2,90	2,20	4,40	4,10	4.00
Standard deviation	0,77	1,04	1,66	0,49	0,83	0,83

Source: The authors (2021).

Discussion

Data from this pilot study seem to corroborate the potential of a board game as a complementary strategy to conventional treatment for training upper limb coordination and HGS in institutionalized elderly.

Considering the results from the present study, there were no statistically significant changes in the speed of execution of the EUROFIT physical tests battery touch test on the discs and in the handgrip strength values during the period in which the elderly participants were only doing the conventional treatment. However, statistically, significant improvements were found in the combination of conventional treatment with the TA!TI! Board Game. Data obtained with the implementation of board games as an additional strategy to conventional rehabilitation seem to indicate the game's potential as a complement to the rehabilitation in the elderly, specifically to improve the function of the upper limbs. The game's potential benefits in the function of the upper limbs demonstrated in the present study seem to be in accordance with data already reported by several previous studies, specifically those focused on the use of digital games, virtual reality, and gametherapy. For example, in the study conducted by Sánchez-Herrera-Baeza et al.[24], the authors included 6 participants with Parkinson's disease, aged 69 to 80 years.

During this study, participants attended sessions with four serious games (games that associate their playful component, considering a serious purpose) to improve the upper limb function. After 18 sessions of 30 minutes each, improvements in handgrip strength and coordination, and speed of the upper limbs were observed. Some participants improved in performance during ADLs', such as eating, handling utensils, and buying food.[24]

In another study conducted by Ma e Bechkoum[25], eight participants with a clinical diagnosis of cerebrovascular accident were included. Participants were divided into two groups: one group received functional treatment, using virtual reality, combined with serious games; the other group received only functional treatment, using virtual reality. After ten sessions, all participants had significant improvements in upper limb strength, coordination, dexterity, and functionality. However, the treatment in the first group was demonstrated to be more effective, having a greater impact on the recovery of the functionality of the upper limbs.[25] This positive effect of digital games on the stimulation of upper limb function in elderly people was also demonstrated by a meta-analysis (61 studies) that includes a methodology of comparison with studies that use conventional treatments.[26] In all the articles mentioned, there is no detailed description of the strategies used in the conventional treatment, and the variability of time and frequency of an intervention is very high (30min/day – 5h/day; 4 – 12 weeks). In a global analysis of the intensity and frequency factor, the present study presents a 2h/week game implementation protocol for only two weeks. Thus, the present investigation shows good results with implementing the board game at much lower intensity levels than most digital games included in the meta-analysis conducted by Tãut et al.[26] The lack of studies focused on the use of board games compared with the diversity of studies that use digital games make a comparison between results difficult. Currently, most of the related studies explore the benefit of using games on independence in activities of daily living (ADL's).[24-26] Future studies on the implementation of board games might include the improvement in upper limb coordination and handgrip strength and its relationship with the daily functionality of the elderly.

In the present study, the elderly's perceptions about the game experience demonstrated to be more important for criteria such as playing in a group (4.0±0.83), playing to work reasoning, and thinking (4.4 ±0.49), playing to train the upper limbs' agility (4.1±0.83), considering it still an important activity for health (4.0±0.77). According to Barbosa et al.[27], factors such as socialization with other people and the possibility of performing mental exercise associated with physical exercise, e.g., interventions with serious games, are important motivations for the elderly, increasing the adherence to a specific program. In a narrative review about the importance of designing physical therapy sessions in a playful context, the authors Barbosa et al.[27] explain the contribution of these approaches to improve elderly adherence to treatments and the functional gains in the geriatric rehabilitation process. For elderly people in an institutional context, implementing these tools can help improve personal interactions and can be described as an adequate context to generate cooperation between residents, particularly among those with greater asymmetry in their functional profiles, allowing them to adapt to group dynamics.[28]

In the analysis of each couple of players considered in the present study, some asymmetries in the cognitive profile were perceived (for example, between P9 and P10). However, the experience with the game was still perceived as very positive by both players. This may indicate the benefit of board games as a context conducive to positive involvement in group tasks, even in elderly people with different levels of disability.

Considering the potential of the board game as a tool to stimulate coordination of upper limbs and handgrip strength in the institutionalized elderly population and a positive and motivating experience for the participants, some important methodological limitations to this study should be considered. The choice of a quasi-experimental study design allowed researchers to understand one action after another in the same group, without control (such as conventional physiotherapy in the first moment and then physiotherapy plus the board game in the second moment). However, it is important to understand that strength and coordination are skills that can be improved with repetition and time. In the absence of a methodology with a control group and randomization, the control of an equal period between T0-T1 and T1-T2 is considered an advantage, which nevertheless allowed us to conclude that the evolution of the variables under study between the two periods was distinct. The sample under study is not very representative of the characteristics of the geriatric population, and both regarding the small number of elderly people included and the context in which they are found (institutionalized elderly). However, the sample size suits a pilot study design.

As previously discussed, functional independence measures were not included, which prevents us from concluding the clinical relevance of the game in parameters such as independence in performing ADLs. It is also important to consider the limitation in the design of the scale for evaluating the perceptions of the elderly about the interaction with the board game. This scale only considers positive statements, which may not allow for an actual level of advised reflection. Finally, there was no time window in this study between conventional therapy and conventional therapy combined with the board game. Altogether, these limitations should be the target of improved methodological design in future investigations in this area.

Despite the positive results demonstrated in this study, more research on this topic is needed, including broader and more heterogeneous samples, including community subjects and groups of elderly people with cognitive decline and/or deterioration.

Conclusion

This exploratory study confirms the potential of board games as a geriatric stimulation tool to improve upper limb coordination and handgrip strength, being a well perceived experience by the elderly participants.

Authors' contributions

Marinho R participated in sample recruitment, implementation of the rehabilitation program, and data collection throughout the study. Rosa MN participated in the design of the study methodology, data reduction and statistical analysis of the data, and the scientific writing of the document. Gordo S participated in the writing and review of the article's scientific message. Pocinho R participated in the methodology design and the scientific writing of this article.

Competing interests

No financial, legal, or political conflicts involving third parties (government, companies, and private foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to grants and funding, advisory board participation, study design, preparation manuscript, statistical analysis, etc.).

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