



Protocol

Efficacy of the Use of Exergames in Promoting the Mental Health of the Elderly: Protocol of a Systematic Review

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Abstract: Background: Scientific and technological advancements have significantly impacted our daily lives, and it is not easy to imagine living without their benefits. However, elderly individuals may experience limited access to these resources, impeding their autonomy. To address this, the use of exergames has been proposed to promote the mental health and socialization of older people. This study aims to systematically review the effectiveness of exergames in promoting older people's mental health and socialization. Methods: The Joanna Briggs Institute's recommended methodology will be used for a systematic review. Databases relevant to the research topic, such as those regarding gerontologic care, aged rehabilitation, geriatric games, video games, play and playthings, mental health, anxiety, depression, stress, and physiological factors, will be searched for experimental and quasi-experimental studies, as well as randomized studies with and without control groups. Results: The systematic literature review will synthesize findings on the effectiveness of exergames in promoting mental health and socialization in the elderly population. Conclusions: Exergames may have the potential to effectively improve the mental health and socialization of the elderly population. Identifying which exergames are most effective for these purposes is important to inform the provision of healthcare to this population.

Keywords: gerontologic care; aged rehabilitation; geriatric games; video games; play and playthings; mental health; anxiety; depression; stress; physiological



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1. Introduction

Games have a strong presence in people's lives today due to scientific advances and their attractiveness to players. This resource has proven to be an innovative strategy, particularly in the health area, increasing a growing interest in research in this context. This can be seen in many systems and applications that benefit from the fun, motivating, and enjoyable experience games provide, which can enable health interventions through technology [1].

Games can be categorized as competitive, cooperative, and collaborative. Cooperative and collaborative games promote socialization among players, as both players work together to achieve mutual benefits [2]. Over the last decade, there has been a significant increase in the use of exergames. This surge in popularity may be attributed to the improved accessibility of this technology, which was previously inaccessible to many [3]. This

can be attributed to the availability and ease of access to active video games for home use, such as PlayStation Move[®] (Sony Corp, Tokyo, Japan), Kinect[®] (Microsoft, Redmond, WA, USA), and Wii[®] (Nintendo Co., Ltd., Kyoto, Japan) [4]. Exergames provide users with an interactive environment that combines physical exercise with cognitive activities, allowing players to move and interact with avatars in a virtual world. This movement activity can be performed individually or in teams, with online connections enabling remote play [3]. While initially designed for recreational purposes, the growing popularity of exergames has piqued the interest of researchers who have evaluated their impact in various contexts and with different groups, including people with neurodegenerative, orthopedic, and neurological diseases.

Exergames are now widely recognized as an effective health intervention in all age groups, particularly among older people, due to their physical, mental [5], and social benefits. Exergames have been demonstrated to improve cognitive functions, visual motor skills, and motor functionality [6,7], particularly executive functioning, which can help prevent falls and promote autonomy in older people, improving their quality of life [2,5,8]. As mentioned before, this type of game can encourage physical activity, which is particularly important for older people, who may face some physical limitations, especially in mobility and balance, which can have positive implications for mental health [9]. Additionally, exergames can also be beneficial in promoting cognition in older adults, including memory, attention, and reasoning [10]. This type of game helps to reduce the possibility of experiencing loneliness and social isolation, as in this type of game, older adults interact with other people, which is positive for their mental health [11]. Immersed in this social environment, exergames can be a fun and enjoyable way to promote mood and self-esteem and reduce stress in older adults [12].

Additionally, exergames offer a fun and motivating experience that is easily accessible, making them a convenient and cost-effective intervention for participants [5,13]. Exergames can overcome traditional games' limitations, such as security concerns, time constraints, and user demotivation.

This proposed systematic review protocol aims to contribute to the existing literature on exergames and older adults, with a specific focus on the potential cognitive and socialization benefits of exergames for this population. By conducting this review, we intend to enhance our understanding of the subject and fill any gaps in current research. While previous studies have examined the effects of exergames on mental health in older adults, few have specifically explored their potential cognitive, emotional management, and socialization benefits. Our future review will go beyond previous research by synthesizing evidence from randomized clinical trials and observational studies, providing a comprehensive overview of current knowledge on this topic. Finally, the protocol for this review aims to help fill the gap in our understanding of how exergames can be used to improve cognitive, emotional management, and socialization function and highlight the potential benefits of integrating exergames into interventions aimed at promoting healthy mental ageing.

The existence of evidence suggests that cognitive stimulation, emotional management, and socialization are three key areas that can benefit older adults' health and well-being through exergame use. This protocol for a systematic review focuses on these elements because they have been identified as important factors in promoting successful ageing and maintaining autonomy in older adults. By examining the effects of exergames on these specific areas, we hope to gain a more comprehensive understanding of the potential benefits of exergames for older adults. This protocol is part of a research project that aims to determine the effectiveness of exergames in promoting the autonomy of elderly individuals for potential implementation in clinical practice. The project includes two protocols: Protocol 1, which focuses on identifying exergames that are effective in physical training, and Protocol 2, which aims to determine the effectiveness of exergames in promoting mental health among elderly individuals. In Protocol 2, all types of exergames will be included, as the aim is to evaluate the effectiveness of exergames in cognitive stimulation, emotional

management capacity, and socialization, which were not considered in Protocol 1. As both protocols involve systematic reviews of the literature, clear objectives have been established to ensure that the results are not confusing or unclear. Such clear objectives are necessary for obtaining more reliable conclusions.

With regard to their research focus, Protocol 1 is geared towards identifying the effects of Wii games on physical training among elderly individuals [14]. Protocol 2, conversely, is centered around determining the effectiveness of exergames in promoting the mental health and socialization of older people. Although both protocols are interested in exergames, they have different desired outcomes.

In terms of their search terms, Protocol 1 employs keywords related to physical activity and rehabilitation, whereas Protocol 2 employs terms related to mental health and socialization. This distinction in search terms reflects each protocol's varying outcomes of interest. Based on these results, an intervention plan will be developed aiming to promote autonomy among older people using exergames. This study will be a randomized controlled trial.

Exergames have been found to improve cognitive ability and emotional creativity in mental health [15,16], as well as memory, attention, reaction time, emotional well-being, self-esteem [17], psychosocial capacity, and sleep quality [2,18,19]. Given these benefits, this systematic review proposed in this protocol aims to identify the effectiveness of exergames in promoting mental health by examining the available scientific evidence. The following research questions will be addressed:

- (a) What is the effectiveness of exergames in cognitive stimulation, emotional management capacity, and socialization of older people?
- (b) What games promote cognitive stimulation, emotional management capacity, and socialization of the elderly?
- (c) How long and how often are these games effective for cognitive stimulation, emotional management training, and socialization of older people?

2. Materials and Methods

The methodology of the search and data extraction has been reported in a previously published review protocol [8], written by the authors and is detailed again below:

2.1. Inclusion Criteria

2.1.1. Types of Participants

The proposed review will focus on studies involving older adults, precisely those aged 60 or older. A cut-off age of 60 years old was selected, which is consistent with the World Health Organization's definition of "older adult" and is commonly used in gerontology research [20]. This age range is also supported by previous studies as the age at which individuals begin to experience age-related declines in physical and cognitive function. By focusing on this age group, our review aims to provide a targeted and relevant analysis of exergames for older adults.

2.1.2. Types of Intervention(s)

The review will include studies that implement the use of exergames for mental health promotion. Mental health is defined as a state of well-being in which an individual can cope with the everyday stresses of life, work productively, and contribute to their community. Exergames have the potential to promote mental health by providing cognitive stimulation, emotional management, and socialization, which are key elements of mental well-being. In terms of interventions, we will include studies that use exergames as the primary intervention for promoting mental health in older adults.

2.1.3. Type of Comparator

The review will consider the use of different exergames that address their effectiveness in promoting the mental health of older people and a comparison between the applicability of exergames with another type of intervention.

2.1.4. Type of Outcomes

The review will consider studies that measure the following outcomes using valid and reliable instruments: cognitive ability, emotional creativity, memory, attention, reaction time, emotional well-being, self-esteem, psychosocial capacity, and sleep quality.

The review will consider studies that measure outcomes using valid and reliable instruments. The primary outcomes of interest are as follows:

Cognitive ability: the capacity to learn, reason, and understand information, as well as to solve problems and make decisions.

Emotional creativity: the ability to generate and express novel and appropriate emotions in response to different situations and to regulate and manage one's own emotional experiences and responses.

Memory: the ability to acquire, store, and retrieve information over time

Attention: the ability to focus and sustain one's cognitive resources on a specific task or stimulus, while inhibiting distractions and irrelevant information.

Reaction time: the speed at which an individual can respond to a stimulus, typically measured by the time between the presentation of a stimulus and the initiation of a response.

In addition, we are also interested in the following outcomes:

Emotional well-being: the subjective experience of positive emotions, life satisfaction, and purpose in life, as well as the absence of negative emotions and psychological distress.

Self-esteem: the evaluative and affective component of one's self-concept, including feelings of self-worth, competence, and adequacy.

Psychosocial capacity: the ability to engage in social interactions and relationships, as well as to cope with stress, adapt to changing environments, and maintain a sense of meaning and purpose in life.

Sleep quality: the subjective and objective characteristics of sleep, including the duration, efficiency, and continuity of sleep, as well as the presence of sleep disturbances and disorders.

These outcomes were selected based on their relevance to the research question and their potential to provide insight into the relationship between the use of exergames for mental health promotion.

2.1.5. Types of Studies

The proposed systematic review will consider experimental and quasi-experimental studies, including randomized studies with and without a control group, with pre-and post-assessment.

No time limit will be considered. Articles written in English, Portuguese, Spanish, and French will be contemplated for inclusion in this study.

2.2. Search Strategy

The research strategy implemented will aim to identify published studies. A three-stage search strategy will be used in this literature review. Initially, the search was limited to MEDLINE (via PubMed), the Cochrane Database, Prospero, DARE databases, and JBI Evidence Synthesis to ensure that no similar recent research reports exist on the research topic. Relevant keywords were obtained by reading the article's title, abstract, and indexed terms identified in the first search. These keywords were used to develop the current search strategy for the relevant databases, which was adapted according to the specificity of each database included. This constitutes the second review phase, as shown in Table 1.

The search strategy was developed by two reviewers and reviewed by the other authors, following the Peer Review of Electronic Search Strategies (PRESS) checklist.

Table 1. Database search strategy and results.

<p>Database: CINAHL Complete (via EBSCO) Filters: English, Portuguese, Spanish, French, excluding MEDLINE Results: 252 Search strategy (23 August 2022) (((MH Mental Health OR MH Mental Health Recovery OR MH Anxiety OR MH Depression OR MH Stress, Physiological OR TI Mental OR AB Mental OR TI Mental Health OR AB Mental Health OR TI Mental Health Recovery OR AB Mental Health Recovery) OR (TI Mental Health OR AB Mental Health Recovery OR TI Anxiety OR AB Anxiety OR TI Anxiety Disorder OR AB Anxiety Disorder OR TI Depression OR AB Depression OR TI Depressive Disorder OR AB Depressive Disorder OR TI Stress OR AB Stress) OR (TI Mental Health Treatment OR AB Mental Health Treatment OR TI Rehabilitation, Psychosocial OR AB Rehabilitation, Psychosocial OR TI Mental age OR AB Mental age OR TI Mental depression OR AB Mental depression OR TI Anxiety in old age OR AB Anxiety in old age OR TI Emotional OR AB Emotional) AND MH Aged OR MH Rehabilitation, Geriatric OR MH (Aged, 80 and Over) OR MH Gerontologic Care OR TI Aged OR AB Aged OR TI Geriatric OR AB Geriatric OR TI (Aged, 80 and Over) OR AB (Aged, 80 and Over)) OR (TI Geriatric Psychiatry OR AB Geriatric Psychiatry OR TI (Aged, 80 and Over) OR AB Gerontologic Care OR TI Gerontologic OR AB Gerontologic OR TI Gerontologic Care OR AB Gerontologic Care OR TI OLDER people OR AB OLDER people) OR TI OLDER patients OR AB OLDER patients OR TI ELDER care OR AB ELDER care OR TI AGING OR AB AGING OR TI GERONTOLOGY OR AB GERONTOLOGY OR TI OLD age OR AB OLD age OR TI ACTIVE aging OR AB ACTIVE aging OR TI OLDER people physiology OR AB OLDER people physiology OR TI Seniors OR AB Seniors OR TI Old people OR AB Old people OR TI Elderly OR AB Elderly OR TI senior citizen OR AB senior citizen OR TI old person OR AB old person OR TI older adults OR AB older adults OR TI Frail Elderly OR AB Frail Elderly) AND (TI SPORTS in video games OR AB SPORTS in video games OR TI NINTENDO Wii Fit games OR AB NINTENDO Wii Fit games OR TI NINTENDO Wii video games OR AB NINTENDO Wii video games OR TI WII Fit games OR AB WII Fit games OR TI VIDEO game consoles OR AB VIDEO game consoles AND TI Kinect OR AB Kinect OR TI Nintendo wii OR AB Nintendo wii OR TI Xbox Kinect OR AB Xbox Kinect OR TI WII Fit games OR AB WII Fit games OR TI Wii fit OR AB Wii fit AND (MM Games OR MM Video Games OR MH (Play and Playthings) OR TI Game* OR AB Game* OR TI Video Game* OR AB Video Game* OR TI Experimental Game* OR AB Experimental Game* OR TI Gamification* OR AB Gamification*) OR (TI Serious game* OR AB Serious game* OR TI Simulation Game* OR AB Simulation Game* OR TI Mobile game* OR AB Mobile game* OR TI Computer game* OR AB Computer game* OR TI Internet game* OR AB Internet game*) OR (TI Electronic game* OR AB Electronic game* OR TI Exergam* OR AB Exergam* OR TI GAMES—Therapeutic use OR AB GAMES—Therapeutic use OR TI VIDEO games—Physiological aspects OR AB VIDEO games—Physiological aspects OR TI EXERCISE video games OR AB EXERCISE video games) OR (TI SPORTS in video games OR AB SPORTS in video games OR TI NINTENDO Wii Fit games OR AB NINTENDO Wii Fit games OR TI NINTENDO Wii video games OR AB NINTENDOWii video games OR TI WII Fit games OR AB WII Fit games OR TI VIDEO game consoles OR AB VIDEO game consoles) OR (TI Kinect OR AB Kinect OR TI Nintendo wii OR AB Nintendo wii OR TI Xbox Kinect OR AB Xbox Kinect OR TI WII Fit games OR AB WII Fit games OR TI Wii fit OR AB Wii fit)</p>
<p>Database: Psychology and Behavioral Sciences Collection (via EBSCO) Filters: English, Portuguese, Spanish, French Results: 88 Search strategy (23 August 2022) ((SU ANXIETY OR SU ANXIETY in old age OR SU MENTAL health OR TI Mental OR AB Mental OR TI Mental Health OR AB Mental Health OR TI Mental Health Recovery OR AB Mental Health Recovery OR TI Anxiety OR AB) OR (TI Anxiety Disorder OR AB Anxiety Disorder OR TI Depression OR AB Depression OR TI Depressive Disorder OR AB Depressive Disorder OR TI Stress, Physiological OR AB Stress, Physiological OR TI Mental Health Treatment OR AB Mental Health Treatment) OR (TI Stress OR AB Stress OR TI Rehabilitation, Psychosocial OR AB Rehabilitation, Psychosocial OR TI Mental age OR AB Mental age OR TI Mental depression OR AB Mental depression OR TI Anxiety in old age OR AB Anxiety in old age OR TI Emotional OR AB Emotional)) AND (-((((SU) GAMES OR SU GAMES & psychology OR SU GAMES—Social aspects OR SU GAMES—Therapeutic use OR SU VIDEO games OR SU GAMIFICATION OR SU</p>

Table 1. Cont.

SIMULATION games OR SU ELECTRONIC artificial life games OR SU ELECTRONIC management games OR SU MOBILE games OR SU COMPUTER games OR MOBILE games) OR SU INTERNET games OR TI Game* OR AB Game* OR TI Video Game* OR AB Video Game* OR TI Experimental Game* OR AB Experimental Game* OR TI Gamification* OR AB Gamification* OR TI Serious game* OR AB Serious game*) OR TI Simulation Game* OR AB Simulation Game* OR TI Mobile game* OR AB Mobile game* OR TI Computer game* OR AB Computer game* OR TI Internet game* OR AB Internet game* OR TI Electronic game* OR AB Electronic game*) OR TI Exergam* OR AB Exergam* OR TI GAMES—Therapeutic use OR AB GAMES—Therapeutic use OR TI VIDEO games—Physiological aspects OR AB VIDEO games—Physiological aspects OR TI EXERCISE VIDEO GAMES OR AB EXERCISE VIDEO GAMES OR TI SPORTS in video games OR AB SPORTS in video games) OR TI NINTENDO Wii Fit games OR AB NINTENDO Wii Fit games OR TI NINTENDO Wii video games OR AB NINTENDO Wii video games OR TI WII FIT GAMES OR AB WII FIT GAMES OR TI VIDEO game consoles OR AB VIDEO game consoles OR TI Kinect OR AB Kinect) OR TI nintendo wii OR AB nintendo wii OR TI xbox Kinect OR AB xbox Kinect OR TI wii fit OR AB wii fit) AND (((((SU OLDER people OR SU AGING OR SU GERIATRICS OR TI Aged OR AB Aged OR TI Geriatric OR AB Geriatric OR TI (Aged, 80 and Over) OR AB (Aged, 80 and Over) OR TI Geriatric Psychiatry OR AB Geriatric Psychiatry) OR TI Gerontologic OR AB Gerontologic OR TI Gerontologic Care OR AB Gerontologic Care care) OR TI AGING OR AB AGING OR TI GERONTOLOGY OR AB GERONTOLOGY OR TI OLD age OR AB OLD age OR TI ACTIVE aging OR AB ACTIVE aging OR TI OLDER people physiology OR AB OLDER people physiology) OR TI seniors OR AB seniors OR TI old people OR AB old people OR TI elderly OR AB elderly OR TI senior citizen OR AB senior citizen OR TI old person OR AB old person) OR TI older adults OR AB older adults OR TI Frail Elderly OR AB Frail Elderly)OR AB ACTIVE aging OR TI OLDER people physiology OR AB OLDER people physiology) OR TI seniors OR AB seniors OR TI old people OR AB old people OR TI elderly OR AB elderly OR TI senior citizen OR AB senior citizen OR TI old person OR AB old person) OR TI older adults OR AB older adults OR TI Frail Elderly OR AB Frail Elderly)OR AB ACTIVE aging OR TI OLDER people physiology OR AB OLDER people physiology) OR TI seniors OR AB seniors OR TI old people OR AB old people OR TI elderly OR AB elderly OR TI senior citizen OR AB senior citizen OR TI old person OR AB old person) OR TI older adults OR AB older adults OR TI Frail Elderly OR AB Frail Elderly)

Database: SPORTDiscus with Full Text (via EBSCO)
 Filters: English, Portuguese, Spanish, French
 Results: 217
 Search strategy (23 August 2022)
 ((SU ANXIETY OR SU ANXIETY in old age OR SU MENTAL health OR TI Mental OR AB Mental OR TI Mental Health OR AB Mental Health OR TI Mental Health Recovery OR AB Mental Health Recovery OR TI Anxiety OR AB) OR (TI Anxiety Disorder OR AB Anxiety Disorder OR TI Depression OR AB Depression OR TI Depressive Disorder OR AB Depressive Disorder OR TI Stress, Physiological OR AB Stress, Physiological OR TI Mental Health Treatment OR AB Mental Health Treatment) OR (TI Stress OR AB Stress OR TI Rehabilitation, Psychosocial OR AB Rehabilitation, Psychosocial OR TI Mental age OR AB Mental age OR TI Mental depression OR AB Mental depression OR TI Anxiety in old age OR AB Anxiety in old age OR TI Emotional OR AB Emotional)) AND (-((((SU GAMES OR SU GAMES & psychology OR SU GAMES—Social aspects OR SU GAMES—Therapeutic use OR SU VIDEO games OR SU GAMIFICATION OR SU SIMULATION games OR SU ELECTRONIC artificial life games OR SU ELECTRONIC management games OR SU MOBILE games OR SU COMPUTER games OR MOBILE games) OR SU INTERNET games OR TI Game* OR AB Game* OR TI Video Game* OR AB Video Game* OR TI Experimental Game* OR AB Experimental Game* OR TI Gamification* OR AB Gamification* OR TI Serious game* OR AB Serious game*) OR TI Simulation Game* OR AB Simulation Game* OR TI Mobile game* OR AB Mobile game* OR TI Computer game* OR AB Computer game* OR TI Internet game* OR AB Internet game* OR TI Electronic game* OR AB Electronic game*) OR TI Exergam* OR AB Exergam* OR TI GAMES—Therapeutic use OR AB GAMES—Therapeutic use OR TI VIDEO games—Physiological aspects OR AB VIDEO games—Physiological aspects OR TI EXERCISE VIDEO GAMES OR AB EXERCISE VIDEO GAMES OR TI SPORTS in video games OR AB SPORTS in video games) OR TI NINTENDO Wii Fit games OR AB NINTENDO Wii Fit games OR TI NINTENDO Wii video games OR AB NINTENDO Wii video games OR TI WII FIT GAMES OR AB WII FIT GAMES OR TI VIDEO game consoles OR AB VIDEO game consoles OR TI Kinect OR AB Kinect) OR TI nintendo wii OR AB nintendo wii OR TI xbox Kinect OR AB xbox Kinect OR TI wii fit OR AB wii fit) AND (((((SU OLDER people OR SU AGING OR SU GERIATRICS OR TI Aged OR AB Aged OR TI Geriatric OR AB Geriatric OR TI (Aged, 80 and Over) OR AB (Aged,

Table 1. *Cont.*

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((((((((((((((((Aged[MeSH Terms]) OR (Geriatrics[MeSH Terms])) OR (Aged[Title/ Abstract])) OR
(Geriatric[Title/ Abstract])) OR (Geriatric Psychiatry[Title/ Abstract])) OR
(Gerontologic[Title/ Abstract])) OR (Gerontologic Care[Title/ Abstract])) OR (OLDER
people[Title/ Abstract])) OR (OLDER patients[Title/ Abstract])) OR (ELDER care[Title/ Abstract]))
OR (AGING[Title/ Abstract])) OR (GERONTOLOGY[Title/ Abstract])) OR (OLD
age[Title/ Abstract])) OR (ACTIVE aging[Title/ Abstract])) OR (OLDER people
physiology[Title/ Abstract])) OR (Seniors[Title/ Abstract])) OR (Old people[Title/ Abstract])) OR
(Elderly[Title/ Abstract])) OR (Senior citizen[Title/ Abstract])) OR (Old person[Title/ Abstract]))
OR (Olderadults[Title/ Abstract])) OR (Frail Elderly[Title/ Abstract]) AND (medline[Filter])

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The review will include primary studies, including experimental and quasi-experimental studies, randomized studies with and without control groups, and studies with pre-and post-assessments, published in the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE[®], Northfield, IL, USA) via PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL[®], EBSCO Information Services, Ipswich, MA, USA), and SPORTDiscus with Full Text. During the eligibility process, the list of bibliographic references of all included articles will be reviewed to identify additional studies relevant to the subject under investigation that meet the inclusion criteria. The search was conducted on 23 August 2022. After the search, all identified articles were deposited in the RAYYAN and ENDNOTE program to identify duplicate articles, facilitate the review process by the reviewers, and manage bibliographic references.

After analyzing the data, a new survey will be carried out to identify recent publications on the subject before the end of the review [21].

The protocol for this systematic review follows the guidelines of the Joanna Briggs Institute (JBI) methodology [21]. For the final assessment, the items identified in the reports prepared for the guidance of systematic reviews and the extension of meta-analyses (PRISMA-P 2020) will be used [22]. This protocol was registered in the OSF (<https://osf.io/37dtq> (accessed on 21 October 2022)).

2.3. Study Selection

The pilot test will be carried out by two independent reviewers (AL and MTM) in the first phase through the analysis of the title and abstract and in the second phase in full text. In the first phase, in reading the title and abstract, 5% of the total articles will be used to carry it out, requiring a consensus of at least 75% among the reviewers. In the second phase of the study, 2% of the articles that meet the inclusion criteria will be analyzed in full text, and it will be necessary to obtain the same level of agreement. After reaching the consensus required in these two phases, all titles and abstracts will be read and selected by two independent reviewers (AL and MTM) to assess the inclusion criteria. All relevant studies will be retrieved in total.

In adherence to the Joanna Briggs Institute (JBI) guidelines [21], the systematic review will report a record of reasons for excluding full-text studies that do not meet the inclusion criteria. Any disagreements between the two independent reviewers (AL and MTM) will be resolved through discussion with a third reviewer (CF). A PRISMA flowchart will present the article selection process [21].

2.4. Assessment of Methodological Quality

After screening, eligible articles will be evaluated critically by two independent reviewers (AL and MTM) using the JBI critical appraisal checklist for experimental and quasi-experimental studies [23]. The corresponding authors will be contacted for clarification if there are any uncertainties or missing information. A third reviewer (CF) will be consulted to resolve any disagreements. It should be noted that the methodological quality of the studies will not be used as a criterion for exclusion but will be considered

when synthesizing the evidence in a narrative form. In case of any discrepancies, the third reviewer (CF) will be consulted.

2.5. Data Extraction

The two reviewers (AL and MTM) will use the PRISMA-P 2020 Checklist [22] to extract data from the articles included in the systematic review. The extracted data will consist of specific details about the interventions that address the objective of this study, as presented in Table 2. These details will include the study code, authors, publication year and country, study objectives, study population and sample size, study type, measurement instruments used, type of game, intervention domain(s), and characteristics such as duration, frequency, and the presence of a control group.

Table 2. Data extraction form.

	Systematic Review Details
Systematic Review Title	Efficacy of the use of exergames in promoting the mental health of the elderly: Protocol of a systematic review
Review Objective(s)	To identify in scientific evidence the effectiveness of exergames in promoting the mental health of the elderly. What is the effectiveness of exergames in cognitive stimulation, emotional management capacity, and socialization of the elderly?
Review Question(s)	What games promote cognitive stimulation, emotional management capacity, and socialization of the elderly? How long and how often are these games effective for cognitive stimulation, emotional management training, and socialization of the elderly?
Inclusion Criteria	
Types of participants	The review will consider studies that include the elderly, that is, people aged 60 years or older.
Types of intervention(s)	The review will consider studies that in their research implement the use of exergames.
Type of comparator	The review will consider as a comparator the use of different exergames to promote mental health and socialization of the elderly, including the duration and frequency of their applicability and/or the comparison between exergames and another type of intervention.
Types of outcomes	The review will consider studies that include the following outcomes assessed by valid and reliable instruments: [Effectiveness of exergames in cognitive stimulation, emotional management skills, and socialization of the elderly.]
Types of Evidence Sources	The systematic review will consider published studies: experimental, and quasi-experimental studies, including randomized studies with and without a control group pre-and post-assessment. No time limit will be considered. Articles in English, Portuguese, Spanish and French will be considered for inclusion in this study.
Evidence Source Details and Characteristics	
Author(s)	
Year of Publication	
Origin/Country of Origin (where the source was published or conducted)	
Aims/Purpose	
Population and Sample	
Kind of study	
Instruments	
Size	
Game type	
Intervention	
control group	
Details/Results Extracted from the Source of Evidence (concerning the concept of the systematic review)	

2.6. Data Synthesis

The authors will determine the type of analysis to be conducted based on the results of the studies reviewed. The chosen analysis may include descriptive research, meta-analysis, or a GRADE evidence analysis. The JBI SUMARI System [24] will be used for the meta-analysis. In the case of moderate to high heterogeneity ($I^2 > 50\%$), random effects

models will be used; otherwise, fixed effects models will be employed. The effect sizes will be expressed in odds ratio (for dichotomous data) and weighted mean differences for continuous data. If ten or more studies are included in the meta-analysis, a funnel plot using JBI SUMARI will be used to assess publication bias. If there is much variability in the results, a GRADE evidence analysis will be performed using the GRADEPro Software (McMaster University, Canada) [25]. If it is impossible to conduct these analyses due to the nature of the studies reviewed, the results will be presented narratively, including tables, figures, or graphs, to facilitate the presentation and understanding of the results of the studies.

3. Discussion

The proposed systematic review will have distinctive aspects that differentiate it from previous studies. For example, it will focus specifically on exergames for mental health promotion in the elderly population, which is an under-researched area. Specifically, will identify the most effective exergames for cognitive stimulation, emotional management capacity, and socialization of the elderly, which will provide valuable insights for future research and clinical practice. Additionally, it will investigate the duration and frequency with which these games should be used to achieve health improvements, which is an important practical consideration for future implementation. The results of the review will inform the selection of exergames for a randomized controlled trial aimed at promoting the autonomy of the elderly, which has important implications for improving the quality of life for this population.

Previous studies have demonstrated the effectiveness of exergames in improving the health of the elderly [26,27]. Therefore, it is essential to identify those games that show the most significant effect for future implementation. These unique aspects of the proposed review will make it an innovative and important contribution to the field of exergames and mental health promotion in the elderly.

The proposed study will include all articles addressing the topic without a specified time limit and studies written in English, Portuguese, Spanish, and French. However, it is worth noting that the authors speak only a few languages, which may limit the scope of the review.

4. Conclusions

The systematic review study proposed in this protocol aims to identify effective intervention programs using exergames to promote the mental health of the elderly, with the ultimate goal of enhancing their autonomy and quality of life. Evidence has shown that these exergame programs offer advantages over traditional interventions, including increased safety, greater accessibility, and reduced demotivation due to the novelty of the technology. Furthermore, providing the elderly with opportunities to familiarize themselves with advanced technology is crucial to preventing the loss of autonomy from being unable to keep up with technological advances. By exploring the effectiveness of these interventions, it will be possible to identify the most effective programs for promoting the mental health of the elderly. This may be particularly important as the elderly population increases worldwide, making it increasingly important to ensure that the elderly have access to effective intervention programs to improve their health and quality of life. Finally, this proposed systematic review can help promote active, healthy, and successful ageing among the elderly by allowing them to become familiar with technology and improve their autonomy. This can help ensure that the elderly enjoy a full and productive life, regardless of age.

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