



BRIEF COMMUNICATION

The impact of video games on the promotion of active aging: a medical perspective

El impacto de los videojuegos en la promoción del envejecimiento activo: una perspectiva médica

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Cite as: Matheus Nascimento J, Bustamante Galarza K. The impact of video games on the promotion of active aging: a medical perspective. Gamification and Augmented Reality. 2025; 3:105. <https://doi.org/10.56294/gr2025105>

Submitted: 25-03-2024

Revised: 11-06-2024

Accepted: 01-10-2024

Published: 01-01-2025

Editor: Adrián Alejandro Vitón-Castillo 

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ABSTRACT

Introduction: currently, population aging is one of the key concerns for healthcare systems and governments, requiring new alternatives to improve quality of life. The rise of technology has made video games and virtual reality widely used in various areas of society, making their use in healthcare unsurprising.

Objective: to analyze the potential of video games as a therapeutic tool to promote well-being and health in old age.

Method: a search was conducted for articles published between 2000 and 2024 through PubMed, Google Scholar, and ChatGPT, focusing on the potential of video games for healthy aging. The following MESH terms were used: “Aging” AND “Cognitive function”; “Exergames” AND “Older adults”; “Video games” AND “Life quality.”

Development: video games in active aging programs improve physical fitness, mental health, and quality of life in older adults. Tools like Kinect and iPACES™ promote functional independence, reduce depression, improve memory and executive function, encourage self-management of health, and facilitate communication with healthcare professionals.

Conclusions: the reviewed studies clearly highlight the benefits of using exergames and virtual reality systems in physical and cognitive training programs for older adults. The integration of these innovative technologies not only improves functional fitness and quality of life but also has a significant positive impact on mental health and cognitive function.

Keywords: Older Adult; Quality of Life; Cognition; Physical Exercise; Healthy Aging; Virtual Reality.

RESUMEN

Introducción: en la actualidad, el envejecimiento poblacional constituye una de las problemáticas de gran interés para los sistemas de salud como para los gobiernos, requiriéndose nuevas alternativas para mejorar la calidad de vida. El auge de las tecnologías ha hecho de los videojuegos y la realidad virtual un medio ampliamente difundido en la sociedad en diferentes áreas, de ahí que su uso en el campo de la salud no resulta extraño.

Objetivo: analizar el potencial de los videojuegos como una herramienta terapéutica para promover el bienestar y la salud en edad avanzadas.

Método: Se realizó una búsqueda de artículos publicados entre 2000 y 2024 mediante PubMed, Google Académico y ChatGPT, sobre las potencialidades de los videojuegos para el envejecimiento saludable. Se emplearon los términos MESH: “Aging” AND “Cognitive function”; “exergames” AND “Older adults”; “Video games” AND “Life quality”.

Desarrollo: Los videojuegos en programas de envejecimiento activo mejoran la aptitud física, la salud mental y la calidad de vida en adultos mayores. Herramientas como Kinect y iPACES™ promueven la independencia

funcional, reducen la depresión, mejoran la memoria y la función ejecutiva, fomentan la autogestión de la salud y facilitan la comunicación con profesionales de salud.

Conclusiones: los estudios revisados destacan claramente los beneficios de la utilización de *exergames* y sistemas de realidad virtual en programas de entrenamiento físico y cognitivo para adultos mayores. La integración de estas tecnologías innovadoras no solo mejora la aptitud funcional y la calidad de vida, sino que también tiene un impacto positivo significativo en la salud mental y la función cognitiva.

Palabras clave: Adulto Mayor; Calidad de Vida; Cognición; Ejercicio Físico; Envejecimiento Saludable; Realidad Virtual.

INTRODUCTION

Exercise games improve executive function in older people and support the relationship between physical activity games and cognitive performance in older adults. From a mechanistic perspective, somatosensory play promotes the transduction of brain neurotrophin signals, thereby protecting the structure and function of neurons in specific brain regions and delaying the decline of executive function in older adults as much as possible.^(1,2,3)

According to the articles read, using games and virtual reality for older adults, especially exergames, is recommended as a physical and mental intervention. Results include increased reflexes and preservation of overall health, with strong impacts on cognitive function and some structural changes in brain structure.^(4,5,6)

Previous studies have shown that slowing cognitive decline is critical to preventing dementia, and aerobic exercise is an effective means of achieving this. In the post-pandemic era, healthy living is ingrained in people's hearts, and a healthy body is essential for a happy life. In addition, the rapid advancement of science and technology has significantly changed people's healthy lifestyles. Internet technology has enhanced home exercise for older adults, with feedback and social interaction features. Among these, exercise video games have developed and evolved, not limited to sedentary games, but to full-body interactive physical activities. Participating in these games can increase energy expenditure and improve physical and cognitive functions, promoting mental and physical health. Therefore, these games involve physical activity and body regulation, which improves physical fitness and promotes healthy aging.^(7,8)

The implementation of exercise video games in the physical and mental health of older adults is a topic that deserves attention. These games include dual cognitive task training and interactive dual task stimulation, representing an innovative strategy to enhance cognitive ability in this demographic group. A positive effect of exercise video games on cognitive function and limb rehabilitation has been observed in older people. Previous studies have suggested that combining physical exercise with cognitive stimulation may improve cognitive abilities in older adults more effectively than exercise alone. Thus, exercise video games offer a variety of sensory stimuli in a complex game environment, facilitating the repetition of goal-oriented tasks and improving cognitive and motor skills. In addition, by increasing physical activity and energy expenditure, these games improve older adults' health and fitness. By adjusting the different aspects of the game, such as modes, levels, and difficulty, interest and adherence to the activity can be increased, which, together with their ease of use, interactivity, and low cost, makes them a versatile tool for therapy and research in the clinical setting.^(10,11)

Somatosensory play promotes the release and expression of brain neurotrophins, which are critical for improving cognitive function in older adults. Brain-derived neurotrophic factor (BDNF), insulin-like growth factor-1 (IGF-1), and vascular endothelial growth factor (VEGF) are vital proteins that mediate the effects of exercise on the brain and cognition. This biomarker has been linked to increased synaptic generation, neurogenesis, and angiogenesis, promoting structural changes in the brain. Combined with cognitive and motor interventions, somatosensory play can modulate neurotrophin signaling, preserving and improving brain function, thus affecting neuronal function and the structure of cognitive areas, which is particularly important in aging and neuropathological conditions. The impact of somatosensory play on the hippocampus, prefrontal cortex, and basal ganglia improves cognitive function in older adults by improving brain structure and promoting neurotrophin protection. These findings underscore the potential of exergames to positively influence cognitive health in older adults and merit further exploration.^(6,11,12,13)

The present research question was posed as a research question: How do video games affect active aging in older adults?

The objective, therefore, was to analyze the potential of video games as a therapeutic tool to promote well-being and health in older adults.

METHOD

This study is a review based on the reading of previous articles, either systematic reviews or clinical trials,

which seek to evaluate the efficacy of video games and virtual reality in promoting active aging.

The study population consisted of articles published in PubMed and Google Scholar. The search was performed with the terms MESH and the application of filters for a good selection of relevant articles.

To determine the articles to be included, the PICO methodology was used to define the object of study and the flow of information to be used:

P: Study population: adults > 60 years of age.

I: Intervention: prescription of exergames and virtual reality.

C: Comparator group: other exercises or none at all.

O: Results: Older adults who incorporated video games and virtual reality into their routine experienced a significant improvement in their physical and cognitive health.

Articles referring to adults over 60 employing exergames and virtual reality were included. Literature not related to exercise prescriptions for exercise video games was excluded.

For data collection, articles collected in the Pubmed database and Google Scholar were used, and we found a total of 33 articles, applying the inclusion and exclusion criteria. A total of 17 potential articles were chosen for the data analysis plan.

For the data analysis, a review of the selected articles was performed, focusing on the title and introduction of each one. Subsequently, each paper was comprehensively evaluated to understand the effectiveness of exergames in promoting active aging.

In order to carry out this study, it was necessary to define the following variables:

Exergames: A type of video game that combines physical exercise with digital games, designed to promote physical activity through interactive and playful activities.

Active Aging: Process of optimizing opportunities for health, participation, and safety to improve quality of life as people age.

Virtual Reality: A technology that allows users to experience and interact with three-dimensional simulated environments through special devices such as glasses or helmets.

Artificial Intelligence: A field of computer science that develops systems capable of performing tasks that require human intelligence, such as learning, perception, and decision-making.

RESULTS

Successful aging for community-dwelling older adults: a pilot study with a tablet application⁽¹⁴⁾

This study used a tablet application called eSeniorCare, which was developed based on the Successful Aging framework. Study participants, older adults with low socioeconomic status, used the app for 24 weeks. eSeniorCare allowed participants to set and follow reminders for medication intake and health goals. In addition, the app offered the opportunity to play selected casual games to stimulate users' minds. The study showed that using the senior care tablet app significantly improved participants' self-perceptions of mental health, physical health, and health-related quality of life. In addition, frequent app users showed statistically significant improvements in Summary Physical Component (PCS) and health-related quality of life (HRQoL) scores. Participants reported that the app motivated them to take better care of themselves, increased their health awareness, improved communication with healthcare providers, supported self-management of health, improved treatment adherence, and provided mental stimulation. These results underscore the potential for tablet apps to positively impact various aspects of older adults' well-being and health outcomes.

Effects of a Kinect-based Physical Training Program on Body Composition, Functional Fitness, and Depression in Institutionalized Older Adults⁽¹⁵⁾

The study assessed functional fitness in institutionalized older adults using a variety of tests, including arm flexion, chair raise, 8-foot rise and go, sit and reach, and an aerobic endurance test. Results indicated that a Kinect-based fitness training program incorporating exergames significantly improved functional fitness, quality of life, and reduced levels of depression after 12 weeks of intervention. Previous research supports that physical activity, including exergames, can benefit the quality of life and physical fitness and reduce depressive symptoms in older adults, highlighting the importance of these activities in promoting mental well-being and functional independence in this population.

The interactive Physical and Cognitive Exercise System (iPACES™): Effects of a 3-month in-home pilot clinical trial for mild cognitive impairment and caregivers⁽¹⁶⁾

The study used an interactive physical and cognitive exercise system called iPACES™ (Interactive et al. System). This system combined physical exercise with mental challenges through a tablet game designed to challenge executive function. The intervention was conducted for three months in the participants' homes, where they used the iPACES™ system to perform interactive physical and mental exercises. The main results of the pilot clinical trial showed that participants' executive function and verbal memory improved significantly

after the 3-month intervention period. In addition, a moderate association was observed between changes in salivary biomarkers and cognitive improvement, suggesting that neuro-exergaming games could positively impact cognitive function and healthy aging.

DISCUSSION

Based on the studies reviewed on the use of video games in active aging, several significant benefits for older adults stand out. Programs such as Kinect-based physical training,⁽¹⁵⁾ including exergames, have improved functional fitness, including strength, balance, and flexibility. This contributes to maintaining independence and functional ability in institutionalized older adults. In addition, applications such as senior care and systems such as iPACES™ have shown improvements in mental health self-perceptions, reducing levels of depression, and increasing health awareness.⁽¹⁶⁾ These tools also promote mental stimulation and self-management of health, improving mental health-related quality of life. Interactive games that combine physical exercise with mental challenges, such as iPACES™, have demonstrated significant benefits in executive function and verbal memory, helping maintain mental acuity and mitigate cognitive decline associated with aging.⁽¹⁶⁾ Video games designed for active aging improve physical and mental health, encourage adherence to exercise programs, improve communication with healthcare professionals, and support the maintenance of autonomy and functional independence.

CONCLUSION

The studies reviewed highlight the benefits of using exergames and virtual reality systems in physical and cognitive training programs for older adults. Integrating these innovative technologies not only improves functional fitness and quality of life but also has a significant positive impact on mental health and cognitive function.

The results demonstrate that exergames and technology applications can contribute to mental well-being, increase functional independence, facilitate health management, and promote mental stimulation. These interventions significantly improve physical, mental, and quality of life, motivating users to take better care of their health and improving adherence to treatment and self-management of health. In addition, the combination of physical exercise and mental challenges can significantly improve executive function and memory.

These findings underscore how technology and exergames can be powerful tools to promote active aging. However, it is essential to recognize that more research is needed to delve deeper into the underlying mechanisms and optimize interventions. More clinical and longitudinal studies evaluating the effectiveness of these technologies and exploring different variables and contexts are crucial. This is an open invitation to researchers to continue to develop innovative solutions that can transform the experience of aging worldwide.

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FINANCING

The authors did not receive funding for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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