

Diagnosis to action

Exergaming-based exercise program for people aged 50 years or older

Programa de exercícios físicos baseado em exergames para pessoas com 50 anos ou mais

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Abstract

The purpose of the program “*Video games for people aged 50 years or older*” is to create free opportunities for older adults to engage in motivating and enjoyable physical activity, and to stimulate their functional fitness and cognition. This program has been carried out in the Universidade Federal de Santa Catarina since March 2014 and involves undergraduate and postgraduate students in the physical education department. The program follows the school semester, with approximately 36 people from the community participating each semester. The program consists of exercises that use video games that simulate sports activities, called exergames. Participants engage in a 60-minute session two or three times a week and on alternating days. Participants are evaluated at the beginning and end of each semester for functional fitness and cognition and the findings are presented to them. We expected that this program can be expanded and spread to other communities.

Keywords

Motor Activity; Physical Fitness; Virtual Reality Exposure Therapy.

Resumo

O programa “*Jogos eletrônicos para pessoas com 50 anos ou mais*” tem como objetivo oportunizar, de forma gratuita, a prática de uma atividade motivadora, atraente e estimuladora da aptidão funcional e da cognição. Este programa é desenvolvido junto ao Centro de Desportos, da Universidade Federal de Santa Catarina desde março de 2014 e envolve alunos de pós-graduação e graduação em Educação Física (Bacharelado). O programa segue o semestre letivo e consiste em programa de exercícios físicos baseados em exergames, usando-se jogos que simulam atividades esportivas, por meio do Xbox 360 Kinect™. A duração das sessões é de 60 minutos e estas são realizadas duas ou três vezes por semana, em dias alternados. Os participantes são avaliados em relação à aptidão funcional e cognição, no início e ao final de cada semestre. Espera-se que este programa possa ser ampliado e difundido para outras comunidades.

Palavras-chave

Atividade motora; Aptidão Física; Terapia de Exposição à Realidade Virtual.

Introduction

Healthy aging involves the interaction between physical and mental aspects, independence in daily activities, social integration, family support, and economic independence¹. In this context, both cognitive and motor performance are determining factors of quality of life, functional limitations, and life expectancy without disability, which themselves are factors that reflect the health status of the elderly². Among the possibilities for preserving and improving physical and cognitive skills, physical activity has received considerable scientific interest in the previous decade³.

A new alternative for leisure and/or physical activity that has been studied recently is the use of video games in combination with physical activity, termed *exergames*, such as the Nintendo Wii™ and Microsoft Xbox 360 Kinect™^{4,5}. Exergames involve various games that simulate physical activity practice, which can increase physical and cognitive demands of the subject⁶.

Several research studies using exergames have been conducted with older adults and have indicated positive effects on balance tasks, mobility^{7,8}, physiological parameters (e.g., cardiac frequency and energy cost)^{4,9}, and cognition (e.g., executive function and processing speed)⁶. Furthermore, the older adults considered the *exergames* to be a playful and motivating activity that has psychological and social benefits⁵.

Therefore, in 2014, a community extension pro-

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gram “*Video games for people aged 50 years or older*” was created and developed at the Universidade Federal de Santa Catarina (UFSC). We invite people aged 50 years or older instead of the typical cutoff of 60 years because cognitive changes tend to occur earlier, around 30 years, what can difficult the successfully of the later interventions¹⁰. The aim of this study is to describe this program and to contribute to the dissemination of the exergaming-based exercise intervention.

Program Description

We started the community extension program “*Video games for people aged 50 years or more*” on February 2014, in the Laboratory for Orientation in Physical Activity and Health (LOAFIS), in the Sports Center (Centro de Desportos, CDS) at UFSC. This program is linked to the research study entitled “*Cognitive performance in older adults: electronic games, physical activity and nutrition*”, which was approved by the Research Ethics Board of UFSC (n° 329.649).

Objectives

The main objective of this program is to provide opportunities for people aged 50 years or older to engage in a free, motivational, and attractive activity that promotes functional and cognitive fitness. Furthermore, we hope to improve participant’s quality of life, social interaction, and digital inclusion; to encourage the generation’s exchange; and to promote interactions between the community and the university. Furthermore, the intervention provided undergraduate students in the physical education department the opportunity for involvement with research and practice, utilizing new technologies as a form of intervention for older adults.

Figure 1 shows the exergames-based exercise program’s logic model.



FIGURE 1 – Exergame program’s logic model.

Target audience and program staff

The program targets individuals of both sexes, aged 50 years and older, who have no prior experience with video games and exergames, who have no visual and hearing impairments that might hinder the identification of colors, images, and sounds. All participants provided a medical certificate indicating consent to participate in physical exercise. Each semester, the program has the capacity to serve 36 to 40 participants.

The coordinator of the program is a Professor in the physical education department (UFSC). In addition to the coordinator, Physical Education graduate and undergraduate students serve as staff members. During the sessions, staff are responsible for explaining how to execute the games, video game handling, control timing of the sessions, as well as provide orientation to warm up and cool down exercises. Thus, students can apply the knowledge acquired in undergraduate classes.

Program recruitment

We promote the program each semester via electronic dissemination on the UFSC website (www.ufsc.br) and CDS at UFSC (www.cds.ufsc.br), Communications agency at UFSC (www.agecom.ufsc.br), and Center for Elder Studies at UFSC (www.neti.ufsc.br). Dissemination was also accomplished through newspapers, brochures, flyers, and personal invitations to individuals.

Program operations

We offer the program each semester, according to school calendar of the UFSC. We equip a room to perform the activities, which includes a projection screen, a projector, a set of speakers, an air conditioner, and an ethylene-vinyl acetate (EVA) carpet. The temperature of the room stays between 21 and 24 degrees Celsius, which is a comfortable temperature¹².

We conduct the exergames training using the Microsoft Xbox 360 Kinect™. Kinect uses a motion-sensing technology that allows for interaction with computer games without the need for a hand-held control or joystick. The duration of the exergames session is 60 minutes and happens on alternate days, with a frequency of three days (i.e., Mondays, Wednesdays, and Fridays) or two days (i.e., Tuesdays and Thursdays) each week. Each session begins with a brief warm up (joint warm up) and ends with a cool down (stretching and breathing exercises).

The sessions include games that simulate sports, such as the *Kinect Sports Ultimate Collection*: bowling, boxing, ski, soccer, tennis, table tennis, and track and field (which includes five separate events: *sprint, javelin, long jump, discus, and hurdles*). In addition, we use a few mini-games that have approximately 1 to 2 minutes, where the goal is to score as many points as possible (e.g., *pin rush, target kick, super saver, body ball* and *paddle panic*). We choose these games from a pilot study that was conducted in 2013, based on participant's preferences and the physical demands of the games.

All of the games provide visual and auditory information (i.e., songs and comments), in accordance with the performance of the player. Staff also can provide information to participants to motivate them or offer explanation.

Ideally, the sessions are performed in pairs and begin with a mini-game. Thereafter, the pairs play two sports games in each session. Every fifth session the participants choose which games they play, in other words it is a free session. We present the model of the 12 sessions in Box 1. If only one participant is present, they can play alone or against the staff.

BOX 1 – Model of 12 sessions of exergaming-based program.

Sessions	Mini-game	Game 1	Game 2
1	Super saver	Bowling	Table tennis
2	Target kick	Tennis	Ski
3	Pin rush	Soccer	Boxing
4	Body ball	Table tennis	Track & field
5	Paddle panic	Ski	Soccer
6	"Open session"		
7	Super saver	Tennis	Bowling
8	Target kick	Soccer	Boxing
9	Pin rush	Track & field	Table tennis
10	Body ball	Ski	Soccer
11	Paddle panic	Tennis	Boxing
12	"Open session"		

Participants use a heart rate monitor (Polar®, model S810) to check their average heart rate and exercise intensity. At the end of each session, we question the participants about their subjective perception of effort (Borg scale, 15 points) to check the perceived intensity of the exercise¹¹.

We instruct participants to wear adequate clothing and to play barefoot because of the EVA carpet.

Measures

Before the start of the program, we collect information regarding sociodemographic characteristics, health conditions, lifestyle variables, and use of medication.

We do the evaluations after the anamnesis and at the end of the semester. We assess cognitive performance by using a battery of computerized cognitive assessments: the *Cogstate Battery* (which has been validated in Brazil)¹³ and the Mini-Mental Status Examination¹⁴. We assessed motor performance with the Fullerton battery¹⁵. We measure weight and height according to standard procedures.

At the end of each semester, we present the results of these assessments to the participants. Up until now, these results (program effects) have been used in a doctoral dissertation and two master's theses.

Final Considerations

The exergaming-based exercise program serves the community and allows an approach that combines education and research and that is produced by the university, while at the same time allowing the university to build a relationship with the community. The program also contributes to the academic qualifications of students in the Physical Education course, because they have the opportunity to practice the lessons they learned in the classroom, as well as their knowledge about games. Graduate students have boosted the development by presenting papers at scientific meetings, and the project results have formed the basis of one doctoral dissertation and two master's theses.

Performing exergaming-based exercise for older adults is feasible and combines physical and cognitive demands, and is an effective way to promote physical

and cognitive improvements in the elderly. As it is an activity that can be practiced in group, it can also contribute to the development of social relationships, in addition to providing moments of fun and relaxation⁵. Finally, people can choose between different activities of varying difficulty and intensity levels, thus resulting in a personalized intervention for people with different physical abilities, which is an important consideration in the older adult population.

Unfortunately, at the moment the possibilities for implementing this kind of program in Brazil as a public health strategy may be limited. This program requires equipment and adequate space; however, this cost is not unreasonable.

Authors' contributions

Alexsander Vieira Guimarães, Vandrizze Meneghini and Aline Rodrigues Barbosa contributed to the planning, creation, drafting, critical review, content guidance and approval of the final version.

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