Effect of Active Video Games on the Balance of Healthy Elderly
Systematic Review

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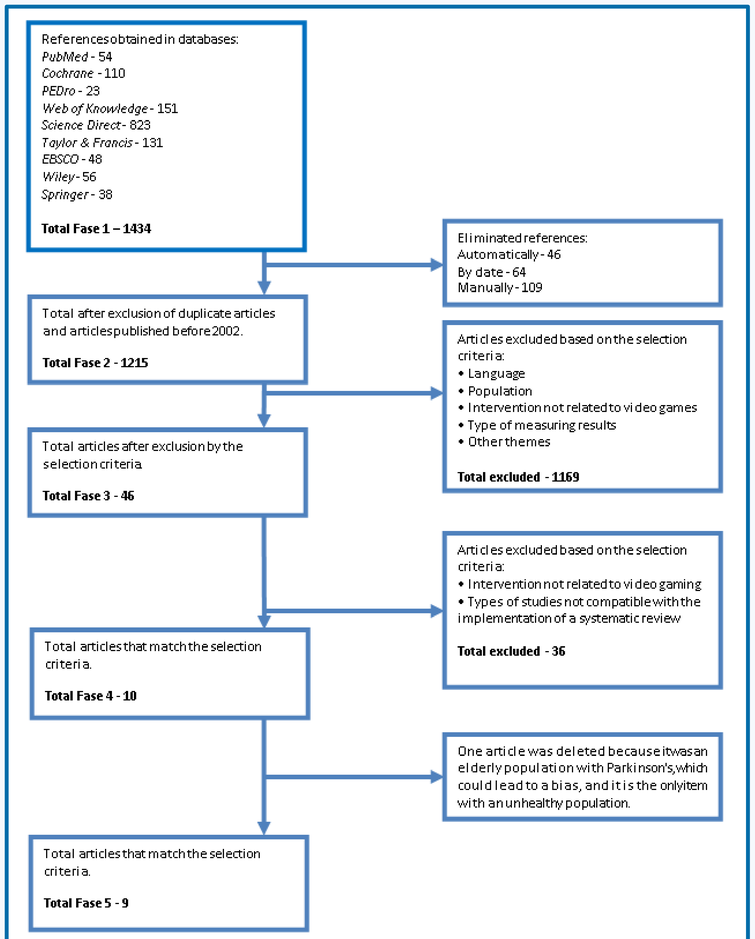
Introduction

With an increasing average life expectancy, Physical Therapists have been confronted with an increasing number of elderly patients, who present changes in balance and diminished motor functions, normally associated with fear of falling and with the natural decline of cognitive and motor systems. Increasingly Physical Therapists feel the need to use new techniques to improve postural reeducation programs and balance.
Then comes the challenge to find effective tools and propose innovative strategies that promote balance, which can contribute actively to the reduction of falls in this population. The active video games combine the action on the screen with the movements of the player. The use of active video games as a therapeutic tool for the development of physical and cognitive functions is a growing trend in health and care of the elderly.

Objective

The goal of this paper is to identify the existing and available scientific evidence about the efficacy of active video games, in balance on healthy elderly people and analyze it in order to give a valid, reliable and updated contribution providing suggestions for future research. For that we defined the following research question: "**What is the effect of active video games in balance, in healthy elderly population?"**

Methodology



Research and analysis of the articles included in this systematic review were prepared according to the protocol for conducting a systematic review based on the guidelines set by **PRISMA**.

The research expression was adapted for each database, according to the terms that produced results. Therefore, the final equation used in this study was:

(wii OR "video games" OR "virtual reality" OR Biomechanics OR kinematics OR "nintendo wii" OR "computer user interface") AND (balance OR "postural balance" OR "weight transfer "OR "equilibrium" OR "postural equilibrium") AND (aged OR elderly OR "older adults").

All the results were imported into a reference manager (EndNote ® X5).

When the final sample was obtained, we analyzed the methodology quality of the selected study's using the **PEDro scale** and completed the analysis grid for each item. In all the steps each article was analyzed independently by two members of the group. The study was completed in June 2012.

Results

Title	Intervention	PEDro Scale
Changes in balance in older adults based on a use of physical therapy vs the Wii Fit gaming system: a preliminary study.	The subjects participated in a training protocol for four weeks, with a frequency of three times per week. The exercise in Wii Fit ® consisted on three games: Ski Slalom, Ski Jump and Table Til, which each game was repeated for three times in each training session.	4/10
Using the Nintendo Wii as an Intervention in a Falls Prevention Group.	The program consists on a seven weeks treatment. Both groups had the same type of intervention, but in the experimental group were included games on Nintendo Wii (Penguin slide, tilt and Bubble Table-river), apart from other components of training (equivalent to conventional).	4/10
Intérêt de l'utilisation d'une console de jeux de type Wii Fit™ sur la réduction des facteurs de risque de chute et l'amélioration de l'équilibre chez la personne âgée.	The study used five of the 40 exercises offered by Wii Fit for rehabilitation of balance and posture: le yoga for standing posture and balance, *la chasse aux poissons and slalom ski for transfers weight, le jeux de billes for anterior-posterior and lateral body and le funambule to management of balance.*	3/10
Active video gaming to improve balance in elderly.	The intervention consisted on a six weeks training with video games, three times a week in training sessions of 20 minutes. The intervention performed is not described.	3/10
Impacto del Entrenamiento del Balance a través de Realidad Virtual en una Población de Adultos Mayores	Applied for eight weeks with a frequency of three times a week, in sessions of 20 minutes. The exercises with Wii Fit and Balance Board consisted on games to promote movement in all three planes of motion: exercise one - snowboard 35 seconds (sagittal plane); exercise two - penguin slide 90 seconds (frontal plane); exercise three - super coal +90 hoop 90 seconds (transverse plane); exercise four - rest 20 seconds; exercise five - repeat exercises one to four with their hands in the pelvis; exercise six - yoga: keep the center of gravity centered for 50 seconds; exercise seven - repeat the exercise six but with eyes closed..	2/10
Interactive Video Dance Games for Healthy Older Adults.	Each user had to complete 24 training sessions with 30 minutes each during three months with twice weekly sessions of counselling. Participants danced alone or in pairs on an interactive panel with four arrows (up, down, left and right). They had to use their feet to press the arrows in an equivalent response to the image that appeared on the screen. The arrows appeared according to the rhythm and beat of the music, with a slow progression of difficulty. The program and the songs were developed and provided by Proprietary Games for Older Adults.	3/10
Effects of an Interactive Computer Game Exercise Regimen on Balance Impairment in Frail Community- Dwelling Older Adults: A Randomized Controlled Trial.	16 sessions scheduled twice a week for 45 minutes. Experimental Group - Strengthening and dynamic balance training, using three computer games, interactive and dynamic weight transfer, with possible variations of intensity / difficulty Control Group - Strengthening and balance training in sitting and standing position, using Thera-band and weights, stationary bike for improving endurance, gait training with and without supervision	7/10
The Effect of Nintendo Wii on Balance: A pilot Study Supporting the Use of the Wii in Occupational Therapy for the Well Elderly.	Sessions three times per week, 20 minutes long. A total of four weeks. Each session consists in 10 minutes of balance activities and 10 minutes of aerobic activity on Wii Fit.	3/10
Exercising with Computers in Later Life (EXCELL) – pilot and feasibility study of the acceptability of the Nintendo® WiiFit in community-dwelling fallers.	In the experimental group intervention was based on individual sessions of exercise with Wii Fit Balance Board - balance and aerobic exercises - supervised by a member of the research, with a frequency of 2 times per week for 12 weeks (modified at 4 and 8 weeks). In the conventional group intervention consisted on a exercise program / education for fall, supervised by physiotherapists, also for 12 weeks.	3/10

- Considering the results of the studies analysed there is better improvement during the first weeks of intervention. This might suggest that the intervention based on active video games is more effective short-term.
- The results described that this type of intervention shows better results when used as a complementary intervention to conventional Physical Therapy.
- The results from the nine studies indicate that some type of oriented activity is better than no activity whatsoever when the goal is to improve balance.
- All the studies, except one, show a decreased time in TUG. This may do to the fact that the homogeneity of the sample was not ensured in this study.
- Although the studies used different evaluation measurements, all appraised balance which is the main variable in this review.

Conclusions

After analyzing the results it's possible to observe that this type of intervention is effective in improving balance in healthy elderly. However the limitations of the studies have to be considered and the results cannot be applied to the general population. It´s essential to continue the investigation about this subject creating more evidence with strong experimental relevance.

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