REALIDADE VIRTUAL NA REABILITAÇÃO DO EQUILÍBRIO DE PACIENTES APÓS AVC
•revisão de literatura•

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Resumo

Introdução: O Acidente Vascular Cerebral pode resultar em alterações com déficit de equilíbrio. A reabilitação torna-se imprescindível para a reabilitação do equilíbrio, sendo a Realidade Virtual um dos recursos que podem ser utilizados. Objetivo: sistematizar o conhecimento sobre o efeito da realidade virtual sobre o equilíbrio de pacientes após AVC. Método: Foi realizada uma revisão de literatura no período de abril a maio de 2014, usando as bases de dados Lilacs e Mediline, via Pubmed, incluindo-se artigos originais publicados de janeiro de 2004 a maio de 2014. Resultados: foram encontrados 24 artigos, permaneceram seis que preencheram os critérios de inclusão, quatro ensaios clínicos randomizados, um ensaio clínico de braço único e um relato de caso. Conclusão: Verificou-se que a realidade virtual pode servir como recurso coadjuvante na reabilitação do equilíbrio desse pacientes, com o propósito do treino orientado à tarefa e de cunho motivacional.

Palavras-chave: Realidade virtual; Equilíbrio; Acidente vascular cerebral.

BALANCE AND VIRTUAL REALITY IN POST STROKE PATIENTS
•literature review•

Abstract

Introduction: The stroke can result in balance deficit disorders. The rehabilitation becomes indispensable for balance rehabilitation, and the virtual reality is one of the tools that can be used. Aim: systematize the knowledge on the virtual reality effect over the balance in patients after stroke. Method: a literature review was realized in the period of April-May 2014, using Lilacs and Medline data base, by Pubmed, including original articles published from January 2004 to may 2014. Results: 24 articles were found, six

remained for they met the inclusion criteria, four randomized clinical trials, a single-arm clinical trial, and a case report. Conclusion: it was seen that virtual reality can be a supporting tool to rehabilitate balance in these patients, for the purpose of training task-oriented and motivational nature.

Keywords: Virtual reality; Balance; Stroke.

INTRODUCTION

The stroke is a neurologic condition, determined by brain lesion of vascular origin, ischemic or hemorrhagic, causing death of neurons and brain disorganization.[1] In Brazil, there is an incidence of 108 cases per 100 thousand people, a year.[2] Its main presentation is the hemiplegia or hemiparesis, which is characterized by sensory and motor impairment,[1] that result among other issues, in balance deficit, with consequential fall episodes and may reduce the functional capacity of the patients.[3,4,5]

Balance is defined as the condition in which all the power acting on the body are balanced in a way that the mass center remains inside the limits of stability, on the support base edges. In order to occur this, some compensatory strategies are used, such as balance, adjustment and protection reactions.[6] In some cases, these strategies are not effective enough to keep body balance, leading to falls. Authors report that 25% to 75% of post stroke patients have fall history and 10% of them, critical consequences.[7]

Physiotherapy becomes essential for these patients rehabilitation,[5] with its various approaches, like conventional physiotherapy. However nowadays there are innovative approaches as the virtual rehabilitation, aiming to simulate functional activities, indispensable for neurologic patients rehabilitation, creating more motivation and entertainment for them, improving the symptoms and thereafter their functional capacity.[8-12]

People that suffered any episode of stroke may show balance deficit, fact that along with other changes from hemiplegia, predispose to falls and consequent reduce of functional capacity. So, it is necessary to collect information about the influence of virtual rehabilitation on the motor and sensory improvement of hemiplegic and if its efficacy lap up to conventional physiotherapy, on balance rehabilitation of these patients. Thus, the goal of this study was systematize the knowledge about the effect of virtual reality over the balance of patients post stroke.

METHODOLOGY

A literature review was performed, using Lilacs and Medline database and Scielo and Pubmed virtual libraries. Data collection was held during February to May 2014. As descriptors, virtual reality, stroke, balance and related words in English, Spanish and Portuguese were used.

Original articles published from January 2004 to May 2014 that addressed about the effect of virtual reality with the use of video games, on the balance of post stroke patients were included. Articles whose goal was only identify the effectiveness of virtual reality on cortical reorganization were excluded.

RESULTS

The number of 24 articles were found, addressing virtual reality on post stroke patients, 17 were excluded; five due to other approaches not

considering balance, four by the fact that they approached the cortical reorganization, five that only addressed the effectiveness of virtual reality in patients post stroke without focusing on balance, three for being systematic reviews, and one due to not consider videogames. Six original articles were included, five randomized clinical trials, and one case report. The Table 1 shows the characterization of the included studies.

Table 1 - Characterization of studies

Author, year	Type of study	Treatment Protocol	Balance Evaluation Instrument	Studies Conclusion
Barcala et al., 2013	Randomized Clinical Trial	Experimental Group (Conventional Physical Therapy and virtual reality) and control group (Conventional Physical Therapy).	Baropodometry, Stabilometry, Berg Balance Scale, Timed Up and Go test, Functional Independence Measure.	Physical Therapy associated with virtual reality improves balance and function in stroke victims.
Ki et al., 2012	Randomized Clinical Trial	Experimental Group (Conventional Physical Therapy and virtual reality) and control group (Conventional Physical Therapy).	Berg Balance Scale, Timed Up and Go test.	Important improvement of dynamic balance in experimental group.
Barcala et al., 2011	Randomized Clinical Trial	Experimental Group (Conventional Physical Therapy and virtual reality) and control group (Conventional Physical Therapy).	Baropodometry, Stabilometry, Berg Balance Scale.	Physiotherapy associated with Wii Fit® features important results on rehabilitation of hemiparetic individuals.
Gómez et al., 2011	Randomized Clinical Trial	Experimental Group (Conventional Physical Therapy and virtual reality) and control group (Conventional Physical Therapy).	Berg Balance Scale, Anterior Reach Test, Timed Stair Test, 1-minute walking test, Timed Up and Go test.	Virtual reality as a safe and effective alternative for balance rehabilitation.
Kim et al., 2009	Randomized Clinical Trial	Experimental Group (Conventional Physical Therapy and virtual reality) and control group (Conventional Physical Therapy).	Balance Performance Moitor, Berg Balance Scale, 10-m walking test, Modified Assessment Scale and GAITRite.	Virtual reality had an additive effect on the locomotor recovery of post stroke hemiparetic patients.
Flynn et al., 2007	Case Report	A post stroke patient realized 20 sessions with virtual reality	Dynamic Gait Index, Fulg-Meyer Assessment, Berg Balance Scale.	Virtual reality can be used for sensory motor recovery post stroke.

DISCUSSION

The majority of studies, report that there was randomization of the patients in two groups, one group that realized conventional therapy and other that added virtual reality to the therapy.[4,13-16] However, only two describe that the randomization was realized through a computer program,[13,14] which may characterize medium risk of bias on the others. Another author, reports that randomization was reached from a randomization table, which may determine an uncertain risk of bias.[16] None of the authors report how the partition was conducted, with no information if there was confidentiality lease of the patients on both groups. Only one of them expose that the study is double blinded, for the patients and therapists did not know the division between groups4 and another study reports blinding only from the evaluator.[16]

On the aforementioned studies, the patients were performing conventional therapy on both groups.[4,13-15] Only two of them describe the protocol used for this conventional therapy,[4,16] one of them consisted of rhythmic stabilization exercises, articular stabilization exercises for knee and hip, training weight transfer between the lower limbs to improve symmetry, balance training with gravity center displacement on the anteroposterior and laterolateral directions.[4] On the other, the exercises included stretching, joint mobilization, static and dynamic balance training and functional activities training.[16] The other authors only quote that the patients performed the exercises aiming the balance training.

In all studies patients underwent activity with virtual reality.[4,8,11,13-15] There was a disagreement among the authors regarding the duration of treatment and as to the number of sessions. Two of them carried out 20 hours of segmented therapy in three to five sessions per week.[11,14] In three studies, the group that conducted the intervention with virtual reality had additional treatment time of 30 minutes compared to the control group who only performed the conventional physiotherapy. In these three studies, the group subjected to virtual reality got more positive response in maintaining balance, which may have been for the benefit of the conduct or the longer treatment.[4,13,16]

Authors report that the selected games were intended to train balance,[4,8,11,13-16] but only four of them mention which games were used.[4,14-16] There was variation between the assessment instruments used in the studies. To assess static balance, the main instruments were Platform Pressure and the Berg Balance Scale (BBS).[4,8,13-16] For dynamic balance, the Timed Up and Go[8,11,13,16] and 10 meter walk Test.[4,8,14]

All studies showed improvement of balance in patients who participated in therapy with virtual reality, and refer potentially an important additional resource for the rehabilitation of patients with brain lesions.[4,8,11,13-16] One study demonstrated a significant improvement in static balance of patients using virtual reality compared to conventional therapy, but there was no significant difference in dynamic balance.[15] In contrast, in another study, the authors concluded that there was a significant improvement in dynamic balance in the group that underwent training with virtual reality, but there was no improvement in static balance in both groups.[14] This difference may be due to different assessment instruments used, which should be selected according to the purpose of the study.

In the clinical trial developed by Kim et al,[4] 2009, the experimental group, which used virtual reality for balance training improved scores on the BBS and on the ability to control the center of gravity in relation to the control group, as well as a significant improvement in gait speed. However, in another study authors found that patients in both groups showed improvement in static and dynamic balance in the BBS and the experimental group showed improvement in anteroposterior displacement, compared with control, reflecting better static balance.[15]

Researchers found that balance training with virtual reality can be beneficial even when it is done at home by the patient.[8,11] In a case report with the

goal of explore the use of low-cost virtual reality in a chronic hemiparetic individual post stroke, which used games from PlayStation 2® for 20 times, the authors ascertained that there was significant improvement in balance evaluated by Dynamic Gait Index and concluded that virtual reality used in household may be an adjunct to standard physical therapy, since it is easy to use and has a motivation potential.[11] In a single-arm clinical trial, patients underwent balance training with virtual reality for two weeks in an outpatient setting and a week at home. The authors observed, comparing with the literature, that patients improved from 15% at BBS and 29% in the TUG, justifying such improvements as a result of the balance training at home strategy sequel.[8]

The present study had the positive side, the fact of gathering publications on the use of virtual reality in balance recovery in post stroke patients, since this is a new tool that can be combined with conventional therapy. As limitation, the small number of publications on the subject, the methodological heterogeneity among studies and the lack of information about the injury site and patients age in the included studies.

CONCLUSION

Patients post stroke may evolve to balance deficits due to several changes of hemiplegia / hemiparesis. Physiotherapy is essential for rehabilitation of such patients, with virtual reality emerging as an additional resource to conventional therapy in the recovery of static and dynamic balance, with the purpose of the task-oriented training and motivational nature.

Due to methodological differences between the studies, it cannot be inferred the optimal protocol for the use of virtual reality as a resource for rehabilitation. It is suggested that further original studies should be conducted for a more consistent knowledge about the effect of balance training with virtual reality in post stroke patients.

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