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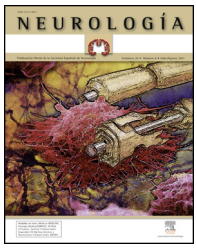

REVIEW ARTICLE

Virtual reality for therapeutic purposes in stroke: A systematic review☆,☆☆

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KEYWORDS
Virtual reality;
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Abstract
Introduction: Virtual reality (VR) is used in the field of rehabilitation/physical therapy to improve patients' functional abilities.

The last 5 years have yielded numerous publications on the use of VR in patients with neurological disease which aim to establish whether this therapeutic resource contributes to the recovery of motor function.

Development: The following databases were reviewed: Cochrane Original, Joanna Briggs Connect, Medline/Pubmed, Cinahl, Scopus, Isi Web of Science, and Sport-Discus.

We included articles published in the last 5 years in English and/or Spanish, focusing on using RV to improve motor function in patients with stroke.

From this pool, we selected 4 systematic reviews and 21 controlled and/or randomised trials. Most studies focused on increasing motor function in the upper limbs, and/or improving performance of activities of daily living. An additional article examines use of the same technique to increase motor function in the lower limb and/or improve walking and static-dynamic balance.

Discussion and conclusions: Strong scientific evidence supports the beneficial effects of VR on upper limb motor recovery in stroke patients. Further studies are needed to fully determine which changes are generated in cortical reorganisation, what type of VR system is the most appropriate, whether benefits are maintained in the long term, and which frequencies and intensities of treatment are the most suitable.

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☆☆ This study has not been presented at any national or international congress nor has it been published in any Spanish or international journal.

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PALABRAS CLAVE
Realidad virtual;
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Realidad virtual con fines terapéuticos en pacientes con ictus: revisión sistemática

Resumen
Introducción: La realidad virtual (RV) se utiliza en rehabilitación con el objetivo de mejorar las capacidades funcionales.

Es en estos últimos 5 años cuando aparece el mayor número de publicaciones sobre la utilización de RV en pacientes con patología neurológica, con el objetivo de determinar si este recurso terapéutico aporta mejoras en la recuperación de la función motora.
Desarrollo: Se ha realizado una revisión sistemática consultando las bases de datos Cochrane Original, Joanna Briggs Connect, Medline/Pubmed, Cinahl, Scopus, Isi Web of Science y SportDiscus.

Se han incluido artículos publicados en los últimos 5 años, publicados en inglés y/o español, realizados en pacientes con ictus, y que utilicen la RV para mejorar la función motora.

Finalmente, se han seleccionado 4 revisiones sistemáticas y 21 ensayos clínicos controlados y/o aleatorizados.

La mayoría de los estudios tienen como objetivo mejorar la función motora del miembro superior, y/o mejorar la realización de las actividades de la vida diaria, aunque también hay algún artículo cuyo objetivo es mejorar la función motora del miembro inferior-mejorar la marcha, así como mejorar el equilibrio estático-dinámico.
Discusión y conclusiones: Hay fuertes evidencias científicas de los efectos beneficiosos de la RV en la recuperación motora del miembro superior en pacientes con ictus. Se necesitan estudios que profundicen en cuáles son los cambios generados en la reorganización cortical, qué tipo de sistema de RV es mejor utilizar, determinar si los resultados se mantienen a largo plazo, y definir qué frecuencias e intensidades de tratamiento son las más adecuadas.

Introduction

Since J. Lamier first used the term 'virtual reality' (VR) in 1986, its definition has changed considerably as new 3-dimensional (3D) technologies have developed.[1–3] One of the most widely accepted definitions today states that VR is the computer-generated simulation of a real environment which enables the user to interact with certain elements in the simulated setting via a man-machine interface.[3]

When VR is used, virtual environments and objects provide the user with visual information (which can be viewed in a head-mounted display, on a projection system, or on a flat screen), as well as auditory, tactile, olfactory, and motion information.[3] There is a great variety of interfaces for interacting with the virtual environment, ranging from common devices (mouse, keyboard, joystick) to more complex ones with motion capture systems or even haptic devices, which provide tactile feedback and make users feel as though they are manipulating real objects.[3] The type of VR environment generated will depend on the equipment and software used.[4]

Virtual environments may vary in terms of the degree of immersion of the user. The term 'immersion' refers to the extent to which the user perceives that they are in the virtual environment rather than the real world and is related to the design of both the software and the hardware.[3,5–8] Based on this concept, we can classify VR systems and devices into 2 categories:

- Immersive VR systems fully integrate the user into the virtual environment. The user only sees computer-generated images, typically by means of a device which blocks out perception of the real world.[7,8] The most widely used immersive systems at present are Glasstrom, IREX, and PlayStation EyeMotion.[9]
- Semi-immersive or non-immersive VR systems are those in which the user perceives both the real world and part of the virtual environment. With these systems, the user is not fully immersed in the virtual environment.[7,8] The most widely used non-immersive systems at present are Virtual Teacher, Cyberglobe, Virtual Reality Motion, Pneumoglobe, and Nintendo-Wii.[9]

Some clinicians have started to include virtual reality in rehabilitation and physical therapy to improve motor function. Today, this technology is being increasingly used in the treatment of neurological disorders (stroke, Parkinson's disease [PD], spinal cord lesions, cerebral palsy). This has had an unquestionably positive impact on assessments, interventions, and patients' motivation to achieve the highest possible level of functional improvement.[7,9–11]

In the last few years, a large number of studies have addressed the use of VR in stroke patients with the aim of evaluating the validity and ease of use of these devices.[12–17] However, most of the articles analysing how this therapeutic resource improves motor rehabilitation in these patients have been published in the past 5 years.[18–20]

In this systematic review, we aimed to identify the VR systems and devices used with therapeutic purposes in stroke patients, and define the motor symptoms most frequently treated with VR (the effects and benefits of VR).