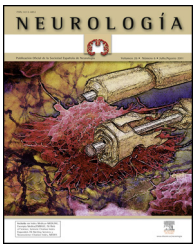
Neurología. 2014;29(9):550—559

NEUROLOGÍA

www.elsevier.es/neurologia



REVIEW ARTICLE

Use of virtual reality systems as proprioception method in cerebral palsy: clinical practice guideline☆

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Received 7 September 2011; accepted 17 December 2011
Available online 31 October 2014

KEYWORDS
Balance;
Cerebral palsy;
Motor learning;
Postural control;
Somatosensory development;
Virtual reality

Abstract
Introduction: The limitations in performing functional activities in children and adolescents with cerebral palsy are important. The use of virtual reality systems is a new treatment approach that reinforces task-oriented motor learning. The purpose of this guide is to study the impact of the use of virtual reality systems in the improvement and acquisition of functional skills, and to evaluate the scientific evidence to determine the strength of recommendation of such interventions.
Development: All available full-text articles, regardless of their methodology, were included. The following databases were consulted: PubMed (Medline), PEDro, EMBASE (OVID-Elsevier), Cochrane Library, Medline (OVID), CINAHL, ISI Web Knowledge. An assessment was made of methodological quality, the level of scientific evidence, and the strength of recommendations using the tools: Critical Review Form for Quantitative Studies and the Guidelines for Critical Review Form for Quantitative Studies and U.S. Preventive Services Task Force. Finally, we included 13 articles and 97 participants were recruited. We obtained significant improvements in outcome measures that assessed postural control and balance, upper limb function, the selective joint control, and gait.
Conclusions: The guide has some limitations: the limited number of patients enrolled, clinical diversity and age range, as well as the methodological quality of existing trials. Virtual reality is a promising tool in the treatment of children with cerebral palsy. There is strong scientific evidence of an acceptable recommendation for the use of virtual reality systems in the treatment of cerebral palsy.

☆ Please cite this article as: Monge Pereira E, Molina Rueda F, Alguacil Diego IM, Cano De La Cuerda R, De Mauro A, Miangolarra Page JC. Empleo de sistemas de realidad virtual como método de propiocepción en parálisis cerebral: guía de práctica clínica. Neurología. 2014;29:550—559.

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2173-5808/$ - see front matter

PALABRAS CLAVE
Aprendizaje motor;
Control postural;
Desarrollo sensoriomotor;
Equilibrio;
Parálisis cerebral;
Realidad virtual

Empleo de sistemas de realidad virtual como método de propiocepción en parálisis cerebral: guía de práctica clínica

Resumen
Introducción: Las limitaciones para realizar actividades funcionales en niños y adolescentes con parálisis cerebral son importantes. El empleo de sistemas de realidad virtual constituye un nuevo enfoque de tratamiento que refuerza el aprendizaje motor orientado a tareas. El objetivo del presente trabajo consiste en analizar qué repercusión tiene el empleo de sistemas de realidad virtual en la mejora y adquisición de habilidades funcionales; y evaluar la evidencia científica existente para determinar qué fuerza de recomendación tienen dichas intervenciones.
Desarrollo: Se incluyeron todos los artículos disponibles a texto completo independientemente de su metodología. Se consultaron las siguientes bases de datos: Pubmed (Medline), PEDro, Embase (OVID-Elsevier), Cochrane Library Plus, Medline (OVID), CINHAL, ISI web Knowledge. Se evaluaron la calidad metodológica, el nivel de evidencia científica y la fuerza de las recomendaciones con las herramientas: *Critical Review Form-Quantitative Studies and the Guidelines for Critical Review Form-Quantitative Studies y U.S. Preventive Services Task Force*. Finalmente, se incluyeron 13 artículos y se reclutó a 97 participantes. Se obtuvieron mejoras significativas en medidas de resultado que evalúan el control postural y el equilibrio, la funcionalidad del miembro superior, el control selectivo articular y la marcha.
Conclusiones: La guía posee algunas limitaciones: número de pacientes reclutados, diversidad clínica y rango de edad; así como la calidad metodológica de los ensayos existentes. La realidad virtual es una prometedora herramienta en el tratamiento de niños con parálisis cerebral. Existe evidencia científica con fuerza de recomendación aceptable para el empleo de sistemas de realidad virtual en el tratamiento de la parálisis cerebral.

Introduction

Background

Cerebral palsy (CP) is described as a range of disorders of motor and postural development that cause functional limitations attributed to non-progressive lesions arising in the developing fetal or infant brain.[1,2] It has traditionally been classified according to type of damage (spasticity, hypotonia, dyskinesia, or ataxia) and its topographical distribution (hemiplegia, diplegia, or tetraplegia). Until recently, there were no standardised methods for classifying cerebral palsy by subtype and severity of motor impairments. The Gross Motor Function Classification System (GMFCS) was developed to classify functional mobility in children diagnosed with cerebral palsy by level of motor function. It describes 5 levels ranging from level I, indicating children with minimal or no mobility dysfunction compared to the general population, to level V, including children who are totally dependent and need help moving around.[1] Although CP is the most common physical disability in childhood, its precise global incidence and prevalence rates are not yet known.[2] Thanks to population-based records, it is estimated that the prevalence of CP in developed countries is 2-2.5 cases per 1000 live births. The current survival probability is high, even for the most severe forms of CP, which results in increasing financial costs. A study in the USA estimated that direct costs (physician visits, hospital stays, assistive devices, and home modifications) and indirect costs (impact on work productivity) of CP in 2003 reached 11.5 billion dollars.[3]

Cerebral palsy and motor function

Skill development in children with CP is restricted by multiple factors that limit voluntary movements, whether manipulatory or mobility-related. These limitations are accompanied by postural constraints.[4]

Normal postural control requires combining sensory information from the visual, proprioceptive, and vestibular systems that provide information on the position and movement of the body and its surroundings. In normal postural control, this information must also be coordinated with motor actions. The proprioceptive system, also called the 'sixth sense', relays basic static (position) and dynamic (movement) information that enables us to know where our body is located in space. In the production of coordinated movement, proprioceptive feedback is critical for controlling muscles, limb segments during multi-joint movement, and movement trajectories. It also provides internal representations of the body that are essential for the acquisition and adaptation of motor skills.[5]

Postural control in patients with CP depends on the capacities of the neuromuscular and musculoskeletal systems. Their neuromuscular system has a restricted capacity for coordinating muscles in postural synergies, which gives rise to multiple dysfunctions in sequencing, in activation time for postural response, and in adapting posture to the setting. The main musculoskeletal dysfunction in these patients is body alignment. Lack of proper alignment between body segments leads to a change in body position with respect to the centre of gravity and the support base.