The Use of Nintendo Wii in the Rehabilitation of Poststroke Patients: A Systematic Review

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Background: To evaluate the effectiveness of the video game console Nintendo Wii (NW) in motor function, balance, and functional independence in the treatment of poststroke patients and to identify which games are commonly used in therapy. *Methods:* Randomized controlled trials were researched in MEDLINE, Cochrane Library, PEDro, CAPES Periodic, BIREME, and LILACS databases, covering publications up to March 31, 2014. The assessment of methodological quality was performed using the PEDro Scale as reference. *Results:* The 5 studies included for analysis showed that NW can provide an improvement of motor function of the individual, but the data are unclear when it comes to the balance and functional independence. *Conclusions:* It was concluded that there is little evidence to ensure the effectiveness and support the inclusion of the treatment with NW in patients with sequelae caused by a stroke; however, some of the studies analyzed suggest that NW can provide improvement in motor function. **Key Words:** Stroke—virtual reality exposure therapy—video games—rehabilitation.

The stroke is a change in the blood supply to the brain, causing an interruption in the supply of oxygen and nutrients, and consequently damaging the cerebral tissue.[1] It is considered the major cause of hospitalization and mortality, leading to 90% of individuals who have experienced a stroke, some kind of malfunction, be it partial or total,[2] depending on the extent of the injury and the brain area that is affected.[3] Hemiplegia[4] and hemiparesis are among the major sequelae, affecting 85% of patients,[5] as well as dysfunctions in the gait, balance, increased risk of falling,[6] and difficulty to perform daily life activities.[2]

The approach adopted in the therapeutic management of individuals who have been affected by a stroke is to improve the functional capacity and prevent secondary complications, enabling the reintegration of the patient in their socio-familial environment.[7] An important factor in rehabilitation is, however, the repetition of specific movements,[8] which may make treatment monotonous and patients' motivation loss, increasing treatment program's nonattendance.[9]

The use of games in rehabilitation, particularly related to the scope of virtual reality programs, is, therefore, considered to be a valuable tool, as they are designed to be fun and interactive, with many challenges and motivational features that encourage users to improve their performance repeatedly.[9] The Nintendo Wii (NW) console is a simple and handy virtual mode of therapy that

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is being used in stroke units and rehabilitation worldwide.[10]

Therefore, some studies have explored its value in treating these patients to fill gaps concerning the evidence on its contribution to the main impairments arising from stroke, such as muscle strength, balance, and functional independence.[5,11-14]

However, there is still a need to establish its effectiveness as a therapeutic option in the rehabilitation of patients who have been affected by stroke impairments. Thus, the present study aimed at systematically reviewing the evidence to assess the effectiveness of treatment with NW in motor function, balance, and functional independence of poststroke patients and identifying which games are used in therapy.

Method

This systematic review followed PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) protocol guidelines.

The electronic survey was conducted from January to March 2014 using the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed), Cochrane Register of Controlled Trials (CENTRAL CCTR/Cochrane Library), Physiotherapy Evidence Database (PEDro), CAPES Periodic, Regional Library of Medicine (BIREME), Latin American and Caribbean Literature on Health Sciences (LILACS).

The relevant studies were obtained by crossing the descriptors in Portuguese and English, using the Boolean operators "AND" and "OR." PubMed descriptors, however, were used for MeSH (Medical Subject Headings) and DECS (Health Sciences Descriptors) for the other databases: MeSH—"virtual reality exposure therapy," "video games," and "stroke"; DECS—"video games," "stroke."

Although "wii" and "virtual reality" are not MeSH descriptors and DECS, they were kept in the research strategy to avoid missing important primary studies. The assessment of methodological quality of the studies was conducted by the PEDro Scale. Research strategy for electronic databases used in this systematic review is shown in Table 1.

Selection of Studies

The identification and selection of studies in the electronic research were performed by 2 reviewers who independently evaluated the titles and abstracts of all primary studies. Afterward, when a study was considered an eligible reference, the full text of the study was obtained to assess whether it fulfilled the pre-established inclusion criteria.

Inclusion Criteria

Randomized controlled trials (RCTs) that used the video game console NW in treating individuals with a clinical diagnosis of stroke and that meet sequelae of this pathology were included. Sample characteristics of the studies were pre-established in individuals of both sexes with age between 18 and 70 years.

Exclusion Criteria

Review articles, meta-analysis, and editorials were excluded, as well as published studies on the clinical trial protocol layout for they do not have final data to be analyzed in this systematic review.

Data Extraction and Study Quality

Data extraction of included studies was performed using a standardized form developed by the authors, which is an adaptation of Cochrane Collaboration checklist[15] for data extraction. The form was made of fields to be filled by a reviewer in the following order: (1) study identification (main author's name, year, published magazine, and country); (2) study method (type of study, blinding, and secret allocation); (3) target population aspects (age, sex, and time of injury); (4) aspects of the intervention performed (sample size, type of games used, presence of supervision, frequency, session length, and follow-up); (5) presence of follow-up; (6) loss of follow-up; (7) studied outcomes; and (8) presented results.

To assess the methodological quality of the RCTs, the PEDro scale was used, based on the Delphi list.[16] It examines whether the study contains sufficient statistical information to allow the results to be interpretable.[17] It consists of 11 items with scores ranging from 0 to 10. As the first

Table 1. *Strategy for electronic databases survey*

Electronic databases	Key words (DECS/MeSH)
PubMed	(''Virtual Reality Exposure Therapy''[Mesh]) OR ''Video Games''[Mesh]) AND ''Stroke''[Mesh]
Library Cochrane	Stroke AND Wii; Stroke AND Virtual Reality Exposure Therapy AND Stroke AND Video Games
PEDro	Stroke AND Wii; Stroke AND Virtual Reality Exposure Therapy AND Stroke AND Video Games
CAPES periodic	Stroke AND Wii; Stroke AND Video Games AND Stroke AND Virtual Reality
BIREME	Stroke AND Wii; Stroke AND Video Games AND Stroke AND Virtual Reality
LILACS	Stroke AND Wii; Stroke AND Video Games AND Stroke AND Virtual Reality