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Systematic Literature Review

VR's EFFICACY IN IMPROVING UPPER EXTREMITY MOTOR FUNGCTION IN STROKE PATIENTS

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A B S T R A K

Background: Stroke remains the second leading cause of death and the third combined cause of death and disability expressed by disability-adjusted lost life years (DALYs) in the world. Technological developments are used to provide more personalized and precise health services and are used for stroke prevention.
Purpose: The purpose of this literature review is to look at the Effectiveness of Increasing Upper Extremity Motor Function Based on Vertual Reality Technology in Stroke Patients.
Methods: The method used in the search for articles is database: Clinicalkey Nursing, EBSCOhost, EMBASE, ProQuest, Sage Journal, ScienceDirect, Scopus, SpringerLink and ClinicalKey.
Results: Based on a literature review of 5 selected articles, it was found that virtual reality is effective for improving upper extremity motor function in stroke patients.
Conclusion: Stroke patients can use virtual reality as a therapy to improve upper extremity motor function.

INTRODUCTION

The WHO defines stroke as a functional brain disease that arises quickly with focal and global clinical signs and symptoms lasting 24 hours or longer [1]. In 2022, the World Stroke Organization (WSO) expects strokes to remain the second and third major causes of death and disability, as measured by disability-adjusted lost years of life (DALYs). From 1990 to 2019, stroke incidence grew 70.0%, stroke deaths 43.0%, standard strokes 102.0%, and DALYs 143.0%, with most of the global stroke burden (86.0% of deaths and 89.0% of DALYs) in low- and lower-middle-income countries (LMIC). Stroke causes most upper-extremity motor abnormalities. Stroke causes long-term upper extremity motor deficits and lower health-related quality of life [2]. Stroke is a global pandemic. Stroke is the second leading cause of death and disability [3]. Stroke patients with upper-extremity hemiparesis need intensive treatment to improve motor function. Physiotherapy is needed alongside medical treatment [4]. In 2018, 10.9% of Indonesians aged 15 or older were diagnosed with stroke, or 2,120,362 persons. (2018). Hence, the Indonesian government has created numerous stroke prevention techniques. Beginning with enhancing public health promotive measures such lobbying for balanced healthy food consumption, managing blood sugar levels, regular physical activity, and at

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least six monthly health exams. The government uses digital technologies to improve stroke services in all hospitals. The health minister wants stroke care to evolve. This technology can improve health care. This may help avoid strokes. So, this study examines virtual reality studies on improving upper extremity motor function in stroke patients.

METHOD

In the initial phase, the researcher identified research questions utilizing the PEOS framework, an effective search approach according to the researcher.

Table 1. PEOS Framework

P	Population	Patient Stroke
E	Exposure	Virtual Reality Technology
O	Outcome	Upper Extremity Motor Function
S	Study Design	Randomized Controlled Trial (RCTs)

This research was conducted using the literature review method. The search was carried out between October and November 2022, with databases such as ClinicalKey Nursing, EBSCOhost, EMBASE, ProQuest, Sage Journal, ScienceDirect, Scopus, SpringerLink, and ClinicalKey being used to implement search strategies. When searching the database, use the boolean operators “AND” and “OR” to combine keywords. The keywords were motor function, muscle strength, upper limbs, virtual reality, virtual reality technology, stroke, and stroke patients. Articles were selected based on search criteria in English, publication deadlines applied between 2017-2022, full-text availability, and stroke patients and reports were determined using a randomized controlled trial (RCT) approach. In a search for all articles using keywords, 2,153,441 articles were found in nine databases. Then, these were narrowed down (Full Text, 2017–2022, English, Randomized Controlled Trial, Clinical Trial, Neurology, Academic Journals, Virtual Reality, Stroke, Scholarly Journals, Evidence-Based Healthcare, Intervention, Open Access, Article). Based on the screening results, five articles were chosen to be looked at in this literature review.

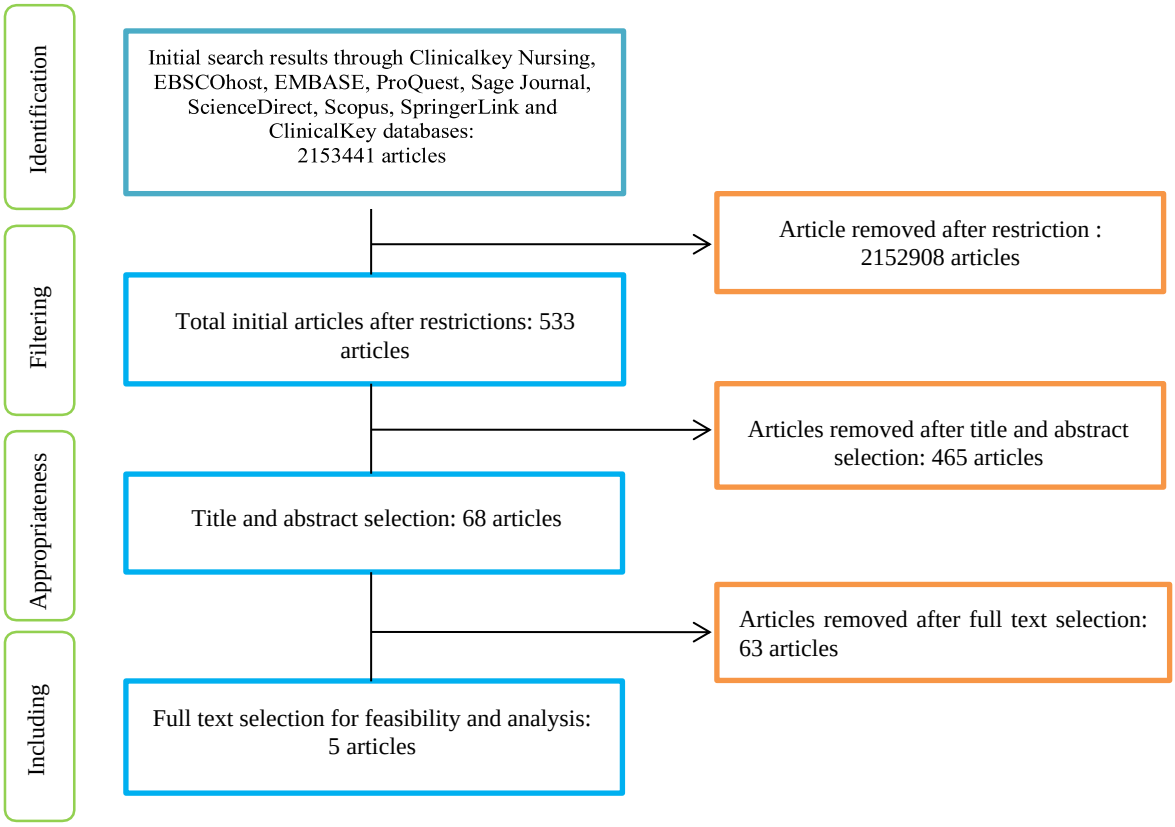

Figure 1. Literature review selection process adapted from PRISMA (2009).

RESULT DAN DISCUSSION

This literature review includes five international studies. Five papers used experimental research. Review results are tabulated.

Table 1. Description of the articles reviewed

Reference	Research Desain	Country	Result
(Salvalaggio et al., 2022)	Randomized Controlled Trial (RCT)	Italy	Single immediate feedback manipulation had no therapeutic advantage over multimodal feedback for stroke rehabilitation, however combining traditional 40-hour therapy with virtual reality had a significant intervention impact (Cohen's d 1.14 and 0.92 for both groups).
(Ul Ain et al., 2021)	Randomized Controlled Trial (RCT)	China	Stroke patients can improve upper limb motor function with Xbox Kinect-based upper limb rehabilitation training and standard therapy.
(Chen et al., 2021)	Randomized Controlled Trial (RCT)	Taiwan	The iTBS+VCT group improved MASUE, BBT, NHPT, MAL, and SIS, whereas both groups improved FMAUE and ARAT. The Mann–Whitney U test showed that after treatment, both groups improved FMAUE and ARAT, but only the iTBS+VCT group improved MASUE, BBT, NHPT, MAL, and SIS. In MASUE, MALAOU, and SIS, the iTBS+VCT group outperformed the sham group by a Mann–Whitney U test. FMAUE, ARAT, BBT, NHPT, and MALQOM changed similarly among groups.
(Aşkın et al., 2018)	Randomized Controlled Trial (RCT)	Turkey	Chronic stroke patients may enhance UE and AROM with Kinect-based VR training. Its efficacy in neurorehabilitation requires larger research with longer follow-ups.
(Ikbali Afsar et al., 2018)	Randomized Controlled Trial (RCT)	Turkey	Brunnstrom's upper extremity Fugl-Meyer, Box & Block Test, and Functional independence scores increased considerably from baseline to post-treatment in both experimental and control groups. Brunnstrom's stage, Functional independence assessments, and Fugl-Meyer gains were similar between groups, however the experimental group's upper limb stage and Box & Block Test gains were significantly higher than the control group's.

Following the completion of the final step in the selection process for the downloaded articles, a total of five articles were collected for evaluation. 2022 was the year that saw the publication of the most current article. It was found in the articles that were reviewed that providing feedback with the visual teacher during movement in an enriched environment did not change motor movement. Additionally, it was found that only one type of feedback that could manipulate (i.e. visualization of the virtual teacher's presence) was not enough, in clinical settings already providing multimodal stimulation, to induce significant differences for direct exploitation of the supervised and reinforced motor learning paradigm. The combination of VR and CT, on the other hand, produces a sizeable intervention impact. During the course of their virtual reality rehabilitation, patients should be provided with a variety of input combinations (for example, visual, aural, a virtual teacher, or haptic). Future research should investigate the effects of these combinations. Therefore, clinical trials should be designed to compare different types of feedback with low or no feedback to patients, rather than focusing on small differences in similar multimodal settings. This will allow

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researchers to investigate the actual effect that cumulative feedback has in real clinical practice. to encourage motor function; this is researched in the context of stroke rehabilitation (Salvalaggio et al., 2022).

In addition to traditional treatment, upper limb motor function in stroke patients may benefit from repetitive use of the hemiparelic upper limb using Xbox Kinect training-based upper limb rehabilitation training. This training has a promising potential to improve upper limb motor function. The findings are in line with those of earlier studies and lend credence to the utilization of Xbox Kinect training in the rehabilitation context for patients who have suffered from chronic stroke. Upper limb therapy that is not expressly meant to target cognitive function has little effect on cognitive ability, however training using an Xbox Kinect has a noticeable impact on increasing movement in synergy and wrist function, as well as coordination. (Ul Ain et al., 2021).

The application of iTBS in the ipsilesional hemisphere has boosted the effectiveness of VCT in terms of lowering spasticity, increasing actual use of the afflicted upper extremity, and enhancing involvement in day-to-day activities. In addition, after receiving iTBS, not one of the patients suffered from any substantial acute side effects. This was true for all of the patients. In conclusion, iTBS may be a treatment option that is both effective and safe, and it may be used as an adjuvant therapy to improve the therapeutic effect of neurorehabilitation in patients who have suffered a stroke. To validate these findings, we require additional research on a much larger scale (Chen et al., 2021). It is possible that chronic stroke patients who make additional use of VR training based on Kinect may experience an improvement in their upper limb motor function (UE) and AROM. In order to determine whether or whether it is successful in neurorehabilitation, additional research must be conducted involving a greater number of participants over a longer period of time. (Aşkın et al., 2018)

From pre-treatment to post-treatment, the levels and scores that Brunnstrom achieved on the upper extremity Fugl-Meyer, Box & Block Test, and Functional independent tests dramatically improved in both the experimental group and the control group. Brunnstrom's upper limb stage and Box & Block Test gains for the experimental group were considerably larger compared to the control group's gains. On the other hand, Brunnstrom's stage gains, Functional independence measures gains, and Fugl-Meyer gains were comparable between groups. (Ikbali Afsar et al., 2018).

CONCLUSION

On the basis of the findings of the PICO analysis and checklist with critical appraisal performed on the five articles that were examined, it is possible to reach the conclusion that the application of virtual reality technology to stroke patients is an effective method for enhancing the motor function of the upper extremities.

ANNOUNCEMENT

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