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E-Learning Post Stroke Rehabilitation: Systematic Review

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Background: *Stroke is the biggest cause of death after heart attack and has an impact on disability that can reduce the quality of life. Disability due to stroke is the result of damage to motor, sensory and cognitive functions of the patient. For this reason, there is a need for rehabilitation that can repair the damage to this function. Rehabilitation in stroke patients can be combined with technological advances. This will have a good impact on the rehabilitation program for stroke patients. The purpose of this study was to provide knowledge about post-stroke rehabilitation programs using electronic learning programs.* ***Methods****: This research design uses a systematic review approach by collecting several articles from a data base published in 2011-2020. The article search was conducted by entering the keywords stroke rehabilitation audiovisual, stroke rehabilitation video, stroke rehabilitation system, and stroke rehabilitation telecommunications. Article searches have predefined inclusion and exclusion criteria. Inclusion criteria included patients diagnosed with stroke. The research design was a randomized control trial and experimental research. Exclusion criteria included stroke patients who were being hospitalized.* ***Result****: The results of a database search obtained 9,409 articles, from Pubmed 379 articles, Proquest 7,640 articles, and Google Scholar 1,390 articles. After sorting with predetermined criteria, 6 articles were found that matched.* ***Conclusion****: The conclusion in this study was that the post-stroke rehabilitation e-learning program gave significant results in improving motor, sensory and cognitive functions of patients in living their daily lives.*

I. Introduction

Stroke is the leading cause of death after heart attack. Stroke also has an impact on sufferers in living their quality of life. Not only that, stroke can also cause disability in patients (Nasution, 2013). According to the World Health Organization (WHO) stroke is defined as a functional brain disorder that occurs suddenly with clinical signs and symptoms both focal and lasting 24 hours or more (Steiner E, et al. 2016). The incidence of stroke in Indonesia is in the third position after heart disease, in 2013 it was recorded that 1.2 million people suffered a stroke (Wicaksana, 2017).

Stroke is a disease that requires continuous care, not only in hospital, but also requires treatment at home. Stroke sufferers require treatment in the form of rehabilitation, in order to restore the function of their limbs to approach the physiological function to be able to improve their life skills (Ann, et al. 2013). But in fact many stroke sufferers miss home care such as rehabilitation, such as physical exercise (Dodakian L, et al. 2017). Many things cause patient non-compliance in doing rehabilitation, such as lack of family time in taking the patient, limited resources, location where the patient lives, education and socio-economics (Chumbler, et al. 2015). Post-stroke care is needed in order to restore the function of the patient's limbs and improve their life skills. Barriers in the rehabilitation process can be solved by having regular home rehabilitation, which relies on the current state of the art technology (Da-Silva, et al. 2019).

The rehabilitation e-learning program for post-stroke patients is an alternative rehabilitation that can be used to overcome barriers to treatment for stroke patients. The provision of rehabilitation programs using e-learning will be guided by experts through a long-distance process that relies on telecommunication techniques, so that sufferers and their families can consult with experts. This e-learning rehabilitation program will increase the level of motor function in stroke patients and make it easier for patients to undergo the treatment process at home (Rolnick, 2013). E-learning rehabilitation will also provide benefits for stroke patients who live in remote areas, far from health services (Dodakian L, et al. 2017).

Post-stroke rehabilitation e-learning programs can provide new findings in helping provide care for sufferers. Therefore, researchers want to make a systematic review of the post-stroke rehabilitation e-learning process, to be able to provide practical information and develop standard operating procedures in the rehabilitation e-learning program

II. METHODS

Literature study was carried out by analyzing and summarizing each related article using a database search. The search method uses proquest, pubmed, and google scholar. The keywords used are stroke, e-learning rehabilitation, telecommunications rehabilitation, and electronic rehabilitation. The determination of the articles obtained must meet the complete article and comply with the established PIO criteria. The PIO framework (population, intervention, and outcome) is designed according to the criteria. The population is stroke sufferers aged more than 18 years, the intervention is the provision of virtual rehabilitation, video, short massage service (SMS), cellphone, computer and video), the outcome is the measurement result of the intervention that has been carried out which can be seen from the motor function and daily activities of stroke sufferers have increased independence. The inclusion criteria in this study were stroke patients with age more than 18 years. This research design uses a randomized control trial (RCT) which will be included in the literature review.

III. RESULTS

The results of a database search obtained 9,409 articles, from Pubmed 379 articles, Proquest 7,640 articles, and Google Scholar 1,390 articles. After sorting with predetermined criteria, Pubmed found 18 articles, Proquest 68 articles, and Google Scholar 24 articles, for a total of 110 articles. There are 46 of the same articles so that it becomes 64 articles, but only 21 articles that can be accessed for free. So that from 21 articles that have an article structure that is in accordance with the PIO, 6 articles are obtained that are appropriate

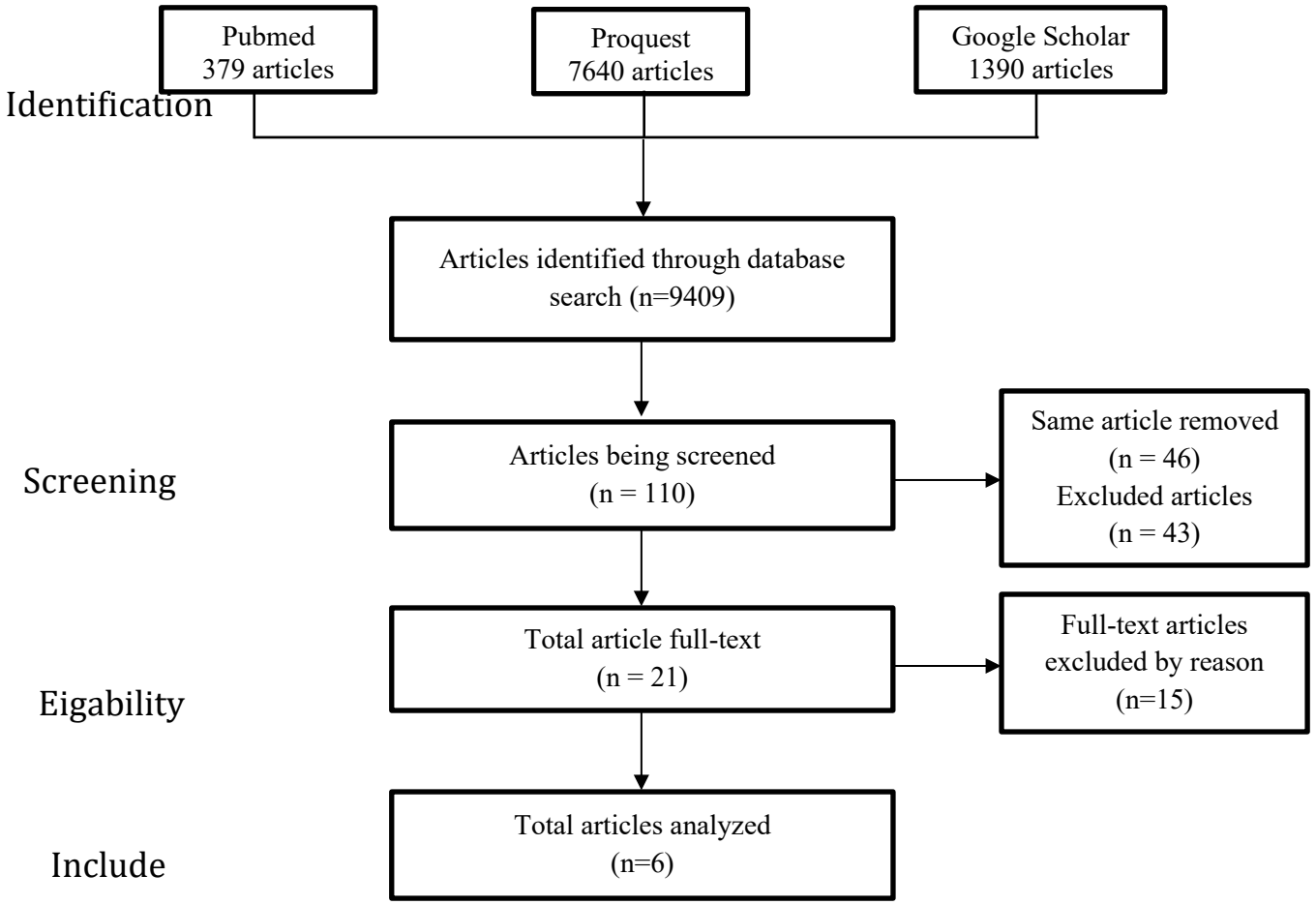

Figure 1. Flowchart of Review of Researched Articles

Table 1. Article Review Table

Artikel	Desain	Population/ Sample Charasteristic	Intervention	Outcome	Conclusion
Deng, et al. (2012) States of America	RCT	N=19 people were randomly divided into two groups. Post-stroke diagnosis	Using software programmed specifically for ankle movements.	Increased walking ability of participants	Dorsiflexion seen from the gait of the intervention group was significantly better than the control group. And the intervention group showed a change in the number of frequency of walking duration compared to the control group
Chumbler et al. (2012)	RCT	N=52 patients with ischemic or hemorrhagic stroke	Functional therapy by using device messages that are in	Physical function ability increases gradually	The provision of telerehabilitation interventions showed a

United States of America		in the previous 24 months, aged between 45 to 90 years.	the house and the treatment process can be monitored according to needs.		gradual increase in the physical function of the limbs which was carried out during 3 months of exercise.
Hage et al. (2018) Norway	RCT	N = 80 people with a diagnosis of post-stroke aphasia. In some public hospitals in Norway	Speech therapy using intensive language through video conferences for 3 months and evaluated using the Norwegian Basic Aphasia Assessment (NGA), Substance VAST (verb and sentence test) Communicative Efffectiviness Index (CETI) and Stroke and Aphasia Quality of Life Scale (SAQOL-39).	Improved speaking ability of patients with post-stroke aphasia	Intensive language training pilots through video conferencing provide scientific evidence in the field of aphasia telerehabilitation, which has a significant impact on post-stroke aphasia in speech rehabilitation.
Jin et al. (2015) China	RCT	N = 210 people with a diagnosis of stroke infarct patient. 35-85 years old.	Therapy using physical exercise and neuromuscular electrical stimulation (NMES) after discharge from the hospital, which was carried out 2 hours per day.	Home-based rehabilitation to evaluate improved mobility and safety of tele-supervised rehabilitation	Home-based rehabilitation tele-supervision will be able to evaluate the improvement and safety of rehabilitation during the recovery of stroke infarct patients
Gauthier et al. (2017) United States of America	RCT	N=224 people, with chronic hemiparesis after stroke.	Video game rehabilitation for stroke patients with hemiparesis who underwent outpatient therapy was given video game therapy for 6 months.	Increased extremity movement function	Video game rehabilitation for stroke patients provides significant results in improving upper extremity movement function in patients with chronic hemiparases.
Gerald et al. (2015)	RCT	N=100 people, with a new stroke diagnosis, age >40	Telerehabilitation lasts for 3-6 months which includes daily	Improved ability in daily activities	This rehabilitation is a treatment that is given through video recordings

Singapore		years and having support in the rehabilitation process	exercise videos, which will later be evaluated with the Jette Late Life Functional and Disability (LLFDI) instrument consisting of an assessment of walking 5 meters with a time period of two minutes and basic daily activities (Barthel Index with Shah modification)		that will be followed by stroke patients and will be evaluated using LLFDI.

IV. RESULT

This literature study consists of 6 articles that discuss post-stroke rehabilitation electronic learning. Each article obtained has a variety of different actions to carry out rehabilitation using various electronic media. However, the results of the literature review in the post-stroke rehabilitation e-learning program can be concluded that the purpose of this post-stroke rehabilitation program is to enable the patient to meet the needs of basic daily activities and return to social functions in life. Post-stroke rehabilitation e-learning refers to the delivery of rehabilitation services through electronic and information and communication technologies, which include monitoring, prevention, intervention, supervision, consultation and counseling (Jin, et al. 2015).

E-learning has the capacity to be able to provide services throughout the patient's life, in all locations where patients are and in all places of care. The types of interventions obtained include videos, video games, virtual reality, short messages, cellphones or computers.

VIDEO

Video is a technology that sends an electronic signal from a moving image (Gauthier, et al. 2017). Post-stroke rehabilitation through video can be an intervention in the speech therapy process for stroke patients with aphasia, to be able to improve speech processes and word pronunciation (Hege P, et al. 2018). Video is also not only used in speech therapy, but can also be used for physical activity therapy, such as exercise. In simple terms, the process of stroke patients with upper extremity hemiparesis, patients can exercise by controlling the remote on electronic media such as television (Caves, et al. 2015). The provision of interventions using video also requires observation and supervision in the process. In order to maintain patient compliance in routine rehabilitation.

GAMES VIDEOS

Video game-based therapy for the rehabilitation of stroke patients will increase the intensity of exercise, muscle movement techniques for post-stroke patients and improve thinking processes that help the patient's brain memory (Gauthier, et al. 2017).

VIRTUAL REALITY

Modality therapy uses virtual reality (VR) which will encourage the patient and motivate the patient to move the part that is experiencing weakness (Gauthier, et al. 2017). The process of

rehabilitation using VR will provide a systematic direct assessment of the process of muscle movement that has been processed by a computer (Huiqiong D, et al. 2012).

SMART PHONE AND COMPUTER

Advances in information technology are growing along with the times, so that the use of technological advances is starting to be used in the world of health. Rehabilitation e-learning provided to stroke sufferers through videos, video games, VR, and short messages can be combined into one electronic device, namely a smart phone or computer. Post-stroke physical activity exercises can be given through video, video games or VR via a smart phone or computer, using a 5 meter walking technique with a period of two minutes and basic daily activities, which are carried out routinely every day (Gerald, et al. 2015) .

V. DISCUSSION

Based on the results of the 6 articles obtained, it shows that the use of E-learning rehabilitation has a significant effect on the long-term care process for stroke patients, in improving treatment, re-treatment, and physical activity abilities. E-learning can also provide improved health services for the wider community who are especially difficult to get health services (Emma A., et al. 2019). The results of this systematic review and analysis also show that the use of e-learning rehabilitation can be used as an efficient treatment practice for stroke patients who are in outpatient settings who have difficulty accessing health facilities. Many forms of stroke rehabilitation E-learning programs can be used as a treatment process (Van de Ven, et al. 2015; Jackson JC, et al. 2012).

Rehabilitation e-learning also has a positive impact from an economic perspective. Because in the use of e-learning, sufferers only need to rehabilitate at their respective residences and do not need to go to health facilities every day, thereby reducing treatment costs. However, in the provision of rehabilitation E-learning, it is necessary to supervise patients, because in the articles obtained, some participants experienced dropouts while carrying out rehabilitation programs. So that the lack of supervision will result in a lack of consistency in doing post-stroke rehabilitation. Another drawback in providing E-learning rehabilitation for stroke patients is that if there is no internet network in the area, it will result in inaccessibility of rehabilitation programs.

VI. CONCLUSION

This systematic review is not used to prove the success of E-learning rehabilitation in restoring motor function in stroke patients. This systematic review is to provide insight regarding the application of technology in the world of health, as well as a form of rehabilitation program using e-learning. Establishment of standard operating procedures for making e-learning rehabilitation programs in order to provide optimal quality in post-stroke rehabilitation e-learning programs.

VII. CONFLICTS OF INTEREST

There is no conflict of interest in this research

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