Original Research

Effect of Combination Mirror Therapy and Cylindrical Grip on Self-Care of Post-Stroke Ischemic Patients

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ABSTRACT

Introduction: Stroke is the leading cause of disability at a productive age. Hemiparesis upper limb is an example of a disability that is found post-stroke, which limits self-care such as eating, bathing, toileting and dressing. The purpose of this study was to determine the effect of a combination of mirror therapy and cylindrical grip on improving self-care of post-stroke patients.

Methods: The design of this study was quasi-experimental (pre-post test with control group design). The population was post-stroke patients who experience upper limb hemiparesis in the Medical Rehabilitation Poly. A sample of 66 respondents (33/33) was chosen using purposive sampling. The independent variable was a combination of mirror therapy and cylindrical grip, and the dependent variable was self-care. Data were collected using a self-care questionnaire with strong validity and reliability. Analysis was undertaken using Kolmogorov Smirnov and Wilcoxon Sign Rank Test. Interventions were given three times a week for a month.

Results: In the intervention and control groups there were significant differences between self-care before and after the intervention with a value of 0.000 (p <0.05).

Conclusion: The increase in the intervention group can be seen from the sub-variables in self-care toileting, which involves cleaning the genitalia area after defecation/urination. This intervention stimulates the finger sensory and motor nerves so that they can perform self-care to the maximum. A combination of mirror therapy and cylindrical grip has been shown to improve self-care.

INTRODUCTION

Stroke is the third leading cause of death in the world and the leading cause of disability at a productive age (Koyama et al., 2018). Upper limb hemiparesis is the most common example of disability after ischemic stroke with a percentage of 73%. 80-85% of these ischemic strokes occur in the supratentorial (STS) which affects the vertebrobasilar region, involving the cerebellum and brain stem which causes many hemipareses in the upper limb (Park et al., 2015). In individuals with hemiparesis, spasticity, muscle weakness, and permanent disruption in the coordination of movements in both fine and gross motor skills there are limitations in self-care (Park et al., 2015). Self-care needs to be improved by individuals because the implementation of self-care requires learning, knowledge, motivation and skills (Dewie & Has, 2017). Self-care agency refers to the complex ability to carry out self-care. For example, giving mirror therapy needs to be preceded by increasing patient knowledge about self-management after being diagnosed with stroke and experiencing impaired balance and limb muscle weakness. Ischemic post-stroke hemiparesis occurs not because of musculoskeletal abnormalities but is caused by damage to the central nervous system that controls the neuromusculoskeletal system and normal

postural reflex mechanisms (Chan & Au-Yeung, 2018). Various attempts were made to improve the independence and self-care of patients, but the implementation of a combination of exercises using tools or media as an active brain stimulation to improve self-care has never been attempted.

The upper extremity plays an important role in daily activities and self-care because it is associated with fine motor skills, especially on the fingers (Dewie & Has, 2017). The impact of these conditions causes the patient to experience self-care deficit or dependence on others and need nursing assistance on an ongoing basis so that patients and families can gradually perform self-care independently such as self-care bathing, dressing, eating and toileting (Vergara et al., 2014). Cylindrical grip is an exercise to stimulate fine motor motion, especially the fingers on the hand in the form of exercises to grasp and squeeze a cylindrical shape (Cai et al., 2018). Mirror therapy is a form of rehabilitation/exercise that relies upon and trains the motorized imagery/imagination of a patient whose nature induces activation of sensory and motor cortex nerves in post-stroke patients (Choi et al., 2019). Improved self-care for stroke patients is formed based on the Theory of Self-Care from Orem and Adaptation from Sister Callista Roy. Orem identified ten basic factors that influence self-care agency (basic conditioning factor) one of which is the level of health. Nurses must be able to identify the therapeutic demand for self-care and the development and level of self-care agency of an individual because the therapeutic demand for self-care and self-care agency changes dynamically (Frank, 2016).

An imbalance between therapeutic demand for self-care and self-care agency impacts an individual's self-care deficit. Interaction between nurses and patients will occur if the patient experiences self-care deficit; this is where nursing agency emerges. The internal process adaptation system that occurs in individuals is defined by Roy as an effector system. The effector or adaptation model includes physiology, self-concept (psychic), role function (social) and dependency [1]. Nursing agency based on Orem's theory in this research is mirror therapy combined with cylindrical grip which becomes a regulator to create gross and fine motor adaptations to the upper limb (based on Roy's theory). The results obtained are output in the form of self-care agency, namely self-care improvement. Hemiparesis causes limitations in carrying out daily activities and self-care (Suhardingsih, 2012). In ischemic post-stroke patients, they will experience complications from sequelae or weakness on one side of the body called hemiparesis. Hemiparesis is caused due to spasticity or decreased muscle strength so that post-stroke patients experience limitations in carrying out daily activities and self-care. Self-care in the context of patients with chronic diseases such as stroke is very complex and requires adaptation with effective and efficient management in order to successfully manage and control chronic diseases including in the rehabilitative stage.

Supporting and educative implementation as a nursing agent in the form of learning and training in mirror therapy combined with cylindrical grip consists of several exercises using the upper limbs including the fingers (Machado et al., 2019). Mirror therapy is used to create a visual illusion which then activates mirror neuron cells in the parietal cortex and cerebellum (Vergara et al., 2014). Cylindrical grip works by increasing the sensory smooth touch of the fingers by increasing the pressure of the handheld receptors, activating the nerve cells C7 and T1 (Arya et al., 2015). Both of these combination therapies stimulate the coordination of upper limb movements of the sensory and motor nerves which can improve the self-care agency of post-stroke patients in the form of muscle strength, and the angular range of motion and fingers. This can lead to periodic recovery of physical function. This process is expected to provide a stimulus effect on the sensory nerves and motor muscles of the upper limb, thus impacting on increasing muscle strength, and range of motion of the upper limb and it can improve self-care in stroke patients in the areas of, for example, eating, dressing, bathing, dressing and toileting (Louie et al., 2019). The purpose of this study was to analyze the effects of mirror therapy in combination with cylindrical grips on the improvement in self-care of post-stroke patients.

MATERIALS AND METHODS

Research Design

This study used a quantitative research design with a quasi-experimental research design (pre-post test with control group design) (Nursalam, 2017). This research was conducted between November 2019 and January 2020 in Banjarmasin, South Kalimantan.

Participants and Recuitment

This study involved 66 respondents who were divided into 2 treatment groups and control groups (33/33) obtained by purposive sampling. Respondents were included based on inclusion criteria to reduce the effects of bias. The inclusion criteria in this study were: 1) patients were willing to be respondents; 2) patients had had hemiparesis of the upper limb for at least three months since the first attack; 3) patients had undergone therapy in medical rehabilitation for at least one week; 4) patients were in a conscious condition (composmetis) and cooperative; 5) Patients were accompanied by family; 6) patients were aged 45-69 years; and 7) their vital signs were in the normal range (BP: 110/70 mmHg-150/90 mmHg, RR: 16-20 x / m, HR: 60-100 x / m, T: 36.5-37.50C). Meanwhile, the exclusion criteria in this study were: 1) patients were experiencing cognitive impairment (delirium, dementia and amnestic disorders); 2) patients were experiencing hearing loss; 3) patients were experiencing visual field

Table 1. Characteristics of Respondents

Characteristics of Respondents	Intervention Group		Control group		Total	
	n	%	n	%	n	%
Gender						
Male	16	48.5	16	48.5	32	48.5
Female	17	51.5	17	51.5	34	51.5
Age (years)						
45-59	23	69.7	14	42.4	37	56.1
60-74	10	30.3	19	57.6	29	43.9
75-90	0	0	0	0	0	0
Hemiparesis						
Right	18	54.5	19	57.6	37	56.1
Left	15	45.5	14	42.4	29	43.9
Education Status						
Bachelor	11	33.3	16	48.5	27	40.9
High school	11	33.3	11	33.3	22	33.3
Middle School	5	15.2	3	9.1	8	12.1
Elementary school	5	15.2	3	9.1	8	12.1
No school	1	3	0	0	1	1.5
Employment Status						
Working	10	30.3	13	39.4	23	34.8
Not Working	23	69.7	20	60.6	43	65.2
Marital status						
Married	33	100	33	100	66	100
Not Married	0	0	0	0	0	0

disorders; 4) patients had disabilities, injuries or acute complications joint; and 4) respondents did not take supplements or additional drugs outside of hospital treatment. The drop out criteria in this study included the patient deciding to stop during the intervention and the patient not completing the therapy process.

Data Collection

The dependent variable is mirror therapy in combination with cylindrical grip and the independent variable is the self-care of post-stroke patients. The treatment group received mirror therapy combined with cylindrical grip while the control group received mirror therapy alone. Interventions in each group involved as many as 2 sessions, 1 session with a duration of 15 minutes with intervals between sessions of 5 minutes, 3 times a week for a month.

Data were obtained through a questionnaire modified for the level of patient independence based on the Theory of Self-Care from Orem for assessing post-stroke patients' self-care. Twenty questions were used to assess post-stroke patients' self-care relating to each of the sub-variables eating, dressing, bathing/toileting and dressing. Answers were categorized as follows: independence = 20, mild dependence = 12-19, moderate dependence = 9-11, heavy dependence = 5-8, total dependence = 0-4. This instrument was tested for validity on 15 stroke patients at Banjarmasin Hospital, and each question item had validity (r> 0.514) so that the instrument or question items correlated significantly to the total score (declared valid). The reliability test used Cronbach's alpha with a value of 0.875> suggesting all items were reliable and all tests had consistently strong reliability. Demographic data included gender,

age, hands with hemiparesis, education, employment status and marital status. Descriptive analysis was used for respondent characteristics. Analysis of influence was undertaken using the Wilcoxon Sign Rank Test statistical test.

This research protocol was declared to have passed an ethical test by the Health Research Ethics Commission of the Faculty of Nursing, Airlangga University on October 14, 2019 with a certificate of ethics number 1786-KEPK in an effort to protect human rights and patient welfare from therapy.

RESULTS

Characteristics of Respondents

Descriptive statistical analysis of the respondents' characteristics is shown in Table 1. This study included 66 post-stroke patients who had upper limb hemiparesis divided into intervention and control groups. The descriptive statistical analysis of self-care indicators in stroke patients is shown in Table II. Self care includes eating, dressing, bathing/toileting and dressing. Table 3 outlines the indicators and subvariable improvements in the intervention and control groups after treatment was given. Table 4 describes the statistical test results of the effects of treatment on each group.

Table 1. shows that in the intervention and control group, 32 people in this study were male and 34 were female and the highest number of people in any age range was for the 45-59 group at 37 people followed by an age range of 60-74 years for 29 people. The number of post-stroke patients who had right hemiparesis was more that 37 people. The education level of as many as 27 people wa to bachelor degree level with 45 respondents no longer working. All respondents in this study were married.

Table 2. Characteristics of Respondents

Indicators	Intervention Group		Control Group	
	n	%	n	%
Eating				
Able to take food to the plate using a spoon	15	45.4	16	48.5
Able to bring food to the mouth by hand	33	100	29	87.8
Able to eat using a spoon or fork	32	96.9	29	87.8
Able to cut food delicately using a spoon or fork or knife	31	93.9	33	100
Able to hold straws to drink	26	78.8	15	45.4
Able to hold a glass to drink	33	100	29	87.8
Make up				
Able to use makeup tools/able to shave a beard or mustache	33	100	22	66.7
Able to use rings/earrings or accessories	33	100	31	93.9
Bathing/Toileting				
Able to use dipper when bathing	31	93.9	32	96.9
Able to soap the body thoroughly	32	96.9	32	96.9
Able to dry self using a towel	30	90.9	33	100
Able to wipe face	33	100	29	87.8
Able to brush teeth	33	100	30	90.9
Able to clean impurities in genital areas after bowel movements	33	100	31	93.9
Able to wash hands after cleaning the genital area	33	100	32	96.9
Dressing				
Able to button clothes independently	31	93.9	25	75.7
Able to release belt	31	93.9	33	100
Able to raise or lower pants	31	93.9	27	81.8
Able to put on and take off a shirt	33	100	29	87.8
Able to tie or remove shoelaces	33	100	27	81.8

Table 3. Effect of Mirror Therapy Combined with Cylindrical Grip on Personal Care in the Intervention and Control Groups

Variables	Categories	Pre		Post	
		n	%	n	%
	Mild Dependency	20	30.3	1	1.5
Self-Care	Moderate Dependency	45	68.2	48	72.7
	Independent	1	1.5	17	25.8
Total		66	100	66	100

Table 4. Effect of Mirror Therapy Combined with Cylindrical Grip on Personal Care in the Intervention and Control Groups

Variable	Groups	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Delta (Δ)	p Value
Self-Care	Intervention	13.12 ± 1.799	18.79 ± 1.193	5.67	0.000
	Control	15.09 ± 3.348	17.09 ± 2.602	2	0.000

Table 2 explains that there are 4 indicators for self care. After being treated with mirror therapy combined with cylindrical grip for 4 weeks, the intervention group experienced a 100% increase in several sub-variables of self-care.

Table 3. For self care before the intervention, there are 20 respondents (30.3%) with mild dependency, 45 respondents (68.2%) with moderate dependency and only 1 respondent (1.5%) who was able to be independent. After 4 weeks of intervention, self-care increased to only 1 respondent (1.5%) with mild dependency, 48 respondents (72.7%) with moderate dependency and 17 respondents (25.8%) who were able to be independent.

Table 4. the intervention group obtained the mean self-care pre-test score of 13.12 ± 1.799. Whereas after doing mirror therapy combined with cylindrical grip for 4 weeks, the mean value for post-test self-care was 18.79 ± 1.193 in the intervention group and the delta value was 5.67. Wilcoxon test results in the intervention group showed that there were significant differences between self care before and after mirror therapy combined with cylindrical grip with a value of 0.000 (p <0.05). In the control group, the mean pre-test range of motion was 15.09 ± 3.348, whereas after mirror therapy had been carried out for 4 weeks, the mean value for the post-test range of motion was 17.09 ± 2.602 in the control group, with a delta value of 2. The Wilcoxon test results in the control group showed a significant difference between the range of motion before and after the mirror therapy combined with cylindrical grip with a value of 0.000 (p <0.05).

DISCUSSION

The administration of mirror therapy combined with cylindrical grip affects the self care of post-stroke patients with hemiparesis (Gurbuz et al., 2016; Muhlisin & Irdawati, 2010). Self care in post-stroke patients includes eating in terms of skills like holding

a spoon, taking food, cutting food, holding a glass and drinking straw. Make up refers to being able to use make-up tools, tidying up your beard or mustache or putting on accessories. Bathing and toileting involves tasks such as holding a dipper for bathing, soaping the body, drying yourself using a towel, wiping your face, brushing teeth, cleaning the genitalia area after defecation or urinating and washing hands after toileting. Dressing involves tasks like buttoning clothes independently, taking off a belt, putting on pants and tying shoelaces. Changes in the intervention group can be seen from the sub-variables in self-care bathing / toileting, in terms of those who could clean their genitalia area after defecation/urination (Suhardingsih, 2012).

These results are in line with research (Gialanella et al., 2008; Yang et al., 2018) which states that post-stroke patients have a significant problem with toileting, in terms of genital care because they experience weakness in the upper extremities and stiffness, especially in the fingers. Finger interventions provided in the form of exercise focused movements to the fingers can stimulate sensory and motor nerves for stroke patients to increase independence, especially in terms of toileting. This is because, with the exercises, the muscles will mobilize (Colombo et al., 2019). Muscle mobilization can prevent muscle stiffness, and blood circulation will increase muscle mass. If this is done routinely, muscle tolerance for movement will also increase (de Rooij et al., 2019). Mirror therapy combined with cylindrical grip given must be stimulated to make the motion response as good and as normal as possible. The training movement for post-stroke patients is a prerequisite for the achievement of the patient's independence, because exercise will gradually help the upper extremity function return to or close to normal, and give the patient strength to control his/her life.

Increased muscle strength and range of motion of the patient's upper limbs affect the increase in self-care abilities (Dewie & Has, 2017). Orem emphasized that individual self-care needs must be met. In patients who have upper limb hemiparesis, nurses play a facilitating role in helping stroke patients with self-care deficits to stand by providing interventions with mirror therapy combined with cylindrical grip for their self-care efforts (Andreas & Tendean, 2019). In patients who received hospital standard interventions in the form of mirror therapy, an increase in muscle strength of the upper limb was also shown.

The results of this study prove that mirror therapy combined with cylindrical grip and mirror therapy on its own affect the self care of post-stroke patients. Both of these combination therapies stimulate coordination of upper limb movements of the sensory and motor nerves which can improve the self-care agency of post-stroke patients in the form of muscle strength, and the angular range of motion and fingers. This can result in periodic recovery of physical function. This process is expected to provide a stimulus effect on the sensory nerves and motor muscles of the upper limb, thus impacting on increasing muscle strength, range of motion of the upper limb and improving self care in stroke patients.

CONCLUSION

The conclusion of this study is that mirror therapy combined with cylindrical grip improves self care especially in terms of toileting in post-stroke patients who have hemiparesis. Mirror therapy combined with cylindrical grip is an easy, inexpensive and safe therapy and has been proven to increase muscle strength, upper extremity range of motion and self care, so health workers can provide this intervention as pharmacological therapy support in hospitals. Health workers are also expected to be able to read, study and apply it to post-stroke patients who have hemiparesis. This study uses interventions of minimum frequency, duration and intensity so that researchers are expected to be able to add more training processes to further speed up the process of hemiparesis recovery.

CONFLICT OF INTEREST

No conflict of interest has been declared.

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