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"Mirror therapy combined with flash cards on the extremity function and stages of self-acceptance of stroke patients."
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Mirror Therapy Combined with Flash Cards on the Extremity Function and Stages of Self-Acceptance of Stroke Patients

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Abstract

Introduction: Stroke can impact all aspects of life, whether personal, social physical and psychological aspects. Psychological changes such as body image are important factors that need to be considered to boost the positive sense of self-acceptance in stroke patients with hemiparesis. One measure that can be taken to minimize the incidence of disability, both physically or psychologically, in stroke patients is mirror therapy (mirror therapy combined with flash cards). **The objective of this study** was to determine whether the administration of mirror therapy combined with flash cards can improve the function of the upper limb muscle strength and the stages of self-acceptance of stroke patients with hemiparesis. **The method**s of this study were quantitative, with an experimental research design. The design used was quasi-experiment with pre-test-posttest control group design involving 60 respondents with consecutive sampling technique for 5 months in the Nusa Indah Ward of the dr. Doris Sylvanus Palangka Raya General Hospital. Upper extremity/arm muscle strength was measured using the muscle strength scale from the Medical Research Council, while self-acceptance stages were measured using a stage questionnaire adapted from Kubler Ross. The data were analyzed with Wilcoxon and Mann-Whitley tests as well as multivariate analysis with Mancova test. **Results and analysis:** Our results showed that statistically, there was an increase in the mean value of muscle strength and self-acceptance stages of the treatment group from the control group. The results of the Mancova test showed that gender has an effect on the intervention given. **The conclusions** of this study are hoped to provide information to nurses in giving nursing care in stroke patients with hemiparesis on the upper arm and motivation to improve the patient's self-acceptance stages.

Keywords: stroke, mirror therapy, flash card

INTRODUCTION

Stroke is one of the neurological syndromes that can potentially cause disability in people (Tantular, 2015). Stroke, as one of the leading causes of morbidity and mortality, shows an increasing incident rate from year to year. It is the most common cause of death and long-standing disability worldwide. The World Health Organization (WHO) has established that stroke is a clinical syndrome characterized by symptoms in the form of impaired brain function which can cause death or disabilities that persist for more than 24 hours, which can be in the form of physical

disability and loss of physical function such as paralysis and communication disorders (Rahayu, 2014).

The incidence of stroke in Indonesia has risen sharply to become the third leading cause of death after heart disease and cancer. The incidence of stroke in Indonesia is the highest among countries with the same risk (Sarkamo, 2009). The data of the 2013 Basic Health Research shows that 7 out of 1000 people in Indonesia had stroke. The data shows that stroke is the main cause of death at all ages with the proportion of stroke (15.4%). Based on the results of diagnosis and symptoms, the highest prevalence of stroke was in South Sulawesi (17.9‰), DI Yogyakarta (16.9‰), Central Sulawesi (16.6‰), followed by East Java (16.9‰), and Central Kalimantan (12.1‰). In 2018, the results of Basic Health Research regarding stroke prevalence in Indonesia showed that 9 out of 1000 people were diagnosed with stroke with East Kalimantan being the region with the highest rate (14.7‰), while Central Kalimantan ranked 10th between DKI and Central Java (Riskesdas 2018).

Medical Record Data of the dr. Doris Palangka Raya General Hospital show that the number of stroke patients who are hospitalized has increased every year. In the period from October to December 2018, 155 stroke patients were hospitalized in the Neurology ward of the dr. Doris Sylvanus Palangka Raya General Hospital, a situation that necessitates serious attention because if it is not treated in a timely manner, stroke patients may suffer from paralysis and cognitive impairment. Immediate treatment is vital to reduce the risk of physical disabilities due to stroke (Batubara, 2015). Recovery of limb strength is still a major issue. More than 85% of stroke patients have hemiparesis and 55%-75% have limited functioning of their extremities after stroke. Extremity motor function is often disturbed, causing limited functional mobility.

The devastating impact of stroke is not only limited to motor physical function, but also includes psychological function because post-stroke patients feel alienated from people and they think that they are no longer useful because their lives depend more on others. Stroke patients are likely to not be able to do routine tasks like they used to on their own. Stroke impacts all aspects of life, personal, social, physical, and psychological aspects. Negative psychological conditions appear in stroke survivors as a result of these changes (Bienias et al., 2017). Psychological changes such as body image are important factors that need to be considered to boost the positive sense of self-acceptance in stroke patients with hemiparesis (Dykema & Hollis, 2016).

Decreased physical function of stroke patients is one of the stressors that must be addressed. Thus, patients need to be equipped with adaptability and effective coping strategies so as not to develop self-acceptance disorders. One measure to reduce the incidence of disability, both physical and psychological, in stroke patients is alternative therapy. One of the emerging therapies to restore physical function, especially muscle strength in stroke patients, is mirror therapy.

Mirror therapy is a relatively new alternative therapy to restore motor function in the limbs (Thieme 2013). It is a therapy focused on hemiparetic movements of the upper and lower extremities. It is a relatively new, simple, inexpensive, and reliable technique to repair limbs. This therapy is performed by placing a mirror in the patient's mid-sagittal plane so that the patient can see the image of the healthy hand, and providing a visual feedback loop that can correct the extremity. Mirror therapy in stroke patients involves moving the healthy extremity while looking at its reflection in a mirror positioned in front of the affected extremity (not visible), thus creating the illusion as if the impaired extremity is moving. This is in line with the study by Sengkey (2014) showing that mirror therapy is effective in rehabilitating stroke patients. Thus, based on this

finding, the authors were intrigued to study the effect of mirror therapy on the extremity function and stages of self-acceptance of post-stroke patients. The aim to this study was to determine whether giving mirror therapy combined with flash cards is able to improve the function of the upper limb muscle strength and the stages of self-acceptance of stroke patients with hemiparesis.

METHODS

This study used a quantitative and experimental study approach. The design used was quasi-experiment with pretest-posttest control group design. The population in this study was all stroke patients with hemiparesis treated in the dr. Doris Sylvanus Palangka Raya General Hospital. The sampling technique in this study was non-probability sampling with the consecutive sampling technique. The sample in this study was stroke patients with hemiparesis treated in the dr. Doris Sylvanus Palangka Raya General Hospital with the following inclusion criteria: aged 30-70 years, willing to be a respondent, good awareness, communicative and cooperative, and having upper extremity hemiparesis. Kriteria eksklusi pasien stroke dengan kesadaran menurun 60 respondents were taken, divided into 30 for the treatment group and 30 for the control group. Data di analisis menggunakan program SPSS versi 20

This study was conducted in the Nusa Indah ward of the dr. Doris Sylvanus Palangka Raya General Hospital from April to August 2022. Data collection was carried out through a questionnaire sheet in the form of respondent biodata containing respondent's initials, gender, age, marital status, education, and occupation. The self-acceptance stage questionnaire has been tested for reliability with a Cronbach's alpha coefficient of 0.86, containing 20 questions from 5 stages of self-acceptance.

Characteristics	Control n=30		Treatment n= 30		Total	
	n	%	n	%	n	%
Gender						
Man	15	50.0	13	43.3	30	100.0
Woman	15	50.0	17	56.7	30	100.0
Total	30	50.0	30	50.0	60	100.0
Age Group						
31 – 40 years	2	6.6	3	10.0	5	100.0
41 – 50 years	2	6.6	4	13.3	6	100.0
51 – 60 years	16	53.3	10	33.3	26	100.0
61 – 70 years	7	23.3	9	30.0	16	100.0
71 – 80 years	3	10.0	4	13.3	7	100.0
Total	30	50.0	30	50.0	60	100.0
Marital Status						
Married	24	80.0	20	66.6	44	100.0
Widowed	4	13.3	8	37.5	12	100.0
Single	2	6.66	2	26.6	4	100.0
Total	30	50.0	30	50.0	60	100.0
Occupation						

CS/RETIRED	9	30.0			6	20.0	15	100.0
Entrepreneur	4	13.3			9	30.0	13	100.0
Farmer	2				2	6.66	4	100.0
		6.66						
Unemployed/Housewife	15	50.0			13	43.3	28	100.0
Total	30	50.0			30	50.0	60	100.0

Analyses in this study included univariate analysis intended to describe the characteristics of each variable. These characteristics were divided into two groups, intervention group and control group. Bivariate analysis was carried out to prove the hypotheses of this study. Tests carried out in this study included simple regression correlation test for the equality of respondents' characteristics, chi-square tests, t test and independent t-test for sample, and also multivariate analysis to determine the effect of confounding variables on the relationship between independent variables and dependent variables using multivariate analysis of covariance (MANCOVA).

RESULTS

Respondents Characteristics

Table. 1 Frequency distribution of respondent characteristics based on gender, age group, marital status, and occupation

Table 2. Relationships between confounding variables and muscle strength measurement and self-acceptance stages of the treatment group and the control group

Counfounding variable	Dependent Variables								
	Self-Acceptance				P value	Muscle Strength				P value
	Low		High			Weak		Strong		
	n	%	n	%		n	%	n	%	
Gender										
Man	0	0.0	32	55.2	0.214	5	33.3	27	60.0	0.073
Woman	2	100.0	26	44.8		10	66.7	18	40.0	
Marital Status										
Married	1	50.0	49	84.5	0.297	13	86.7	37	82.2	0.507
Single	0	0.0	2	3.4		1	6.7	1	2.2	
Widowed	1	50.0	7	12.1		1	6.7	7	15.6	
Education										
Elementary School	1	50.0	12	22.4	0.854	3	20.0	11	24.4	0.806
Junior High	0	0.0	8	13.8		3	20.0	5	11.1	
Senior High	1	50.0	25	43.1		7	46.7	19	42.2	
University	0	0.0	10	17.2		2	13.3	8	17.8	
No School	0	0.0	2	3.4		0	0.0	2	4.4	
Occupation										
Housewife	6	40.0	15	33.3	0.679	1	50.0	20	34.5	0.827
CS	2	13.3	7	15.6		1	50.0	8	13.8	
Entrepreneur	0	0.0	3	6.7		0	0.0	3	5.2	
Private	1	6.7	9	20.0		0	0.0	10	17.2	

Retired	2	13.3	5	11.1		0	0.0	7	12.1	
Farmer	2	13.3	4	8.9		0	0.0	6	10.3	
Others	2	13.3	2	4.4		0	0.0	4	6.9	
Age Group										
< 30	0	0.0	2	3.4	0.507	0	0.0	2	4.4	0.297
31-40	0	0.0	3	5.2		2	13.3	1	2.2	
41-50	0	0.0	6	10.3		0	0.0	6	13.3	
51-60	0	0.0	26	44.8		8	53.3	18	40.0	
61-70	1	50.0	15	25.9		3	20.0	13	28.9	
> 70	1	50.0	6	10.3		2	13.3	5	11.1	
Total	2	100.0	58	100.0		15	100	45	100	

The effect of muscle strength and self-acceptance stages

Table 3. Comparison of upper limb (arm) muscle strength scores and self-acceptance stage scores of stroke patients in the Ruang Nusa ward of the dr. Doris Sylvanus Palangka Raya General Hospital (n = 60)

Variable	Mean of muscle strength and self-acceptance stages		Difference in Mean Value	P Value
	Control Group	Intervention Group		
Upper Extremity Muscle Strength (Arm)	3.16	3.27	0.11	0.741
Denial Stage	14.23	13.4	-0.83	0.031
Anger Stage	11	9.77	-1.23	0.104
Bargain Stage	17.43	15.47	-1.96	0.000
Depression Stage	12.6	13.03	0.43	0.223
Acceptance Stage	15.4	16.3	0.9	0.254
Total Self-acceptance	70.67	67.97	-2.7	0.032

Multivariate analysis with MANCOVA test

Box's Test of Equality of Covariance Matrices[a]

In Table Box's Test of Equality of Covariance Matrices, the p value (Sig) = 0.042 (p<α), then Ho is rejected, which means that there is a significant difference in matrices of variance or covariance of the dependent variables for all groups (fulfilled).

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.583	35.663[b]	2.000	51.000	.000	.583

	Wilks' Lambda	.417	35.663[b]	2.000	51.000	.000	.583
	Hotelling's Trace	1.399	35.663[b]	2.000	51.000	.000	.583
	Roy's Largest Root	1.399	35.663[b]	2.000	51.000	.000	.583
Sample	Pillai's Trace	.022	.571[b]	2.000	51.000	.568	.022
	Wilks' Lambda	.978	.571[b]	2.000	51.000	.568	.022
	Hotelling's Trace	.022	.571[b]	2.000	51.000	.568	.022
	Roy's Largest Root	.022	.571[b]	2.000	51.000	.568	.022
Gender	Pillai's Trace	.175	5.424[b]	2.000	51.000	.007	.175
	Wilks' Lambda	.825	5.424[b]	2.000	51.000	.007	.175
	Hotelling's Trace	.213	5.424[b]	2.000	51.000	.007	.175
	Roy's Largest Root	.213	5.424[b]	2.000	51.000	.007	.175
Status	Pillai's Trace	.089	2.479[b]	2.000	51.000	.094	.089
	Wilks' Lambda	.911	2.479[b]	2.000	51.000	.094	.089
	Hotelling's Trace	.097	2.479[b]	2.000	51.000	.094	.089
	Roy's Largest Root	.097	2.479[b]	2.000	51.000	.094	.089
	Pillai's Trace	.010	.251[b]	2.000	51.000	.779	.010

		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Education	Wilks' Lambda	.990	.251[b]	2.000	51.000	.779	.010
	Hotelling's Trace	.010	.251[b]	2.000	51.000	.779	.010
	Roy's Largest Root	.010	.251[b]	2.000	51.000	.779	.010
Occupation	Pillai's Trace	.054	1.443[b]	2.000	51.000	.246	.054
	Wilks' Lambda	.946	1.443[b]	2.000	51.000	.246	.054
	Hotelling's Trace	.057	1.443[b]	2.000	51.000	.246	.054
	Roy's Largest Root	.057	1.443[b]	2.000	51.000	.246	.054
Age Group	Pillai's Trace	.030	.786[b]	2.000	51.000	.461	.030
	Wilks' Lambda	.970	.786[b]	2.000	51.000	.461	.030
	Hotelling's Trace	.031	.786[b]	2.000	51.000	.461	.030
	Roy's Largest Root	.031	.786[b]	2.000	51.000	.461	.030
Gender * Status * Education * Occupation * Age Group	Pillai's Trace	.038	1.008[b]	2.000	51.000	.372	.038
	Wilks' Lambda	.962	1.008[b]	2.000	51.000	.372	.038
	Hotelling's Trace	.040	1.008[b]	2.000	51.000	.372	.038
	Roy's Largest Root	.040	1.008[b]	2.000	51.000	.372	.038

a. Design: Intercept + Sample + Gender + Status + Education + Occupation + Age Group + Gender * Status * Education * Occupation * Age Group

b. Exact statistic

For multivariate p values considering Hotelling's Trace values

Variable	p value	Interpretation
Gender	0.007	Gender is significant on the model (both variables, namely muscle strength and self-acceptance stages)
Marital Status	0.094	Marital Status, Education, Occupation, Age did not show significant results on the model (both variables, namely muscle strength and self-acceptance stages)
Education	0.779	
Occupation	0.246	
Age Group	0.372	

DISCUSSION

The results of this study showed that the number of men and women was the same in the control group, namely 50%, while in the treatment group, women outperformed men with 56.7%. In the age group, the highest score was in the age range of 51-60 years. This age range existed in both groups, namely the control group and the treatment group. For marital status, good response was shown by the control group, while 'married' was the dominant result for the treatment group. In the distribution of occupation, retired and entrepreneur status was high in both groups. From the results, it can be concluded that the results of the study on the characteristics of respondents based on gender, age group, marital status, and occupation between the treatment group and the control group tended to be the identical. This is in line with the study by Polikandrioti (2009) stating that stroke was the fifth leading cause of death for men and the third leading cause of death for women. The risk of stroke in men is higher than in women. Stroke affects all individuals of all ages. The older a person is, the higher the risk of stroke. The risk of stroke increases with age, with the incidence doubling for every decade after age 55 (AHA, 2017).

The results of analysis of relationship between respondent characteristics and muscle strength and stroke patient self-acceptance showed that after being given mirror therapy combined with flash cards, both groups showed that there was no relationship between respondent characteristics, whether gender, marital status, education, occupation, and age group, and muscle strength and self-acceptance, shown by a p value > 0. Meanwhile, the results of analysis of the effect of muscle strength and self-acceptance stages in the treatment group receiving mirror therapy combined with flash cards and also strength and self-acceptance showed that there was a decreased score in the anger stage (-1.23) but p>0.05 and a higher score for upper extremity (arm) muscle strength (0.11) but p>0.05. Furthermore, in the self-acceptance stages of bargaining stage, the p value was lower with 0.008. The results of the study of the effect of mirror therapy combined with flash cards on the stages of self-acceptance of stroke patients treated in the Nusa Indah ward of the dr. Doris Sylvanus General Hospital consisted of 5 (five) stages, namely denial, anger, bargaining, depression, and acceptance. Vasile (2013) expressed that self-acceptance is the state of the individual who has confidence in themselves, and is able and willing to live with that situation.

A stroke patient with weakness in the upper extremity is, according to Roles (2016), a patient who undergoes changes in physical function, cognitive and body image which are very important factors that need to be considered in the positive self-acceptance of stroke patients. Loss of physical function is a stressor that must be faced by stroke patients, and without the right adaptive coping strategy, the patient may have self-acceptance disorder that hinders recovery process. A stroke attack can cause a traumatic experience for sufferers because they experience impaired function in certain limbs, which can be limbs or sensory limbs and other body parts. These results are in line with what was stated by (Sun, 2014; D.Irawandi, 2018), where cognitive disorders and physical changes in stroke patients make it difficult for them to accept their condition resulting in feelings of sadness, anger and uselessness, hopelessness and weakness.

In stroke patients, it is known that cognitive impairment and physical disability are negatively correlated with hopelessness; meaning that the higher the degree of cognitive impairment and physical disability, the greater the hopelessness of the stroke patient. In this condition, the patient is expected to have a good coping mechanism so as to accept their condition by building positive thoughts from within them. Positive thoughts in stroke patients can accelerate their adaptation process so that they are more receptive to the changes that happen to them. This is because mirror therapy combined with flash cards has an effect muscle strength and automatically induces positive thoughts so that patients are more motivated to recover. Thus, it can be said that stroke patients' self-acceptance is the result of improved muscle strength. Self-acceptance in stroke patients requires a process in which each individual has a different response. Self-acceptance is achieved when a person is able to face the reality rather than giving up on resignation or hope, because loss of role, body functions are responded differently by each individual. Motivation from the family and healthcare or nursing team affects patients' psychosocial state in achieving more positive thoughts, in self-acceptance in response to the physical and social transitions that patients experience later in life.

Based on this reasoning, stroke patients with upper extremity/arm weakness given mirror therapy intervention combined with flash cards showed statistically significant changes in terms of self-acceptance, where initially, the patients were in the denial and anger stage and reached the acceptance stage after the intervention. The results are in line with the theory brought forward by Stuart (2013), stating that most ways of behaving shown by individuals follow their self-concepts, namely changing individual behaviors and perceptions through good self-management so that they can accept their conditions.

The implementation of mirror therapy combined with flash cards containing education on joint motion range in stroke patients treated in the Nusa Indah ward of the dr. Doris Sylvanus Palangka Raya Regional Hospital resulted in the activation of both hemispheres of the brain which can facilitate the recovery of motor muscle strength and self-acceptance of patients (Caires, et al., 2016). Modified flash cards containing joint motion range that can be carried out patients can improve their muscle strength through afferent fiber stimulation responsible for conveying sensory information to the brain and stretching to the central nervous system to assist and maintain posture and joint position. While mirror therapy in stroke patients help provide visual stimulation to the brain. With mirror therapy, the brain is stimulated to re-recognize sensory stimulation resulting in motor recovery of the limbs with hemiparesis through visual illusions (Kim et al, 2014). The results of this study are in line with the previous study by Fryer, G. (2011) saying that there was no effect of giving mirror therapy or ROM (range of motion) in stroke patients who had hemiparesis. This

was due to the small number of sample and differences in the size of lesion in the patients. Mirror therapy and ROM exercise in stroke patients did not give significant results when statistical tests were carried out.

Another study in line with the results of this study was the study by Uthara Mohan et al. (2013) suggesting the insignificance of the results of the study. The best outcome in this study was simply recovery from gripping exercises.

While results that are not in line with this study are studies by HuyJin Kim et al. (2013) on mirror therapy (mirror therapy with electrical stimulation) which showed improvement in upper extremity motor skills in stroke patients on the fourth day for 3 weeks. Another study showing significant results are the study by Lin K., Chen. et al (2012) showing that the combination of mirror therapy and somatosensory had a positive effect on motoric recovery of post-stroke patients, including muscle strength, manual dexterity and mobility, conducted for three weeks. They also said that a combination of two therapies, namely mirror therapy with ROM, can reduce pain and improve upper extremity function in stroke patients. Most of the explanations and research findings above suggest that mirror therapy with a combination of ROM has an effect on both the treatment group and the control group. Another result is also presented by Gou et al. (2016) showing that post-stroke patients with hemiparesis can be manipulated with motor sensory input. Thus, mirror therapy combined with flash cards is one of the sensorimotor inputs to the motor cortex which plays an important (critical) role in the process of restoring motor skills to post-stroke clients.

The mirror therapy combined with flash card study was carried out by the client adjusting a comfortable sitting position, then placing a mirror between the two arms and placing a flash card containing images of the range of joint movement in front of the patient. Then, using the healthy in accordance with the image on the flash card, the patient performed a movement while looking at the mirror and imagining or feeling as if the paretic arm was also moving. This aimed to provide sensory input to the motor area of the cerebral cortex. This finding is in line with D. Irawandi et al. (2018) demonstrating that to achieve good motor skills in post-stroke patients, cognitive processes, behavioral science and psychology need to be involved, which is based on the researchers' thoughts on the results of mirror therapy combined with flash cards, where patient's learning of motoric motions began with the stage of the patient's cognitive ability to understand the various motion pictures in the given flash card. The motions must be learned by the patients, so that it gradually develops into affective abilities and so on into automation until habitual.

Cognitive abilities emphasize to the patient the importance of awareness to perform motions and exercises on the impaired upper extremity/arm, because these efforts can increase sensory input and feedback to the brain, which is the basis for motor control or conscious movement. Therefore, motion exercise with self-awareness of post-stroke patients with upper extremity/arm weakness are very important in the healing process because this exercise focuses on how the movements are produced according to the images in the flash cards being studied. Thus, the active participation of the patients to make conscious motions is needed in determining the motor function of their motions or impaired function of certain limbs, which can affect limbs or sensory limbs and other body parts. In this study, the stroke patients had upper extremity or arm weakness and suffered from cognitive impairment. When the pretest was carried out for both groups, the overall self-acceptance scores were in the denial, anger and bargaining stages.

3. Research Limitations

This study only clinically measured muscle strength and self-acceptance stages of stroke patients with upper extremity/arm weakness treated in the Nusa Indah ward of the dr. Doris Sylvanus General Hospital through the mirror therapy intervention combined with flash cards, namely giving the therapy for 5-10 minutes, once a day for two weeks, with 6 motions. This study did not study muscle strength reactions and biomolecular self-acceptance stages or other examinations where otherwise the regulation of changes in motor function in the cerebral cortex may be achieved.

CONCLUSIONS

Based on the results, it can be concluded that the characteristics analyzed by multivariate technique with the MANCOVA test showed that muscle strength and self-acceptance of the stroke patients in the dr. Doris Sylvanus Palangka Raya are linearly related to gender variable. It means that gender is shown statistically to make a difference in intervention results in the treatment group. While for the effect of mirror therapy combined with flash cards on the muscle strength of upper extremity/arm on the self-acceptance of the stroke patients, there is a statistically significant different between the treatment group and the control group. Saran bagi perawat agar dapat memberikan edukasi Terapi cermin dengan kombinasi flash card kepada kelurga yang merawat pasien stroke yang mengalami kelemahan esktermitas, karena terapi ini diharapkan mampu memulihkan fungsi motorik pada anggota tubuh yang lemah.

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