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Research Article

Effect of Mirror Therapy Intervention on Motor Impairment Improvements in Elderly

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Abstract

Aims: The slowness in the elderly activities is caused by a decrease in function of the musculoskeletal system, characterized by a decrease or increase in fat free mass which can cause a decrease in muscle mass, resulting in motor disorders. It is believed that providing range of motion exercises such as mirror therapy can stimulate the nerves in the motor cortex, thus providing signals to the brain to stimulate movement.

Objective: This research is to identify the effect of mirror therapy on motor impairment in the elderly.

Method: This type of research used quasi-experiment with two group pretest-posttest design approach and analysis method used Generalized Linear Model (GLM). The sample was 84 respondents, consisting of 42 intervention group samples and 42 control group samples. Sampling techniques were generally used as samples according to inclusion and exclusion criteria. The intervention was given for 4 weeks and assessed every week.

Results: There was an effect of mirror therapy intervention on improving motor impairment in the elderly (p-value = 0.000). Conclusion: mirror therapy is a non-pharmacological therapy that can be used to improve motor impairment in the elderly.

Keywords:

Elderly, motor impairment, mirror therapy, quasi-experiment, exercise

INTRODUCTION

Based on the World Health Organization (WHO), the prevalence of the elderly population in the Southeast Asia Region is 8% of the total population and there has been an increase in the number of elderly people from 2010 around 9.77% and in 2020 reaching 11.34%. The number of elderly people in Indonesia according to data from the Central Statistics Agency (BPS, 2020) has reached 15,000,000 and is estimated to increase threefold by 2050. The degenerative process in the elderly can cause various physical, biological, social, spiritual and financial problems (1). Problems often experienced by the elderly

is motor impairment and have an impact on daily living activities.

Motor impairment is often seen in neurological conditions such as cerebral palsy, Parkinson's disease, stroke, and multiple sclerosis. Motor impairment is the loss of part or all of the function of a part of the body, usually in the legs or limbs, caused by muscle weakness, poor stamina, lack of muscle control, or total paralysis. Motor impairment results in slowness when doing activities or moving, it is difficult for the feet to tread, there is a risk of falling and balance disorders occur (2). The risk of falling is more significant in the elderly due to reduced nerve conduction velocity,

changes in visual acuity, and decreased muscle mass and function (1). In addition, there is a decrease in the function of the musculoskeletal system with a reduction in fat-free mass or an increase in fat mass which can cause a reduction in muscle mass, in the muscles of the lower extremities resulting in balance disorders in the elderly (3,4). That changes that occur in the elderly result in sluggishness when doing activities or moving, difficulty in walking on the feet, risk of falling, and balance problems. Factors that are relevant to motor impairment in the elderly are (1) joint biomechanics and kinematics, (2) sensorimotor control and balance and gait nerves, (3) cardiopulmonary dysregulation and (4) cognition, anxiety, and risk of falling (5). Management that can be done to overcome motor disorders is by overcoming motor disorders, one of which is by improving biomechanics and sensorimotor by providing stimulus to the problematic limbs. Providing exercises such as range of motion exercises and mirror therapy (6).

Mirror therapy is a type of rehabilitation therapy based on the patient's motor imagination. When practicing, the image in the mirror will provide ipsilateral or contralateral visual stimulation to the brain to stimulate the movement of other body parts that are experiencing weakness (7). The goal of mirror therapy treatment is to

improve motor function, increase muscle strength, reduce sensory disturbances, reduce pain (8). Mirror Therapy is believed to be able to stimulate nerve connections in the related motor cortex, thereby providing visual stimulation to the brain (9).

METHODS

The research design used in the research was quasi experimental with a two group pretest-posttest design. This study conducted in two nursing home in Bandung-West Java. The sample consisted of 84 elderly living in nursing homes which were divided into control and intervention groups of 42 respondents each. Sampling was taken by random sampling with inclusion criteria: elderly with motor impairment and having a motor impairment score <34, elderly with muscle strength 3-4. Exclusion criteria: elderly who have impaired body functions including fractures, blindness and unstable hemodynamics. The study was conducted for 5 weeks with a duration of 30 minutes each meeting. The intervention provided is a mirror therapy. The instrument used is FMA-LE (FUGL-Meyer Assessment Lower Extremity) with a validity test value of 0.361. Statistical analysis used is frequency distribution, deviation, min-max, T test and GLM-RM (Generalized Linear Model - Repeated Measure).

RESULTS

The results of the characteristics of the respondents in this study based on age, gender and physical activity, in the study are presented in the following table 1

Table 1. Description of respondent characteristics

Variable		Intervention (42) f (%)	Control (42) f (%)
Age (years)	45-59	7 (16,7%)	1 (2,4%)
	60-74	29 (69,0%)	20 (47,6%)
	75-90	6 (14,3%)	21 (50%)
Gender	Female	31 (73,8%)	31 (73,8%)
	Male	11 (26,2%)	11 (26,2%)

Based on table 1 shows that most of the age is 64 -74 years (69.0%). The prevalence for gender in the intervention group and the control group showed the same percentage and physical activity in the intervention group was higher than the control group with a mean of 80.87 (SD = 49.97)

Table 2. Description of improvement in motor impairment in the elderly in the intervention and control group

Variable	Measurement	Intervention		Control	
		Mean± SD	Min-max	Mean± SD	Min-max
<i>Motor Impairment</i>	Week 1	16,76±5,697	5 – 25	17,40±6,692	4 – 34
	Week 2	17,88±6,157	6 – 26	17,48±6,715	4 – 34
	Week 3	19,71±6,740	5 – 30	17,38±6,732	4 – 34
	Week 4	22,05±6,386	10 – 31	17,12±6,549	4 – 34
	Week 5	25,67±6,392	11- 34	17,26±6,703	4 – 34

The table above shows an increase in improvement in motor impairment starting in week 1 with a mean of 16.76 (SD=5.697) to week 5 with a mean of 25.67 (SD=6.392) Table 2

Table 3 The effect of mirror therapy on motor impairment in the elderly before and after intervention

Variable	Group	Mean	Std Deviation	N	Levene's Sig	Sig (2-tailed)
Pretest	control	16,76	5,967	42	0,922	0,643
Motor Impairment	Intervensi	17,40	6,692	42		
Posttest	Kontrol	25,67	6,392	42	0,847	0,000
Motor Impairment	Intervensi	17,26	6,703	42		

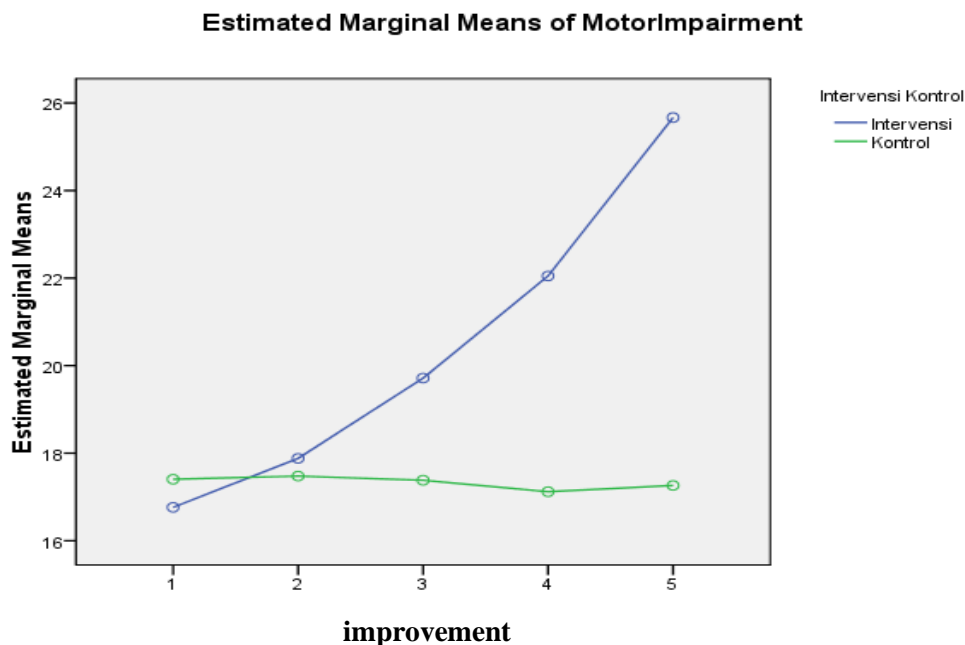
The table above shows that there are differences in motor impairment before and after intervention with a p value of 0.00 (Table 3)

Table 4 The Effect of mirror therapy on motor impairment in the elderly in the control and intervention groups

Variable	Mean	Std Deviasi	N	Std Error Mean	ig(2-tailed)
Intervention group	-8,095	2,487	42	0,384	0,000
Control group	0,143	1,117	42	0,172	0,412

The table above shows that after being given the mirror therapy intervention, there was a significant improvement in motor impairment with p-value = 0.00 (Table 4)

Graph of repeated measurements of mirror therapy intervention on motor improvement in elderly people



Based on the graphic images the intervention group achieved improvement in motor impairment starting in the second week after implementing the mirror therapy intervention, and the maximum motor impairment improvement score in the fourth week.

DISCUSSION

The number of respondents obtained in this study were 84 respondents with ages mainly in the advanced phase (60-74 years) in the intervention group and the control group. Previous studies have shown that at more than 60 years various problems arise and processes occur because when a person has passed the final adult stage (10). The aging process causes health problems including degenerative diseases. Degenerative diseases that appear in the elderly usually attack the elderly physically, including the musculoskeletal system such as balance disorders, motor disorders (low back pain, knee osteoarthritis, ischilagia, incontinence and stroke). The characteristics of the respondents show that the majority of respondents are female.

Women who have menopause will experience a decrease in hormones which can cause musculoskeletal disorders which will decrease muscle mass, muscle size, need for transfusion to the muscles so that the muscles will shrink, the strength produced by the muscles decreases with age, and the strength of the lower extremity muscles decreases. by 40% which ultimately causes motor disorders in the elderly—following (11). The research results showed that the intervention group resulted in improvements in motor impairment by implementing the mirror therapy pretest and post-test interventions, namely p-value 0.000. In the control group, the p-value was 0.412. This shows a significant difference in improving motor impairment in the elderly between the pretest and post-test in the intervention and control groups. The intervention carried out in this study was in the form of exercises in front of the mirror by moving the lower extremities.

Giving this mirror therapy intervention can increase and maintain the value of muscle strength and motor function in the elderly.

In line with research conducted by (12). The results of his study demonstrated that VR therapy associated with MT could successfully replace classical physiotherapy in lower extremity rehabilitation after stroke. The use of mirrors can stimulate the premotor cortex for motor rehabilitation. The premotor cortex has a number of functions that suggest the display of visual images in a mirror for motor rehabilitation. Apart from the stimulation provided by mirror therapy from a neurological and sensory perspective, mirror therapy can help reverse the function of damaged body parts (13).

The results of data analysis on the effect of mirror therapy on motor impairment in elderly people before and after in the intervention and control groups resulted in an improvement in motor impairment after implementing the mirror therapy intervention with a p-value of 0.000. In the control and intervention groups before implementing the mirror therapy intervention, the p-value was 0.643. This shows that there is a significant improvement in motor impairment after being given the mirror therapy intervention. This research is in line with research conducted by Martinez, et al (14) which states that mirror therapy is significantly more effective in improving motor function as measured by the FUGL-MEYER test. Other research shows that mirror therapy is more effective as an additive or conjuvant therapy compared to motor imagery techniques in stroke patients and mirror therapy can improve functional mobility, independence and motor function in stroke patients.

The graphic results show a significant difference in the intervention group in achieving a maximum improvement score for elderly motor impairments compared to the control group. In the intervention group, there was an increase in the improvement of elderly motor impairment from the 2nd week one week after implementing the mirror therapy intervention, the increase continued

gradually to the 3rd week two weeks after the intervention, then to the 4th week three weeks after the intervention and to the maximum point in the third week. 5 four weeks after the intervention. In the control group, the graph of improvement in motor impairment in the control group had an increase, but it was not significant, it tended to be average, and at the point of week 4, three weeks after the intervention, it had decreased. The results of this study are in line with research conducted by (15) entitled The effect of mirror therapy on lower extremity motor function and ambulation in post-stroke patients: A prospective, randomized-controlled study said giving mirror therapy 5x in 1 week , each session was given therapy for 15-60 minutes for 4 weeks using mirror media positioned from the knees to the feet as a tool in therapy, resulting in a significant difference ($p < 0.05$). Based on the results of observations in the field (16), the researchers assume that the more frequently mirror therapy interventions are carried out, the better the improvement in motor impairment in the elderly will be, because mirror therapy is a form of therapy that involves the respondent's motor imagination because during the mirror image training it will provide visual stimulation to the nerves. brain to stimulate movement of the weaker limb. Apart from that, practicing every day can form a habit in the elderly so that motor impairment in the elderly does not experience or worsen.

CONCLUSION

The results of the study concluded that the effect of the mirror therapy intervention on improving the motor impairment of the elderly was significant. Mirror therapy exercises are a program implemented by nursing home management in an effort to prevent and improve motor function in the elderly so that the elderly can achieve an optimal level of well-being and quality of life.

RESEARCH LIMITATIONS

The research was only carried out in 2 nursing homes, not including elderly people who lived with their families or in the community, so it was limited according to the characteristics of the elderly who lived there.

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