



The Effect of Weight-Bearing Exercise on Improving Muscle Tone in Post-Stroke Patients

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ABSTRACT

Stroke is a neurological disorder that can cause a decline in motor function, one of which is a decrease in muscle tone. One of the interventions that can be carried out in the rehabilitation of post-stroke patients is weight bearing exercise (WBE). This study aims to determine the effect of weight bearing exercise on the improvement of muscle tone in post-stroke patients. This study uses a quasi-experimental design with a pretest-posttest with control group approach. The sample in this study consisted of 19 respondents in the treatment group. Measurements were taken before and after the intervention using a muscle tone scale. Data analysis was performed using the paired t-test. The research results showed that before the intervention, most respondents were in the low muscle tone category, with grade 2 totaling 10 people (52.6%) and grade 3 totaling 9 people (47.4%). After the intervention, there was an increase to grade 4 totaling 12 people (63.2%) and grade 5 totaling 7 people (36.8%). The mean value increased from 2.47 to 4.37 with a standard deviation from 0.513 to 0.496. The paired t-test results showed a p-value = 0.000 ($p < 0.05$). The conclusion of this study shows that weight bearing exercise has a significant effect on increasing muscle tone in post-stroke patients.

INTRODUCTION

Stroke is one of the most common noncommunicable diseases leading to disability and death worldwide. An interruption in blood flow to the brain can cause a stroke, which damages brain tissue and disrupts neurological function (Wulandari et al., 2025). This condition can lead to various complications, such as sensory impairments, speech disorders, loss of balance, and hemiparesis—or muscle weakness on one side of the body.

Motor function, including reduced muscle strength and tone, typically occurs in stroke patients. According to Mustafa (2023), reduced muscle tone can lead to difficulty moving, imbalance, and dependence on assistance for daily activities such as walking, standing, and transferring. Patients' quality of life may decline due to these impairments and increase the risk of additional complications, such as contractures and muscle atrophy, if not properly managed.

Data from the World Health Organization (WHO) indicate that stroke-related deaths remain one of the leading causes of death globally, and this figure continues to rise annually (Liu et al., 2025). Stroke incidence rates in Indonesia are also rising, particularly among adults and the elderly. This increase results in more patients requiring long-term rehabilitation to restore their motor functions (Rahayu et al., 2025).

The goal of post-stroke rehabilitation is to help patients regain bodily functions, improve their mobility, and maintain the ability to perform daily activities independently. Weight-Bearing Exercise (WBE) is a type of exercise involving weight-bearing on the extremities, aimed at improving muscle activation,

balance, coordination, and postural control in patients. It is one of the rehabilitation therapies that can be provided (Sasahira, 2025).

Weight-Bearing Exercise enhances neuromuscular activity and motor control in post-stroke patients through proprioceptive stimulation of muscles and joints (Yuliana, 2024). This exercise, performed gradually and repeatedly, aids the brain's neuroplasticity process in re-establishing neural pathways damaged by stroke. Weight-bearing exercises can also help patients maintain their posture, stand, and walk independently.

There are still a significant number of post-stroke patients with mobility impairments and muscle weakness at the Kebomas Community Health Center. According to initial observations, most patients experience movement limitations in both the upper and lower extremities. Therefore, effective rehabilitation exercises are needed to improve patients' muscle tone and enhance their functional abilities. However, post-stroke patients have not yet been performing weight-bearing exercises on a regular basis. Considering this issue, the researchers aim to conduct a study on how weight-bearing exercises impact the improvement of muscle tone in stroke patients at the Kebomas Community Health Center. It is hoped that this study will serve as one of the non-pharmacological intervention alternatives capable of enhancing motor skills and quality of life for stroke patients.

METHOD

Using a quasi-experimental design, this study employed a pre-test and post-test control group design. The study involved post-stroke patients in the service area of the Kebomas Community Health Center. A purposive sampling technique was used based on inclusion and exclusion criteria. Muscle tone was the dependent variable in this study, and weight-lifting exercises were the independent variable.

The manual muscle strength assessment tool (MMT) was used to measure muscle tone. The research process began with an initial measurement (pre-test). Subsequently, the treatment group received weight-lifting exercises, while the control group received no exercises. After the intervention period ended, a final measurement (post-test) was conducted to assess changes in muscle tone. Subsequently, the data were statistically analyzed to determine differences before and after the intervention, as well as differences between the treatment and control groups. Ethical considerations such as informed consent, anonymity, and respondent confidentiality were also addressed in this study.

RESULT

Characteristics of Respondents by Age

Tabel 1. The characteristics of respondents based on the age of post-stroke patients at the Kebomas Community Health Center in Gresik Regency

Age	Treatment group		Control group	
	n	%	n	%
Early-aged elderly category (41–50 years old)	6	32 %	5	26%
Middle-aged elderly category (51–60 years old)	13	68 %	14	74%
Total	19	100%	19	100%

Table 1 shows that the majority of respondents in the treatment group fell into the middle-aged elderly category (51–60 years old), totaling 13 people (68%), while 6 people (32%) fell into the early-aged elderly category (41–50 years old). In the control group, the majority of respondents were also in the middle-aged elderly category (51–60 years old), totaling 14 people (74%), while the early-aged elderly category (41–50 years old) comprised 5 people (26%). Thus, the majority of respondents in both groups fell within the 51–60-year-old age range.

Characteristics of Respondents by Gender

Table 2 Gender of Respondents at the Kebomas Community Health Center

Gender	Treatment group		Control group	
	n	%	n	%
Male	13	68%	14	74%
Female	6	32 %	5	26%
Total	19	100%	19	100%

Table 2 shows that the majority of respondents in the treatment group were male, totaling 13 people (68%), while 6 were female (32%). In the control group, the majority of respondents were also male, totaling 14 people (74%), while females numbered 5 (26%). Thus, the majority of respondents in both groups were male.

Characteristics of Respondents by Occupation

Table 3. Respondents Occupations at the Kebomas Community Health Center

Occupations	Treatment group		Control group	
	n	%	n	%
Homemakers	5	26%	2	10%
Civil servant	1	6 %	4	22%
Self-employed individuals	7	36%	3	15%
Retirees	6	32%	10	53%
Total	19	100%	19	100%

Table 3 shows the occupations of respondents in the treatment group: 7 self-employed individuals (36%), 6 retirees (32%), 5 homemakers (26%), and 1 civil servant (6%), while in the control group, there were 10 retirees (53%), 4 civil servants (22%), 3 self-employed individuals (15%), and 2 homemakers (10%).

Respondent Characteristics Based on Time Since Stroke

Table 4. Time Since Stroke Among Respondents at the Kebomas Community Health Center

Time Since Stroke	Treatment group		Control group	
	n	%	n	%
1-5 months	15	78%	12	64%
6-10 months	3	16%	5	26%
1 year	1	6%	2	10%
Total	19	100%	19	100%

Table 5.5 shows that the duration since stroke onset for respondents in the treatment group was 1–5 months for 15 people (78%), 6–10 months for 3 people (16%), and 1 year for 1 person (6%), while in the control group, 12 participants (64%) had a duration of 1–5 months, 5 participants (26%) had a duration of 6–10 months, and 2 participants (10%) had a duration of 1 year. Thus, the majority of participants in both groups had a post-stroke duration of 1–5 months.

DISCUSSION

Based on the research findings, it was found that prior to the weight-bearing exercise intervention, the majority of respondents were in the low muscle tone category. This indicates that post-stroke patients experience a significant decline in motor function, which affects their mobility. Following the intervention, there was a significant increase in muscle tone among all respondents. Most respondents improved to grade 4 and grade 5. This indicates that weight-bearing exercise is effective in improving muscle tone in post-stroke patients.

Based on the results of the paired t-test, a p-value of 0.000 ($p < 0.05$) was obtained, leading to the conclusion that there is a significant effect of weight-bearing exercise on muscle tone improvement. Theoretically, weight-bearing exercise is a form of training that applies mechanical stress to muscles and joints, thereby stimulating proprioceptive receptors. This stimulation sends signals to the central nervous system, which in turn enhances neuromuscular activation. Additionally, repetitive exercises can strengthen motor pathways and improve muscle contraction.

The results of this study align with previous research indicating that weight-bearing exercises can improve muscle strength and motor function. In this study, the increase in muscle tone occurred due to repeated sensorimotor stimulation and the patient's active participation in the exercises. The researchers suggest that improved muscle tone is influenced not only by physical exercise but also by the consistency of the exercises and the patient's active participation throughout the rehabilitation process. Thus, weight-bearing exercise can serve as an effective intervention for enhancing muscle tone in post-stroke patients.

CONCLUSION

Research findings indicate that weight-bearing exercises have a significant effect on improving muscle tone in stroke patients. The neuromuscular stimulation that occurs during these exercises enables this

intervention to help improve motor function. Weight-bearing exercises can stimulate the proprioceptive system and gradually increase muscle activation by improving muscle tone. This indicates that weight-bearing exercises are an effective rehabilitation technique to aid in the recovery of stroke patients.

Additionally, the success of this intervention is influenced by the patient's active participation in the exercises and consistency in therapy implementation. Repetitive exercises enhance muscle and nerve adaptation, which helps patients perform daily activities. Therefore, to improve muscle tone and quality of life for post-stroke patients, resistance training can be incorporated into a structured rehabilitation program.

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