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## Effectiveness *Heel-Raise-Lower Exercise and Dual Task Gait Training* against a patient *Reversible Ischemic Neurologic Deficit Stroke (RIND)* to improve: A Case Study

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### Abstract

**Introduction:** Stroke is a disease that causes damage to the brain due to infarction or blood vessels supplying blood to the brain which can cause decreased sensory function, muscle weakness, muscle atrophy, weight loss bearing, posture control, coordination, balance, and lower limb instability. Global Burden Disease data in 2010 showed that 80% of the total population had ischemic stroke while 20% had hemorrhagic stroke. While in Indonesia in 2019 the incidence of stroke per year is 200 out of 100,000 population, around 2.5% and the rest are disabled light or heavy.

**Purpose:** The purpose of this case study is to find out Effectiveness *Heel-Raise-Lower Exercise and Dual Task Gait Training* for a patient *Reversible Ischemic Neurologic Deficit Stroke (RIND)* to improve balance.

**Method:** The method used in this study is Case Report. After doing therapy 3 times a week for 2 weeks The results showed an increase in each examination of muscle strength (MMT), Spasticity Examination (*Aswort Scale*), and Balance Check (*Breg Balance Scale*).

**Conclusin:** Based on the results of the evaluation, it was concluded that in this case study, the provision of a physiotherapy intervention program in the form of: *Heel-Raise-Lower Exercise and Dual Task Gait Training* increase muscle strength, reduce spasticity, improve balance, coordination and walking patterns.

**Keywords:** Stroke, *Heel-Raise-Lower Exercise*, *Dual Task Gait Training*, *Aswort Scale*, *Breg Balance Scale*.

### Introduction

Prevalence of stroke in worldwide 19% in 1990, then increased in 2010. Global Burden Disease data in 2010 showed that 80% of the total population had ischemic stroke while 20% had hemorrhagic stroke. (Units & Collaboration, 2013). According to the Ministry of Health in 2019 the incidence of stroke in Indonesia per year is 200 out of 100,000 population, about 2.5% and the rest are disabled light or



heavy. In 2013, West Java had an incidence rate of The highest was 533,895 patients based on the diagnosis of health workers. The incidence rate in Central Java is 431,201 patients based on health care diagnosis.

Stroke is a disease that causes damage to the brain due to infarction or blood vessels supplying blood to the brain. (Jeon & Choi, 2015). Infaq and Blood vessel disorders are usually due to rupture of blood vessels or blockage of blood clots so that they can cause focal clinical signs with symptoms that appear within 24 hours or more and can cause death. Stroke is classified into two, namely ischemic and hemorrhagic. *World Health Organization*, 2016).

Ischemic stroke is caused by blockage of a blood vessel in the brain. Classification of ischemic stroke based on time as follows: 1. Transient ischemic attack (TIA) lasts from a few minutes to 1 hour. Symptoms that disappear spontaneously and completely in less than 24 hours, 2. Reversible Ischemic Neurologic Deficit (RIND) symptoms disappear more than 24 hours but not more than 1 week, 3. Stroke In Evolution (SIE) / incomplete stroke a slow stroke condition - slowly the appearance of symptoms that get worse, a few hours to a few days, 4. Complete Stroke is a blockage that persists or is permanent (Yang et al., 2015). The characteristics of ischemic stroke are characterized by decreased sensory function, muscle weakness, muscle atrophy, weight bearing disorders, posture control, coordination, balance, and lower limb instability (Purnamasari et al., 2019).

The role of physiotherapy in efforts to improve balance and coordination is designed with exercise modification *Heel-Raise-Lower Exercise* with the addition of Gait Training. According to research conducted by Sim Jung (2020) "Effectiveness of Heel-Raise-Lower Exercise after Transcutaneous Electrical Nerve Stimulation in Patients with Stroke". Results significantly increased in the TENS group, namely the administration of *Heel-Raise-Lower Exercise* after Transcutaneous Electrical Nerve Stimulation compared to the placebo group, namely the administration of *Heel-Raise-Lower Exercise*. *Heel-Raise-Lower Exercise* is movements performed using muscle strength and limbs controlling the center of gravity. Aim to control posture, increase muscle strength and improve balance (Jeon & Choi, 2015).

According to Pratama's research (2021) "The effect of giving Dual Task Training on reducing the risk of falling in Ischemic Stroke cases". The results showed a decreased risk of falling accompanied by an increase in standing balance. Dual Task Gait Training is a cognitive and motor exercise by walking on a flat surface. The walking route consists of walking forward, walking backwards, and walking on an S-shaped route (Liu, et al., 2017).



## Method

The research method used in this study is a case study. The case study was conducted in one of the Physiotherapy Clinics in Tegal City, Slawi Regency on a patient Mr. S, 54 years old and working as a civil servant.

## Case Presentation

Mr. S is a 54-year-old civil servant, the first incident was in December 2020. The incident of weakness and paralysis when returning from the hospital after recovering from COVID had a history of high blood sugar 300 mg/dL and blood pressure 150/100 mmHg during the attack. The patient was hospitalized in the ward at Dr Soeselo Slawi Hospital for 1 week. The patient then came for Physiotherapy to the Slawi Center Physiotherapy Clinic. The patient also had left limb weakness. Now the patient is able to sit up on his own, down on his own and the blood pressure is normal. There is a balance disorder and reduced coordination when walking. Patient has no history of comorbidities that are relevant to the patient's current condition.

Subsequent examination including vital signs in the patient showed normal in all aspects. Physical examination that the patient complains of There is weakness in the left limb, the presence of weakness of muscle tone, impaired coordination of walking, impaired balance of walking, and walking activity is not normal seen from inspection and palpation.

Table. 1 Vital Signs and Laboratory

Vital Signs	Laboratory
Blood pressure : 130/75 mmHg	Glucose in Fasting Blood: 300 ml/dL
Pulse : 65/min	
Breathing: 20 minutes	
Temperature : 36°C	

In addition to the specific inspection, namely the examination of muscle strength evaluated using Manual Muscle Testing. On a scale of 0 (absence of muscle tone) to 5 (against gravity and maximum resistance). Examination of muscle tone was evaluated using the Aswort scale. The Aswort scale is a measurement for muscle spasticity and assesses resistance and muscle movement in a person with a nerve injury. The Berg balance scale was used to examine the effect of the movement of the diagonal pattern on dynamic balance. This tool consists of 14 items related to functional tasks that are usually carried out in activities of daily life. Points are awarded for the three areas of sitting, standing, and changing postures, graded from 0 to 4, with a maximum score of 56 points.



Table.2 Examination of Muscle Strength (MMT)

muscle groups	left	Right
Upper extremity flexors	3	5
Upper extremity extensors	3	5
Upper extremity abductors	3	5
Upper extremity adductor	3	5
Lower extremity flexors	3	5
Lower extremity extensors	3	5

From the results of the examination of muscle strength in table 2 above, it shows that the measurement of muscle strength in the left extremity of the muscle group in the upper extremity (flexion, extension, adduction and adduction movements) and lower extremities (flexion and extension movements) is 3 which moves with a full range of joint motion. and against gravity. Meanwhile, in measuring the strength of the right extremity muscles in the upper and lower extremity movements, the value is 5 which means it is against gravity and against maximum resistance.

Table.3 Spasticity Examination (Aswort Scale)

Mark	Information
T0 1+	There is a slight increase in muscle tone, characterized by minimal resistance throughout the remaining ROM

From the results of the spasticity examination table. 3 above shows measurements on the left upper and lower extremities, the value is 1+ where there is a slight increase in muscle tone, indicated by minimal resistance throughout the rest of the ROM.

Table.4 Balance Check (*Breg Balance Scale*)

No	description	Score
1.	Sitting to standing	3
2.	Standing unsupported	2
3.	Sitting unsupported	3
4.	Stand to sit	2
5.	Transfer/move	3
6.	Standing with your eyes closed	3
7.	Stand with your feet together	2
8.	Reaching forward with arms extended maximally	3
9.	Picking up objects from the floor	3
10.	Turn around to look back	2
11.	360 degree turn	2
12.	Placing alternating feet on the beam (step stool)	2



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13.	Stand with one foot in front of the other	1
14.	Stand on one leg	3
	Total	34

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From the results of the balance check table. 4 above shows the measurement with a total score of 34 where the interpretation is walking with assistance. With the lowest score on standing with one foot in front of the other, a score of 1 where Requires assistance by holding on for 15 seconds.

### Physiotherapy Intervention

Balance and coordination exercises designed with exercise modifications *Heel-Raise-Lower Exercise* with the addition of Gait Training. *Heel-Raise-Lower Exercise* movements performed using muscle strength and gravity control. Aims to control posture, increase muscle strength and improve balance. The patient is instructed to stand on a flat and stable surface, slowly raising and lowering both heels (Jeon & Choi, 2015).



Picture. 1 *Heel-Raise-Lower Exercise*

Gait training exercises include cognitive, motor, and conventional physical exercises. Cognitive and motor exercises by walking on a flat surface. The walking route consists of walking forward, walking backwards, and walking on an S-shaped route. While Conventional Physical Exercise includes focused training activities for muscle strengthening, balance, and gait. Strengthened muscles include hip exors, hip extensors, hip abductors, knee extensors, knee exors, ankle dorsiflexors and ankle plantarflexors (Liu, et al., 2017). The patient did therapy 3 times a week for 2 weeks.



Table.5 Dual task gait training

Classification	Exercise program	Duration of exercise
<i>Cognitive dual task gait training</i>	<ul style="list-style-type: none"> <li>- Walking while repeating words</li> <li>- Walking while saying numbers</li> <li>- Walking while saying numbers backwards</li> <li>- Walk while telling</li> </ul>	10 minutes
<i>Motor dual task gait training</i>	<ul style="list-style-type: none"> <li>- walking while holding one or two balls (diameter = 20cm)</li> <li>- walking while holding an umbrella with both hands</li> <li>- walking while swinging a toy</li> <li>- walking while playing a musical instrument</li> <li>- walking while bouncing a basketball (diameter = 24.6 cm)</li> <li>- walking while kicking a basketball that is in the net held by the participant</li> <li>- walking while holding one ball and simultaneously kicking another basketball into the net</li> </ul>	10 minutes
Conventional exercise	physical <ul style="list-style-type: none"> <li>- Standing with eyes closed or open</li> <li>- Stand on 1 leg</li> <li>- Squat exercise</li> <li>- Lifting weights in different directions</li> </ul>	10 minutes

## Results

In this case study, the physiotherapist conducted a subjective and objective examination. Subjective examination with an assessment process on the patient regarding the patient's condition with the initials Mr. S with a medical diagnosis of left hemiplegic stroke caused by stroke *Reversible Ischemic Neurologic Deficit (RIND)*. From the results of the examination, several priority problems were found, namely a decrease in muscle strength, spasticity, balance disorders, coordination and walking disorders.

Objective examination, namely physiotherapy examination of vital signs with normal results. Followed by examination of muscle strength with MMT, examination of spasticity with the Asworth Scale, examination of balance and coordination with the Berg Balance Scale.



In this case, the author provides physiotherapy interventions that can be given to patients in the form of: *Heel-Raise-Lower Exercise and Dual Task Gait Training* to resolve the issue. After the intervention was given to the patient, there were changes in the results of the examination of muscle strength, spasticity, and balance in the patient after doing therapy 3 times a week for 2 weeks.

Table 6 Results of Pre and Post Administration of Muscle Strength Examination *Heel-Raise-Lower Exercise and Dual Task Gait Training*

muscle groups	Pre		Post	
	Left	Right	Left	Right
Upper extremity flexors	3	5	5	5
Upper extremity extensors	3	5	5	5
Upper extremity abductors	3	5	5	5
Upper extremity adductor	3	5	5	5
Lower extremity flexors	3	5	4	5
Lower extremity extensors	3	5	4	5

From the results of the examination of muscle strength Pre and Post giving the intervention *Heel-Raise-Lower Exercise and Dual Task Gait Training* Table 6 above shows that the measurement of muscle strength in the left extremity The muscle group in the upper extremity (flexion, extension, adduction and adduction movements) has an increase from a value of 3 where m moves with a full range of joint motion and against gravity, increasing to a value of 5 against gravity. and maximum resistance. While the lower left extremity (flexion and extension movements) showed an increase from a value of 3 which moved with the full range of motion of the joint and against gravity, to a value of 4 against gravity. The right extremity shows the same value, namely 5 which is against gravity and maximum resistance.

Table 7 Results of Pre and Post Administration of Spasticity Examination *Heel-Raise-Lower Exercise and Dual Task Gait Training*

	Mark	Information
Pre	1+	There is a slight increase in muscle tone, characterized by minimal resistance throughout the remainder of the ROM,
Post	0	Absence of muscle tone

From the results of the Pre and Post spasticity examination of the intervention *Heel-Raise-Lower Exercise and Dual Task Gait Training* Table 7 above shows that there is a decrease in spasticity from a value of 1+ where there is a slight increase in muscle tone, characterized by minimal resistance throughout the rest of the ROM, to a value of 0 where there is no muscle tone.

Table.8 Results of Pre- and Post-Given Balance Examination *Heel-Raise-Lower Exercise and Dual Task Gait Training*

No	Description	Score	
		Pre	Post



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1.	Sitting to standing	3	4
2.	Standing unsupported	2	3
3.	Sitting unsupported	3	4
4.	Stand to sit	2	4
5.	Transfer/move	3	4
6.	Standing with your eyes closed	3	4
7.	Stand with your feet together	2	3
8.	Reaching forward with arms extended maximally	3	3
9.	Picking up objects from the floor	3	3
10.	Turn around to look back	2	3
11.	360 degree turn	2	3
12.	Placing alternating feet on the beam (step stool)	2	3
13.	Stand with one foot in front of the other	1	2
14.	Stand on one leg	3	4
	Total	34	47

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From the results of the examination of muscle strength Pre and Post giving the intervention *Heel-Raise-Lower Exercise and Dual Task Gait Training* table.8 above shows the measurement with a total score of 34 where the interpretation is walking with assistance, to a score of 47 where the interpretation is Independent (Independent) with an increase in all descriptions.

## Discussion

In this case study, the author raises the case of a 54-year-old man medical diagnosis of left hemiplegic stroke caused by stroke *Reversible Ischemic Neurologic Deficit (RIND)*. By checking muscle strength using MMT, checking for spasticity using the Asworth Scale, checking balance and coordination using the Berg Balance Scale. Based on the results of the examination after being given the intervention *Heel-Raise-Lower Exercise and Dual Task Gait Training*.

*Heel-Raise-Lower Exercise* is Standing exercises with heels up and down (eccentric and concentric phases) which aims to increase the strength and strength of the ankle plantarflexion. This movement is relatively simple that can be done at home and requires no tools. In addition, this exercise requires a higher level of posture control compared to machine-based exercises and can be helpful in daily life (Mi Lee, 2017). According to Sim Jung (2020) the plantar flexor of the ankle contracts strongly to maintain a standing posture and contributes to postural control through contraction. The plantar flexors at the ankle provide most of the energy needed to propel mass body forward during walking. The strength of the ankle plantar flexor on the paretic side is related to the walking speed of stroke patients.





*Dual task training* is one of the balance training programs aimed at increasing confidence in balance control so as to improve standing balance, and make it easier to carry out daily activities. Dual task training motor or cognitive function during conventional therapy has been found to be beneficial for stroke patients. Dual task training on stroke survivors, focusing on dual task training It was concluded that cognitive motor impairment was effective in improving balance and gait in the short term. However, for both types of secondary tasks, namely dual task training cognitive and manual, and did not evaluate long-term outcomes (Hofheinz, 2016).

This research still has many shortcomings. for further research it is recommended to add more varied exercises such as walking, counting and standing while throwing the ball, towards the physiotherapist, and the dose of exercise should be paid more attention in order to obtain more optimal and significant evaluation results in terms of improving balance.

## Conclusion

It can be concluded that in this case, the provision of a physiotherapy intervention program in the form of: *Heel-Raise-Lower Exercise and Dual Task Gait Training* which is done 3 times a week for 2 weeks can increase muscle strength, reduce spasticity, improve balance, coordination and walking patterns.

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