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THE EFFECT OF GAZE STABILITY EXERCISE ON THE BALANCE OF ELDERLY WITH A HISTORY OF POST STROKE

Gaze Stability Exercise Meningkatkan Keseimbangan Lansia dengan Riwayat Post Stroke

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ABSTRAK

Stroke adalah satu permasalahan yang sering dialami lansia. Stroke terjadi ketika pembuluh darah otak pecah atau tersumbat, yang menyebabkan sebagian otak kehilangan pasokan darah untuk membawa oksigen yang diperlukan, sehingga menyebabkan kematian jaringan. Gangguan neurologis, seperti gangguan vestibular, adalah salah satu kondisi dan faktor risiko yang dapat menyebabkan gangguan keseimbangan. Penelitian ini bertujuan untuk mengetahui pengaruh Gaze Stability Exercise terhadap keseimbangan lansia dengan riwayat post stroke. Penelitian ini menggunakan jenis penelitian pre-eksperimen dengan desain one group pre-post test. Sampel dipilih berdasarkan metode purposive sampling dengan total sampel sebanyak 20 lansia. Intervensi dilakukan sebanyak 3 kali seminggu selama 4 minggu. Pengukuran keseimbangan menggunakan Time Up and Go Test (TUGT). Rerata TUGT sebelum intervensi 17,81 detik dan sesudah intervensi 16,26 detik. Hasil uji ststistik menggunakan uji Paired T Test dan didapatkan hasil nilai p-value 0,002 (p<0,05). Penelitian ini menunjukkan bahwa terdapat pengaruh intervensi Gaze Stability Exercise terhadap keseimbangan lansia dengan riwayat post stroke.

***Kata kunci**: gaze stability exercise, keseimbangan, stroke*

ABSTRACT

Stroke is a problem that is often experienced by the elderly. A stroke occurs when a cerebral blood vessel ruptures or is blocked, causing a portion of the brain to lose its blood supply to carry the necessary oxygen, leading to tissue death. Neurological disorders, such as vestibular disorders, are one of the conditions and risk factors that can cause balance disorders. This study aims to determine the effect of Gaze Stability Exercise on the balance of the elderly with a history of post-stroke. This study used a type of pre-experiment research with a one-group pre-post test design. Samples were selected based on a purposive sampling method with a total sample of 20 elderly people. The intervention was carried out 3 times a week for 4 weeks. Balance measurement using the Time Up and Go Test (TUGT). The average TUGT before intervention was 17.81 seconds, and after intervention was 16.26 seconds. The results of statistical tests using the Paired T Test test the results obtained, a p-value of 0.002 (p <0.05). This study shows that there is an effect of Gaze Stability Exercise intervention on the balance of the elderly with a history of post-stroke.

Keywords: balance, gaze stability exercise, stroke

INTRODUCTION

According to Law Number 13 of 1998, the elderly are defined as someone who have reached the age of 60 (sixty) years and above. However, according to the WHO in 2013, the elderly is someone more than or equal to 55 years of age. The decline in the ability of tissues to repair themselves and maintain their normal structure and function is called elderly.[1] Indonesia is one of the countries experiencing an increase in the number of elderly people, in accordance with WHO predictions.

According to the data from the Central Statistics Agency of Indonesia in 2022, the proportion of elderly people

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rose from around 7.6% in 2010 to 10% in 2020.[2]By 2035, this percentage is predicted to increase to 13.8%. Based on gender, there are more female elderly (51.81%) than male elderly (48.19%), and there are more elderly in urban areas (56.05%) than in rural areas (43.95%). A total of 65.56% of elderly are classified as young elderly (60-69 years old), 26.7% are middle elderly (70-79 years old), and 7.69% are elderly (80 years old and above).

Stroke is a common problem among the elderly. It occurs when a blood vessel in the brain ruptures or becomes blocked, depriving part of the brain of the blood supply necessary for oxygen delivery, leading to tissue death.[3]

According to the WHO, stroke is the second leading cause of death worldwide, while in Indonesia, it is the most deadly. The World Health Organization (2021) reported that there were 5.5 million deaths from stroke and 13.7 million new cases of stroke each year.[4]

The 2023 Indonesian Health Survey (SKI) shows that stroke prevalence in Indonesia increases with age. The highest rate of stroke cases reported by health workers was in the age group 75 years and older (41.3%), with the lowest number of cases recorded in the 15-24 age group (0.1%). By gender, there were more men (8.8%) than women (7.9%). Based on residence, the number of strokes in urban areas (9.7%) was higher than in rural areas (6.4%).[5]

Elderly people who experience a stroke have various problems, including difficulty walking or balance disorders (16.43%), weakness or paralysis of half the body (90%).[6] As explained above, one of the risks of stroke is impaired balance. According to Khanna et al. (2014), balance is the ability to maintain an upright posture, both statically and dynamically, which requires a complex interaction between peripheral and central factors such as vision, somatosensation, vestibular sensation, motor output, and muscle tone.[7]

Neurological disorders, such as vestibular disorders, are one of the conditions and risk factors that can cause balance disorders.[8] Measuring tools to measure balance can use the Time Up and Go Test.[9] For balance disorders in elderly people at risk of stroke, the physiotherapy modality that can be carried out is exercise therapy with Gaze Stability Exercise.

Gaze Stability Exercise is a balance exercise that is based on the supposed capacity of the vestibular system to change the magnitude of the vestibule-ocular reflex (VOR) in response to certain inputs.[10] Gaze stability exercises focus on head movement, eye movement, and gaze focus to maintain balance. Gaze stability exercises have been shown to affect head alignment, resulting in improved overall balance perception and increased stability.[11] In the elderly, there is a decrease in the vestibulo-ocular reflex (VOR), which can cause loss of balance when standing and walking.

METHODS

This research has met all the requirements with ethical clearance from the ethics committee of Muhammadiyah University of Purwokerto on August 20, 2024, Number KEPK/UMP/106/VIII/2024. This study uses a quantitative method with a Pre-Experimental one-group pre-post test research design. The population taken in this study was elderly people with a history of post-stroke in Jatimelati Village, Jatiwarna District, Bekasi City, with a total sample of 20 people. The independent variable in this study was Gaze Stability Exercise, and the dependent variable was balance. This study was conducted at Posbindu Kenanga Jatimelati, Pondok Melati, Bekasi City, from July to August 2024, 3 times a week for 4 weeks.

Inclusion criteria: 1) elderly aged≤60 years old, 2) have a history of stroke with a mild neurological deficit NIHSS score, 3) have balance disorders with Time Up To Go measurements of

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11-20 seconds, 4) able to walk without using aids, 5) can communicate well, 6) willing to be a research sample and follow the exercise program from start to finish consistently and sign the informed consent. Exclusion criteria: 1) have visual impairment and 2) are uncooperative.

Afterward, the sample size and sampling method were determined. Next, equipment for the examination was prepared, including research instruments, an explanation of the exercise program, informed consent, a stopwatch, and a chair with a backrest for the Timed Up and Go Test. This test is a measuring tool for assessing dynamic balance in the elderly. This was followed by a pre-test, intervention, and a post-test at the end of the meeting.

The collected research data were then processed using SPSS software. The analysis used included univariate and bivariate analyses. Univariate analysis was conducted to describe the characteristics of each research variable, which included demographic data such as age (mean, minimum, and maximum values), gender (frequency distribution), and balance level values (mean, minimum, maximum, and standard deviation) before and after the intervention. Next, bivariate analysis was conducted by first testing the normality of the data using the Shapiro-Wilk test, followed by a Paired Sample T-Test.

RESULTS

Table 1. Respondent Characteristics

Variables	Information	n
Gender	Man	9 (45%)
	Woman	11(55%)
Age	≥60	20 (100%)

Respondent characteristics based on Table 1 consist of 20 samples, namely 45% male, 55% female and 100% aged > 60 years.

Table 2. Balance Measurement Results

Information	Mean	Median	Elementary School	Min – Max
Before	17.60	18.05	1.47	14.21 – 19.54
After	16.12	15.94	1.87	10.82 – 19.11
Average	1.48	2.11	0.4	0.29-3.86

Based on Table 2, the balance results before the intervention were measured using the Time Up and Go Test (TUGT). The average value before the intervention was 17.60 seconds and the standard deviation was 1.47 seconds, which indicated that the respondents experienced balance disorders.

The TUGT results after the intervention obtained the lowest value of 10.82 seconds and the highest value of 19.11 seconds. The average value after the intervention was 16.12 seconds with a standard deviation of 1.87 seconds. The average change in balance before and after the intervention was 1.48 seconds. Where the largest value of balance change occurred in respondents at 3.86 seconds, while the smallest occurred in respondents at 0.29 seconds.

Table 3. Normality Test Results

Variables	Mean ± SD	p	Information
Before	17.60±1.47	0.182	Normal
After	16.12± 1.87	0.201	Normal

The results of table 3 show that the normality of the data before 0.182 and after 0.201 is p>0.05, so it can be said that the data is normal.

Table 4. Statistical Test Results

Variables	Mean ± SD	*p*
Before - after	1.47±0.092	0.000

Based on the results of the statistical test using the Paired Sample T-Test in Table 4, the average value is 1.47 and the standard deviation is 0.92 and the 95% confidence level shows a p-value of 0.000 < 0.050, which indicates a significant increase in balance, so it is concluded that there is an influence. *Gaze Stability Exercise* towards improving the balance of elderly with a history of post-stroke at the Kenanga Elderly Posyandu in 2024

DISCUSSION

Stroke is a common problem among the elderly. It occurs when a blood vessel in the brain ruptures or becomes blocked, depriving part of the brain of the blood supply necessary for oxygen delivery, leading to tissue death.[3] According to Khanna et al. (2014) Stroke

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Results of the Indonesian Health Survey (SKI) by the BKPK Ministry of Health2023 showed that the prevalence of stroke in Indonesia increases with age.[5]The highest rate of stroke cases reported by health workers was in the age group 75 years and above (41.3%), with the lowest number of cases recorded in the age group 15 to 24 years (0.1%). By gender, more men (8.8%) than women (7.9%). Based on residence, the number of strokes in urban areas (9.7%) was higher than in rural areas (6.4%). Elderly people who experienced a stroke had various problems, including difficulty walking or impaired balance (16.43%), weakness or paralysis of one half of the body (90%).[6]

As explained above, one of the risks of stroke is impaired balance. According to Khanna et al. (2014), balance is the ability to maintain an upright posture, both statically and dynamically, requiring a complex interaction between peripheral and central factors such as vision, somatosensation, vestibular sensation, motor output, and muscle tone.[7]

Neurological disorders, such as vestibular disorders, are one of the conditions and risk factors that can cause balance disorders.[8] Deger et al (2019) state that when balance deteriorates, either due to disease or the normal aging process, the risk of falls increases in older adults.[12] According toPimenta et alin 2017 in a study entitled “Effects of oculomotor and gaze stability exercises on balance after stroke: Clinical trial protocol” that balance disorders can be treated inspection using Time up to Go.[13]

According to Pimenta in 2017, physiotherapy plays a role in treating balance disorders. For balance disorders in elderly people at risk of stroke, physiotherapy modalities that can be performed include gaze stability exercises. Gaze stability exercises performed for four weeks have been shown to affect head alignment, resulting in improved balance perception through the vestibular-ocular reflex (VOR). Gaze stability is necessary to coordinate head, trunk, and pelvic movements during walking.

It has been suggested that VOR adaptation training affects head alignment, resulting in an improvement in overall balance perception, expanding the limits of stability [14]. In principle, Gaze stability exercise can provide significant benefits to VOR and dynamic visual acuity. The vestibular system will send information that then stimulates the vestibular-ocular reflex (VOR), vestibular-spinal reflex (VSR), and vestibular-collic reflex (VCR) which work to stabilize the eyes, help postural stability during standing and walking, and stabilize the head through the response of the neck muscles (including the sternocleidomastoid and scalene muscles).[15]

Based on the results of statistical tests using a paired sample t-test in table 2, it shows an average decrease in TUGT of 1.38 seconds with a standard deviation of 0.931 and a p value <0.05, which means there is a significant increase in balance after being given the gaze stability exercise intervention.

This research is in line with Khanna's 2014 theory, namely that Gaze stability exercise improves vestibular-ocular reflex (VOR) function so that head stabilization, eyeballs and focus of vision contribute to improving dynamic balance that it can help postural stability when standing and walking.[16]

Another study in line with this is the study conducted by Cui et al. (2024), whose results showed a greater decrease in TUGT results in chronic post-stroke patients with the same exercise for 6 weeks. However, the

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results of this study were smaller due to the possibility of providing a shorter intervention duration of 4 weeks and different exercise intensity. The exercise by Cui et al. used a combination of gait training and balance exercises, which increased stability function more.[17]

Thus, the results of this study align with previous theory and research, although the decline was not as significant as in studies using longer interventions or additional exercise. Other factors affecting balance in post-stroke elderly, such as physical activity, complications, and cognitive function, have not been studied.

CONCLUSION

In the study of the effect of gaze stability exercise on the balance of the elderly with a history of post-stroke which was carried out for 4 weeks with a frequency of 3 times a week, it can be concluded that the results of this study have an effect on the intervention of gaze stability exercise on the balance of the elderly with a history of stroke because there is a change in the average value of the measurement results using the Time Up To Go Test and based on the results of statistical tests using the Paired Sample T-Test, the results obtained are that there is a significant effect of gaze stability exercise intervention on the balance of the elderly with a history of post-stroke which is carried out 3 times a week for 4 weeks. Further research is expected to be able to examine more deeply the risk factors for stroke in each individual to get more effective and maximum results.

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