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THE EFFECT OF PROVIDING CORE STABILITY EXERCISE ON INCREASING BALANCE IN THE ELDERLY

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Abstract

BACKGROUND: Elderly people will experience decreased function in the neurological, sensory and musculoskeletal systems. In the sensory system, elderly people can experience visual, vestibular and proprioceptive disorders. Balance is a complex interaction originating from several systems including the sensory system (visual, vestibular, somatosensory and proprioceptive) and the musculoskeletal system. Core stability exercise is an exercise aimed at the core muscles, namely the abdominal and lumbopelvic muscles, where these muscles function as active stability in the core area (lumbopelvic-hip complex). Strong core muscles can improve balance and stability. With good stability, the center of gravity (COG) can be maintained above the base of support (BOS). **OBJECTIVE:** To determine the effect of providing core stability exercise on improving balance in the elderly. **METHODS:** Two group pre and post-test design with control using a simple random sampling technique of 60 subjects. The measuring instrument used is the Timed Up and Go Test (TUGT). This research was conducted for 4 weeks. **RESEARCH RESULTS:** This study used non-parametric tests so that the difference test between initial and final balance values in group I used Wilcoxon. The results of the initial and final balance difference test in group I obtained a value of $p = 0.000$, which means $p < 0.05$, so there is a significant difference in TUGT values before and after being given core stability exercise. It can be concluded that core stability exercise has an effect on improving the balance of the elderly. **CONCLUSION:** Providing core stability exercises can improve balance in the elderly. Based on p value = 0.000 ($p < 0.05$)

Keywords: core stability exercise, balance, Timed Up and Go Test.

INTRODUCTION

According to WHO, an elderly person is someone who has entered the age of 60 years and over and is an age group of humans who have entered the final stages of their life. More than 10 percent of the world's 6.9 billion population are elderly (Kiik et al., 2018). It is estimated that at least 1 in 6 people in the world will be aged 60 years or more in 2030 (World Health Organization (WHO, 2022). Currently, the number of people aged 60 years and over will increase from 1 billion, in 2020 to 1.4 billion . In 2050, the number of people aged 60 years and over in the world will double (2.1 billion). Starting in 2021, the number of elderly people in Indonesia will be more than 10 percent. aging population). Over a decade (2010-2021) the number of elderly people has become 10.82 percent, increasing by at least 3 percent (Central Statistics Agency (BPS, 2022).

Increasing age in the elderly will result in a decline in physiological functions and the emergence of various diseases. This decreased physical ability will affect mobility in the elderly, resulting in the risk of falls which can be complicated by other diseases (Wagiyanto et al., 2021). Decreased balance abilities in the elderly will result in the risk of falls. Balance is the main factor in maintaining projection at the center of the body when moving, sitting, standing and walking, and is needed to maintain posture and stability when a person moves from one place to another. (Supriyono E, 2015). A complaint that is often experienced by elderly people is postural balance disorders. The risk of falling is high when an elderly person's posture is unbalanced.

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Balance is a complex interaction originating from several systems including the sensory system (visual, vestibular, somatosensory and proprioceptive) and the musculoskeletal system (Marlian & Rosadi, 2021). Balance is the relative ability to control the center of gravity or the body's center of mass. of mass) to the support plane (base of support). The center of gravity is a point where the mass of an object is concentrated based on its gravitational pull. In order to maintain balance, the center of gravity must move to compensate for disturbances that can cause people to lose their balance (Bruijn & Van Dieën, 2018)

Core stability exercise (CSE) is an exercise aimed at the core muscles, namely the abdominal and lumbopelvic muscles, where these muscles function as active stability in the core area (lumbopelvic-hip complex). Strong core muscles can improve balance and stability. With good stability, the center of gravity (COG) can be maintained above the base of support (BOS) (Yundarwati & Soemardiawan, 2019)

A significant increase in balance through core stability exercise has been shown by research (Sannicandro, 2020), which proves that an increase in balance values occurs more effectively with this exercise. Providing core stability exercise for 4 weeks will influence further balance development according to research (Gamble K et al., 2021)

Based on the problems described in the background above, at the Mawar Putih Semarang Elderly Posyandu there are 70 elderly people, where after carrying out a balance test in the form of a fukuda stepping test by IFI Semarang members on August 27 2023, the results were obtained for 50 elderly people with balance disorders. Therefore, the author was encouraged to conduct research to determine the effect of providing core stability exercise on improving balance in the elderly.

METHODS

This research uses a quasi-experimental research design and a two group pre and post test design with control, with a quantitative research design. Balance measurement using the Timed Up and Go Test (TUGT). Subjects who had been measured were then randomly divided into two groups, namely group I and II, where group I was the treatment group that was given CSE for 4 weeks with a frequency of 2 times a week and a duration of approximately 15 minute. Meanwhile, group II was a control group that was not given CSE. Randomization was carried out by means of the subject's arrival sequence number being randomly drawn to fall into group I or group II. The elderly population at the Mawar Putih Semarang Elderly Posyandu is 70 people. The sample used was 60 people according to the inclusion and exclusion criteria

This study used simple random sampling. Subjects who had been measured were then randomly divided into two groups, namely groups I and II, where group I was the treatment group that was given CSE for 4 weeks with a frequency of 2 times a week and a duration of approximately 15 minutes. Meanwhile, group II was a control group that was not given CSE. Randomization was carried out by means of the subject's arrival sequence number being randomly drawn to fall into group I or group II. This research was conducted at the Mawar Putih Semarang Elderly Posyandu, carried out for 1 month or 4 weeks starting from February 1 to February 29 2024. There are 2 variables in this research, namely improving balance as the independent variable, core stability exercise as the dependent variable.

RESULTS AND DISCUSSION

A. Research Result

1. Description of Subject Characteristics

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Includes gender and age. The results of the description of the characteristics of the research subjects are presented in tables 1 and 2

Table 1
Characteristics of Research Subjects Based on Gender

Gender	Group I (CSE)		Group II (Control)		Total	
	Amount	%	Amount	%	Amount	%
Man	5	16,7	6	20	11	18,3
Woman	25	83,3	24	80	49	81,7
Total	30	100	30	100	60	100

Source: primary data 2024

Based on table 1, gender data for group I contained 25 women (83.3%) and 5 men (16.7%). Group II contained 6 men (20%) and 24 women (80%). So, of the total research subjects, 11 people were male (18.3%), while 49 people were female (81.7%).

Table 2
Characteristics of Research Subjects Based on Age

Age	Group I (CSE)		Group II (Control)		Total	
	Amount	%	Amount	%	Amount	%
60-62	5	16,7	6	20	11	18,33
63-65	9	30	8	26,7	17	28,33
66-68	10	33,3	8	26,7	18	30
69-71	4	13,3	1	3,3	5	8,33
72-74	2	6,7	7	23,3	9	15
Total	30	100	30	100	60	100

Source: primary data 2024

Based on table 2, the age data for group I is 60-62 years old, 5 people (16.7%), 63-65 years old, 9 people (30%), 66-68 years old, 10 people (33.3%), 69-71 years 4 people (13.3%), 72-74 years 2 people (6.7%). Group II contained 6 people aged 60-62 years (20%), 63-65 years 8 people (26.7%), 66-68 years 8 people (26.7%), 69-71 years 1 person (3, 3 %), 72-74 years 7 people (23.3%). So the total research subjects were 11 people (18.33%) aged 60-62 years, 17 people (28.33%) aged 63-65 years, 18 people (30%) aged 66-68 years, 5 people (8, 33%) aged 69-71 years, 9 people (15%) aged 72-74 years.

2. Elderly Balance Data

Table 3
TUGT Research Data Results

	Group I (CSE)			Group II (Control)		
	Pre **(second)**	***Post*** **(second)**	**Difference (second)**	***Pre*** **(second)**	***Post*** **(second)**	**Difference (second)**
Maximum	24	19	5	27	27	0
Minimun	8	6	2	8	7	1
Mean	13,6	10,27	3,33	14,73	13,60	1,13
Standard Deviation	4,446	3,638	0,808	5,771	6,095	-0,324

Source: primary data 2024

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Based on table 3, the results of this study use the TUGT measuring instrument to assess balance in the elderly. The research data obtained, namely group I, obtained maximum data for pre 24 and post 19 so the difference was 5, minimum pre 8 and post 6 so the difference was 2, average pre 13.6 and post 10.27 so the difference was 3.33, standard deviation pre 4,446 and post 3,638 so the difference is 0.808. Group II obtained maximum data for pre 27 and post 27 so the difference is 0, minimum pre 8 and post 7 so the difference is 1, mean pre 14.73 and post 13.60 so the difference is 1.13, standard deviation pre 5.771 and post 6.095 so the difference is - 0.324.

3. Normality Test

Table 4
Data Normality Test

	Kolmogorov-smirnov Test					
	Group I (CSE)			**Group II (Control)**		
	statistics	**df**	**Sig**	**statistics**	**df**	**Sig**
Pretest	0,220	30	0,001	0,251	30	0,000
Posttest	0,296	30	0,000	0,239	30	0,000

Source: primary data 2024

According to table 4, the normality test in group I before treatment was obtained, the result was p = 0.001 and after treatment, the result was p = 0.000, so the p value <0.05 so the data was not normally distributed. Group II has a pre and post value of 0.000 so p < 0.05 so the data is not normally distributed. Therefore, the hypothesis test that can be used is a non-parametric test.

4. Hypothesis Testing

This study uses non-parametric tests so that the difference test between initial and final balance values in group I uses Wilcoxon, presented in table 5.

Table 5
Hypothesis Testing TUGT Group I (CSE) Values

Variable	**Amount**	***Mean***		**Sig (2-tailed)**	**Conclusion**
		pre	***post***		
Elderly Balance	30	13,60	10,27	0,000	HA accepted

Source: primary data 2024

The results of the initial and final balance influence test in group I obtained a value of p = 0.000 where p < 0.05, so from these results it can be interpreted that there is a significant dissimilarity in TUGT values before and after being given core stability exercise. From this data analysis it can be concluded that HA is accepted. Where HA, namely core stability exercise, has an effect on the balance of the elderly.

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5. Homogeneity Test

Table 6
Group I (CSE) and II (Control) Homogeneity Test

Variable	Average difference	Sig. (2-tailed)	Conclusion
Elderly Balance	-1,133	0,398	Homogeneous

Source: primary data 2024

The homogeneity test used was the Independent Sample T-Test with the pre-test value obtained at p = 0.398, which means p > 0.05, so that both groups came from the same or homogeneous TUGT measurement value.

B. Discussion

1. Characteristics of Respondents Based on Gender

This is in accordance with research (Safitri, 2016) which states that women are more at risk of experiencing changes in body balance compared to men, because women are more susceptible to experiencing musculoskeletal decline due to hormonal factors during the menopause process. After menopause, there will be changes in the estrogen hormone, the impact of which can result in osteoporosis. Osteoporosis can cause bones to become increasingly eroded, weak bones can ultimately cause falls in elderly women (S. R., & N. S. K. Dewi, 2015).

2. Characteristics of Respondents Based on Age

As age increases, the aging process will follow, there will be a decrease in physical abilities due to a decrease in the abilities of various organs, functions and body systems such as the musculoskeletal system, vestibular system, proprioceptive system, and eye disorders caused by physiological degenerative processes (Murtiyani & Suidah, 2019) . As a person gets older, their physical activity capacity decreases, so this can reduce the balance of elderly people (Ashari et al., 2022).

3. Data Description of the Effect of Core Stability Exercise on the Balance of the Elderly

The normality test in this study has a pre and post p value < 0.05 so the data is not normally distributed. Hypothesis testing that can be used is by using non-parametric tests. In the pre and post difference test on all subjects the results obtained were significant, namely p = 0.000, which means there was a significant benefit in the initial measurements and evaluation results. The results of this research are in line with research conducted by (Wagiyanto et al., 2021) which states that core stability exercise has an effect on increasing balance with the significance of the p value being 0.000 (p < 0.05).

Core stability exercise can have an effect in improving dynamic balance. This is because core stability exercise will improve neuromuscular function (Magdalena, 2017). This muscle strength will help the muscles work optimally to form good stability so that the body can maintain its balance when carrying out various movements (Wahyuni Dirmayanti, 2018).

In this study, the subjects consisted of 11 male subjects (18.3%) and 49 female subjects (81.7%). Gender has quite a big influence in this research because the muscle strength of the lower limbs in women and men is different. This is caused by differences in muscle mass. Muscles in men contain less fat than women (Lesmana, 2014). Musculoskeletal decline in elderly men and

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elderly women is very different. The decrease in hand strength is 5-15%, leg strength is 20-40% in men, while in women hand strength is 10-20% and leg strength is 30-50% (Lupa et al., 2017).

4. **Control Group Data Description**

The increased risk of falls due to balance disorders in the elderly is closely related to dynamic balance, where dynamic balance is the most important component when moving and daily activities (Suadnyana et al., 2014). In the control group there was no additional core stability exercise physical activity so that muscle strength did not increase. This resulted in no changes in body balance in the elderly control group, from the results of examinations carried out using TUGT.

CONCLUSION

Based on research on "The Effect of Providing Core Stability Exercise on Improving Balance in the Elderly" which was conducted on 60 elderly subjects at the Mawar Putih Semarang Elderly Posyandu which was carried out on February 1 2024 - February 29 2024 which was divided into 2 groups, namely the treatment group and the control group, by providing treatment in the form of a core stability exercise program in group I with an intensity of 2 times a week within 4 weeks. Therefore, it can be concluded that there is an influence of core stability exercise on improving balance in the elderly at the Mawar Putih Semarang Elderly Posyandu.

Based on the implementation and results of the research that has been carried out, the researchers provide suggestions including controlling the subject's activities outside of treatment as much as possible, increasing the number of research enumerators, so that they can supervise and help the elderly if there are difficult movements, the next researcher can use the Fukuda stepping test balance measuring instrument, in a control group can be given therapy to compare results with the treatment group.

AUTHOR CONTRIBUTIONS

Maria Dyah Ayu Ika et al / The Effect of Providing Core Stability Exercise on Improving Balance in the Elderly

CONFLICT OF INTEREST

This research was conducted without any commercial relationships or association with sponsors.

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