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Core Strength Training, Balance to Increase Togok Flex and Leg Strength in the Elderly in Semarang

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Abstract

This study aimed to determine core strength training, balance to increase torso flexibility and leg strength in an elderly in Semarang. The research method is an experiment using a 2x2 factorial design. The sample consisted of 20 older women who were selected by purposive sampling. The results in this study are that are significant differences in the effect of (1) core strength training (floor and seated), (2) balance (high and low), (3) and there is the interaction of core strength training and balance to increase torso flexibility and leg strength an elderly

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INTRODUCTION

Humans will continue to age yearly until they reach the elderly stage. Humans develop from helplessness to becoming perfect and independent humans and finally become helpless old again (Rahman, 2016). Human changes will also continue to develop in terms of body shape, bone structure, muscle time, etc. This is also in line with Nugroho's opinion in the journal Sudawan which states that the age of 60 and over or the elderly is a natural process accompanied by a decrease in physical, psychological, and social conditions that interact with each other (Sudawan & Livana, 2017).

The elderly is the final stage in the life process, accompanied by physical, psychological, and social declines and changes related to each other (Prastika & Siyam, 2021; Syahrudin, 2020). Aging is a normal human biological process; human aging includes gradual changes, starting from structure, function, and tolerance to environmental stress (Ali, Sudirjo, & Rahman, 2021; Dahlan & Alimuddin, 2019). The elderly have their classification ranging from middle age to ancient age.

The effectiveness of various cytological functions of the body will begin to decline at 30 years and above and will be more clearly visible at age 55-60. As we get older, the function of body organs will decrease, both through natural factors and due to disease; this certainly impacts other aspects of life, both social, economic, and health. There are various decreases in the function of the elderly body,

physical abilities, psychosocial problems, and environmental stress in the elderly; this is also a process of elderly life (Aniyati & Kamalah, 2018). Decreased muscle strength and flexibility will cause a decrease in mobility and limited movement in the elderly (P Palgunadi, Rahayu, & Subiyono, 2014). The elderly need flexibility and good strength to do all activities without experiencing obstacles; with good muscles, bones, and joints, the elderly can perform daily activities.

According to Sukirno in the journal Wahyuni (Wahyuni & Kurdi, 2018) explained, that torso is a torso that forms the body; the torso is formed by a group of head bones, ribs, sternum, and bones incorporated in the torso or torso. Clarified again by Syaifuddin in Wulantoro (Wulantoro, 2019), Togok / spine (Vertebral Column) consists of 5 parts, namely: (1) cervical vertebra, (2) thoracic vertebra, (3) lumbar vertebra, (4) sacral vertebra, and (5) conoidal vertebra, the torso functions as a support for intervertebral grip cartilage. Its arch gives it the flexibility to bend without breaking.

Leg muscles are the lower movers consisting of transverse fiber muscles or skeletal muscles, and leg muscles are divided into 2, namely upper leg muscles and lower leg muscles (Adityatama, 2017; Gustaman, 2019). The upper leg muscles are located at the end of the groin to the knee or patella; the upper leg muscles are divided into three groups, namely (1) Muscle Adbuktor, in this muscle, there is an inner muscle abductor mandamus, middle adductor brevis muscle, outer abductor longus muscle, femoral

abductor muscle, (2) Extensor muscle (Ruadriseps Femoris), in this muscle there is the rectus femoris muscle, external vastus lateralis muscle, internal vastus medialis muscle, and internal vastus inter medial muscle, (3) Flexor Femoris muscle, in this muscle there are biceps femoris, semimembranosus muscle, semi tendinous muscle, Sartorius's muscle. The lower leg muscles are telemarked in the knee or patella to the soles of the feet; the lower leg muscles are divided into seven parts, namely: (1) Shin Muscles, located in front of the anterior tibial muscle, (2) External Muscles of Talangus Longus, located on the instep of the little finger, ring finger and middle toe (3) External Muscles or Thumb Drum, located above the big toe, (4) Muscle Tendo Achilles, located at the base of the shinbone condyle and attached to the lateral condyle bone, (5) Muscle Falangus Longus, located at the base of the calf, veins passing through the finger bones, and attached to the master knuckle, (6) Posterior Tibial Muscle, located on the membrane between the bones and Melaka at the base of the leg bones, (7) Kedang and Jari Bersama muscles, located on the instep.

Balance is the body's ability to maintain a position under any conditions in various movements. Balance is needed when doing daily activities; a small example is that balance is needed to walk; if you have a poor balance, then when walking, humans cannot walk straight. Balance is a person's ability to control his body on a footing (Knudson, 2007). There are two types of balance, namely static balance and dynamic balance. A good balance is

needed for everyone to support their daily mobility. Not only do athletes need balance to excel, but it is very useful for the elderly to live in their old age without the help of others (Prasetyo & Indardi, 2014). Added again by Sudrajat and Soetardji (Sudrajat & Soetardji, 2014), the decline in the elderly can be seen in motor, sensory, and sensorimotor functions where the decreased function of muscle tissue, bones, and joints, which will affect strength, speed, flexibility, instability, and body strength including difficulty walking, squatting, sitting, and moving.

Core strength training is an exercise method to increase the capacity of the muscles in the back, abdomen, and hips. Core strength training improves balance and maintains posture and harmony (Fig, 2005). Chang et al. (Chang, Lin, & Lai, 2015) added that core strength could strengthen back muscles and improve low back pain. Core strength describes the ability to control or control the position and central motion of the body, including (1) head and neck alignment, (2) alignment of vertebral column thorax, (3) pelvic stability/mobility, (4) ankle and hip strategy (Kahle, 2009).

Core strength training can be an addition or alternative to improving balance or resistance training programs for the elderly (Granacher, Gollhofer, Hortoba, Kressig, & Muehlbauer, 2013). Getting maximum results in core strength training only takes 5-8 weeks to get the best results. Cuneo et al. (Cuneo, Dial, & Hill, 2005) state that a significant increase in muscles often used for activity in core strength training takes as long as five

weeks. They added to Junker (Junker & Stöggl, 2019) that core strength training is carried out for 5-8 weeks with 30 minutes to exercise to improve balance, dynamics, and flexibility.

METHODS

This type of research is experimental research using a 2x2 factorial design. This method is validation, which tests the influence of one or more variables on variables. This experimental research uses two different groups, namely the provision of the core strength training method in terms of balance (high and low). The division into experimental groups is based on the initial performance of the balance test; after the initial test scores are obtained, they will be ranked, and subjects with equivalent abilities will be paired into Group 1 and Group 2. Thus both groups, before being given treatment, will get a balanced group

The subjects in this study were the elderly who were in the Pucang Gading Elderly Social Service Home. Sampling in this study uses purposive sampling, which is the sample used by the criteria set by the researcher or based on unique selection. The criteria set by the researchers were women aged 65-69 who could stand, could walk, and did not use walkers. Pucang Gading Elderly, Social Service Home, has 47 women; those included in the criteria are 38 elderly.

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Elderly Social Service Home. Sampling in this study uses purposive sampling, which is the sample used by the criteria set by the researcher or based on unique selection. The criteria set by the researchers were women aged 65-69 who could stand, could walk, and did not use walkers. Pucang Gading Elderly, Social Service House, has 47 women; those included in the criteria are 38 elderly.

The data collection technique in this study uses measurement tests with the following stages: (1) Conducting balance measurement tests using time up and go tests. This test is used to determine the group so that the group gets equal (2) Conduct an initial test (pretest) of flex using chair sit and reach, and an initial test of leg strength using a 30-Second Chair Stand (3) Provide treatment or treatment to the exercise group for five weeks, and (4) Perform a final test or post-test measuring the flexure of the togek and leg strength and evaluate the results.

Data analysis techniques will be carried out through prerequisite tests and normality tests using the Shapiro-Wilk method; after all, average data are continued with homogeneity tests using the Levene Test, and after homogeneous data are continued hypothesis tests using two-way ANOVA.

FINDINGS AND DISCUSSION

Findings

Below are the data processing results from the ANOVA Two-Way Test of flexure and leg strength. Here are the results below.

Table 1 ANOVA Two-Way Test Results of Togok Flex

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	166.950	3	55.650	30.081	.000
Intercept	1748.450	1	1748.450	945.108	.000
Core_Strength	18.050	1	18.050	9.757	.007
Keseimbangan	140.450	1	140.450	75.919	.000
Core_Strength*	8.450	1	8.450	4.568	.048
Keseimbangan					
Error	29.600	16	1.850		
Total	1945.000	20			
Corrected Total	196.550	19			

Core Strength Training (Floor and Seated) Against Togok Flex, From the results of the ANOVA test in Table 1, it is found that the F value is 9.757, and the significant p-value is $0.007 < 0.05$, meaning that the decision is acceptable. Because there is a significant difference in influence. Based on the analysis results, the core strength training floor with an average of 13.6 is higher or better than the core strength training seated of 10.4. Post-test difference of 3.2. This research hypothesis states that "There is a significant difference in influence after performing core strength floor and core strength seated exercises against the flexibility of took in the elderly at the Pucang Gading Elderly Social Service Home," which has been proven.

High and Low Balance Against Togok Flexure, From the results of the ANOVA test in Table 1, it is found that the F value is 75.919, and the significant p-value is $0.000 < 0.05$, meaning that based on the decision, it is acceptable. Because there is a significant difference in influence. Based on the analysis results, it was obtained that the type III sum of square got a value of 140,450 with df 1, and for mean square got a value of 140,450. This research hypothesis states that "There is a difference in the effect between the elderly who have a high and low balance on the flexibility of the took in the elderly at the Pucang Gading Elderly Social Service Home" has been proven.

Table 2 ANOVA Two-Way Leg Strength Test Results

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	102.600	3	34.200	27.918	.000
Intercept	1729.800	1	1729.800	1412.082	.000
Core_Strength	7.200	1	7.200	5.878	.028
Keseimbangan	88.200	1	88.200	72.000	.000
Core_Strength*	7.200	1	7.200	5.878	.028
Keseimbangan					
Error	19.600	16	1.225		
Total	1852.000	20			
Corrected Total	122.200	19			

Interaction of Core Strength Training and Balance Against Togok Flexure, From the results of the ANOVA test in Table 1, it is found that the F value is 4.568, and the significant p-value is $0.048 < 0.05$, meaning that the decision is acceptable. The research hypothesis that states that "There is an interaction between core strength (floor and seated) and balance (high and low) training on the flexure of the took in the elderly at the Pucang Gading Elderly Social Service Home" has been proven.

Core Strength Training (Floor and Seated) on Leg Strength, From the results of the ANOVA test in Table 2, it is found that the F value is 9.757, and the significant p-value is $0.028 < 0.05$, meaning that the decision is acceptable. Because there is a significant difference in influence. Based on the analysis results, the core strength training floor with an average of 9.9 is higher or better than the core strength training seated of 8.7. Post-test difference of 1.2. This research hypothesis states that "There is a significant difference in influence after doing core strength floor and core strength seated exercises against limb strength in the elderly at Pucang Gading Elderly Social Service Home," it has been proven.

Balance of High and Low to Leg Strength, From the results of the ANOVA test in Table 2, it is found that the F value is 72,000, and the p-significant value is $0.000 < 0.05$, meaning that the decision is acceptable. Because there is a significant difference in influence. Based on the analysis results, it was obtained that the type III sum of square got a

value of 88,200 with df 1, and for mean square got a value of 88,200. This research hypothesis states that "There is a difference in the effect between the elderly who have a high and low balance on the flexibility of the took in the elderly at the Pucang Gading Elderly Social Service Home," which has been proven.

Interaction of Core Strength Training and Balance to Leg Strength, From the results of the ANOVA test in Table 2, it is found that the F value is 5.878, and the significant p-value is $0.028 < 0.05$, meaning that the decision is acceptable. The research hypothesis that states that "There is an interaction between core strength (floor and seated) and balance (high and low) training on leg strength in the elderly at Pucang Gading Elderly Social Service Home" has been proven.

Discussion

Based on hypothesis testing, there is a significant difference in the effect between core strength training floor and core strength training seated on increasing the flexibility of the elderly took. Core Strength Training Floor is higher (good) than Core Strength Training Seated if, in biomechanics analysis, the Core Strength Training Floor movement is more focused on the elderly took, such as the Pelvic Tilt movement is more focused on the load on the took.

This finding is supported by several previous studies that mention that pelvic tilt is an exercise performed to repair or align the lumbar spine and can also be used as a rehabilitation exercise (Akuthota & Nedler, 2004; Gluppe, Engh, & Bo, 2021; Takaki et

al., 2016). Core strength training is an exercise performed by activating the abdominal and paraspinal muscles as a unit of motion (Wowiling & Lolombulan, 2016) added again by Wahyuni et al. (Wahyuni, Wahidah & Suwanto, 2019) that core strength training exercise method that aims to strengthen muscle groups surrounding the lumbar and small intrinsic muscles around the spine. Core strength training consists of movements carried out in a sitting and lying position, and this exercise is an easy and light exercise that is not burdensome if applied to the elderly (Hayati, Anggriani, & Nasution, 2021).

Balance is a complex process that involves the reception and integrity of sensory input in the execution and planning of movements to be used to achieve goals that require an upright posture. Balance is a complex process involving the coordination of the sensory system (visual, vestibular, and proprioceptive) and motor system (muscle strength and flexibility). A bent or forward-curved posture is a sagittal collapse of the vertebral column that leads to a forward projection of the gravitational line, affecting postural balance (Fernandes, Ribeiro, Fernandes, & Menezes, 2018). As a result of this change will result in balance disorders and can put the elderly at risk of falling and will cause injury to the elderly (Sabakodi, Darmawijaya, & Vitalistyawati, 2022).

The elderly have a high risk of falling due to reduced muscle strength, impaired reflexes, and loss of mobility, which all occur due to aging. Balance is needed to improve the coordination of motion when walking or

standing (Eckstrom, Neukam, Wright, & Kalin, 2020).

Core strength training floor is a core strength exercise or strength training by supine means. Core strength training floor has several types of exercises: pelvic tilt, bridge, swiss or therapy ball, trunk rotation lying down with feet on the ball, tall kneeling, and standing march with elbow tap. This core strength floor exercise only uses pelvic tilt exercises, pelvic tilt exercises there are several types of exercises, namely pelvic tilt, pelvic tilt lying down, pelvic tilt march, pelvic tilt with single leg raise, and pelvic tilt with double leg raise.

The pelvic tilt is used to strengthen abdominal muscles, reduce lower back pain, improve or align the lumbar spine, and pelvic tilt exercises are used as rehabilitation exercises (Takaki et al., 2016). As a form of spinal alignment, a form of avoiding low back pain, pelvic tilt exercises have been recommended to relieve low back pain (Drysdale, Earl, & Hertel, 2004; Singer, 1986).

Core strength training seated is a core exercise by sitting in a chair. In core strength training seated, there are several types of exercises, namely: (1) seated forward roll-up, (2) seated side bends, (3) seated leg lifts, (4) seated taps, and (5) seated half roll-back.

Core Strength Training, in particular, increases muscle strength, improves metabolism, increases glycogen storage, increases oxidative enzyme activity, and improves agility, coordination, and balance. Core Strength Training involves the use of resistance to produce muscle contractions,

thereby increasing the ability to produce muscle strength, leading not only to increased muscle hypertrophy but also to increased mobility endurance, but also to increased anaerobic endurance, and increased bone density (Kelley, Kelley, & Tran, 2001).

Core strength training floor and seated have several movements, which are perfect movements for leg strength training if analyzed biomechanics. The core strength training floor movements that increase leg strength are pelvic tilt with single leg raise and pelvic tilt with double leg raise. For core strength training, seated that can increase leg strength if biomechanics are analyzed are seated leg lifts and seated leg taps.

Lack of activity in the elderly results in muscles and joints, especially in the knees; most elderly complain of pain in the knee joints and difficulty straightening the legs (Putra et al., 2022). Leg strength plays a role in the elderly in maintaining position when standing and walking; core strength training is essential to improve body balance and posture control in movements such as upright posture when sitting, and core strength training contributes to leg strength and body control (Hsu, Oda, Shirahata, Watanabe, & Sasaki, 2018).

In line with the research conducted by Jeong et al. (Jeong, Choi, & Shin, 2021) stated that core strength training is very influential on the incidence of lower extremity injuries and can change motor control strategies and biomechanical parameters at risk associated with ACL (Anterior Cruciate Ligament) injuries During cutting maneuvers

by reducing the valgus adduction angle of the knee and hip, core strength training may be considered in carrying out a preventive ACL (Anterior Cruciate Ligament) program to alter the alignment of the lower extremities. Core strength has proven critical in lower extremity injuries; core muscle strengthening techniques have been widely used in injury prevention and rehabilitation (Sugimoto, Myer, Foss, & Hewett, 2014).

Limb strength dramatically affects the balance of the elderly. This is in line with research conducted by Khalaj et al. (Khalaj, Vicenzino, Heales, & Smith, 2020), which states that decreased leg strength will significantly affect the body's ability to maintain balance both in healthy people without injury and people with a history of injury.

The results of research by Muliawan et al. (Muliawan, Darmawijaya, & Vitalistyawati, 2022) in a study entitled "The Relationship of Leg Muscle Strength with Dynamic Balance of the Elderly in Buruan Kaja Village" with the results of a correlation test between leg muscle strength and dynamic balance obtained significant results of 0.004 with decision making < 0.05 if the significant value of $0.004 < 0.05$ that there is a significant relationship between leg muscle strength and dynamic balance.

Balance is a person's ability to maintain a stable position or not fall when relying on gravity. Knudson (Knudson, 2007) explains that balance is a person's ability to control his body on a footing. Equilibrium is divided into two types, namely static balance and dynamic

equilibrium.

Static equilibrium is maintaining a position that does not move or does not move, only stationary at the point that is stepped on. According to Kim (Kim & Kim, 2018), static balance controls the body's balance when standing still. Dynamic balance is maintaining position from point A to point B, which involves controlling the body as the body moves in space. Bressel et al. (Bressel, Yonker, Kras, & Heath, 2007) explain that dynamic balance is the ability to control the balance of the body during movements such as walking.

Based on the results discussed in this study, that a significant interaction between core strength training (floor and seated) and balance (high and low) on leg strength in the elderly at the Pucang Gading Elderly Social Service Home in Semarang. The results show that the core strength training floor is an effective method for the elderly with a high balance, and the core strength training seated method is effectively used for the elderly with low balance.

Core strength training is performed by activating the abdominal and paraspinal muscles as a unit of motion (Wowiling & Lolombulan, 2016). Wahyuni et al. (Wahyuni et al., 2019) added that core strength training is an exercise method that aims to strengthen muscle groups surrounding the lumbar and small intrinsic muscles of the spine. Core strength training consists of movements carried out in a sitting and lying position, and this exercise is an easy and light exercise that is not burdensome if applied to the elderly

(Hayati et al., 2021).

Core strength training is an exercise method to increase the capacity of the muscles in the back, abdomen, and hips. Core strength training improves balance and maintains posture and harmony (Fig, 2005). Balance is a complex process involving the coordination of the sensory system (visual, vestibular, and proprioceptive) and motor system (muscle strength and flexibility). Balance is needed by the elderly because when they reach the age of 30 years, a decline will occur and will be more pronounced at the age of 55-60 years. Explained by Pristant et al. (Prisianto, Adiputra, & Irfan, 2016) explained that the poor ability of postural muscles in the elderly causes the static balance to decrease and will affect the postural state and the ability of the elderly to maintain their body balance toward the fulcrum plane.

CONCLUSION

Based on the research results and the data analysis that has been carried out, the following conclusions were obtained. 1). There is a significant difference in influence after conducting core strength floor and core strength seated exercises on the flexibility of the togok in the elderly at the Pucang Gading Elderly Social Service Home; 2). There is a difference in the influence between the elderly who have a high and low balance on the flexibility of the elderly at the Pucang Gading Elderly Social Service Home; 3). There is an interaction between core strength training (floor and seated) and balance (high and low) on the flexibility of the togok in the elderly at

the Pucang Gading Elderly Social Service Home; 4). There is a significant difference in influence after doing core strength floor and core strength seated exercises on leg strength in the elderly at the Pucang Gading Elderly Social Service Home; 5). There is a difference in the effect between the elderly who have a high and low balance on the strength of the elderly limbs at the Pucang Gading Elderly Social Service Home; 6). There is an interaction between core strength training (floor and seated) and balance (high and low) on the flexure of the toek in the elderly at the Pucang Gading Elderly Social Service Home.

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