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Case Series

The effectiveness comparison of the Otago home exercise program with balance strategy exercise on dynamic balance in the elderly

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ABSTRACT

Decreased balance can cause various obstacles and can cause injury to the elderly, one of which is falling. Falls cause hip fractures and more serious injuries such as head injuries. The purpose of this study was to compare the effectiveness of the Otago home exercise. The research sample consisted of 30 respondents who were divided into the treatment group who received the Otago home exercise programme (OHEP) training as many as 15 respondents and the control group who received the balance strategy exercise (BSE) training as many as 15 respondents. After training 3 times/week for 4 weeks results were obtained, the difference in the average increase in dynamic balance was analyzed by paired sample t test before and after the intervention in the OHEP group with a p=0.000 (p<0.05) and the BSE group with a p=0.000 (p<0.05) which means that there is a significant difference in the increase in dynamic balance before and after training. Independent t test obtained p=0.000 (p<0.05) which means there is a significant difference between the two groups. The average percentage increase in dynamic balance in the OHEP group was greater than the BSE group with a difference of 12.36%. In conclusion based on the results of the study, it can be concluded that the provision of the OHEP is better at improving dynamic balance than the BSE in the elderly.

Keywords: Elderly, Dynamic balance, OHEP me, Balance strategy exercise, Timed up and go test

INTRODUCTION

The elderly will experience changes in body functions which caused by degenerative processes. One of the changes that occur is in the musculoskeletal system, such as a decrease in muscle mass that affects muscle strength, especially in the upper and lower extremity muscles and postural muscles, which will affect the ability of the elderly to maintain balance and postural control.[1] Balance is the ability of the body to maintain its position in a state of rest (static) or when moving (dynamic). Balance occurs through a complex interaction between sensory system which includes vestibular, visual, somatosensory and proprioceptive systems with motor system.[2]

Decreased balance can cause various obstacles and can cause injury to the elderly, one of which is falling. Elderly people often experience falls due to various factors such as accidents (31%), weak gait (17%) and dizziness (13%).[3] One study reported that more than 2% of falls caused hip fractures, more than 5% caused other fractures, and more than 10% caused more serious injuries such as head injuries.[4]

The OHEP is an exercise program designed to improve balance in the elderly by combining balance training, strengthening exercises and walking programs. BSE is an exercise program consisting of ankle strategy exercise, hip strategy exercise and stepping strategy exercise which aims to improve balance by utilizing postural control during movement.

Both types of training are effective in improving dynamic balance. The research that comparing the effectiveness of the two trainings has never been done. Therefore, the authors needed to do research to compare the two trainings.

CASE SERIES

The respondents in this study were all elderly aged 60-74 years who were registered in Pemanis Penebel village, had a body mass index in the normal and overweight categories (18.5-24.99) and a TUG test value of more than 12 seconds. The measurement of dynamic balance in the elderly was done with the TUG test. The walking time was measured with a stopwatch from the start of standing up to sitting back down.[5] Subjects with musculoskeletal injuries such as fractures and impaired posture were excluded from this study. Subjects who met the inclusion and exclusion criteria were included in the study and became the research sample. The research sample consisted of 30 respondents who were divided into the treatment group who received the OHEP training as many as 15 respondents, and the control group who received the BSE training as many as 15 respondents.

The OHEP is an exercise program that consists of components of muscle strengthening, improving balance and walking exercises. These components are combined into a series of exercises that begin with a warm-up, core exercise and end with a cool-down. There are five types of strengthening exercises in the OHEP me, where three types of exercise use additional weights. Load that was used starts from 0.5 to 2 kg with 8-10 repetitions per 1 movement, where main focus of strengthening exercises is on lower extremity muscles.[6] The OHEP consists of 12 forms of exercise which are divided into 4 levels by reducing assistance from hands when performing movements at each level. Walking exercises can also be done independently on a regular basis for at least 30 min every week. For starters, it can start by walking for 5-10 min and continue to increase until you reach 30 min.

BSE consists of ankle strategy exercise emphasizes the control of postural sway of the ankle and foot. Ankle strategy exercise serves to maintain the body's center of gravity by generating rotation of the ankle against the supporting surface and neutralizing the knee and hip joints to stabilize the proximal joint. Hip strategy exercise describes the control of postural sway of the pelvis and trunk. Head and hips are in the opposite directions. Hip strategy exercise relies on rapid torso movement to generate frictional force/horizontal movement against the base of support to move the center of gravity. Stepping strategy exercise describes stepping with the legs or reaching with the arms and attempting to improve the new base of support by activating the limb when the center of gravity exceeds the original base of support.

After training 3 times/week for 4 weeks results obtained in Table 1 shows that OHEP study subjects had a mean age of 68.80 years old and in the BSE group had a mean age of 66.33 years old. BMI in treatment group obtained an average of 21.224 and the control group obtained an average of 21.986. Each group consisted of 15 respondents which consisting of 2 men and 13 women.

Different results of average increase in dynamic balance which analysed by paired sample t test before and after intervention in OHEP group with p=0.000 (p<0.05) and BSE group with p=0.000 (p<0.05) which means that there is a significant difference in improvement of dynamic balance before and after exercise. Independent t test analysis obtained p=0.000 (p<0.05), this indicates that there is a significant difference in OHEP compared to BSE in increasing balance of elderly. Average percentage increase in dynamic balance in OHEP group greater than BSE group with a difference of 12.36% (Table 2).

Table 1: Characteristics of the respondents.

Characteristics	Number of respondents	Mean±SD		Percentage (%)	
		OHEP	SBE	OHEP	SBE
Age (years)	30	68.80±5.003	66.33±4.577		
Gender	30				
Men		-	-	2 (13.3)	2 (13.3)
Women				13 (86.7)	13 (86.7)
Body mass index (kg/m^2)		21.224±2.559	21.986±2.290		

Table 2: The average increase in fall balance before and after exercise.

Groups	Mean±SD, pre test	Mean±SD, post test	Paired sample t test	Independen t t test	Percentage decrease in TUG test (%)
OHPE	16.233±1.6365	12.300±1.1723	0.000	0.000	25.16
BSE	15.293±1.5572	12.980±1.2072	0.000		12.80
Difference					12.36

DISCUSSION

Reducing fall risk in the OHEP group

Based on the results of the paired sample t test in the treatment group that was given the OHEP, the average TUG-Test time before exercise was 16.233 seconds and the average after exercise was 12.300 seconds with a difference in TUG-test time before and after exercise 3.933 seconds. In addition, it was obtained p=0.000 (p<0.05) which indicated a significant difference between the dynamic balance before and after exercise in the elderly. This showed that the OHEP can improve dynamic balance in the elderly.

The complex training components of the OHEP can improve the functional capacity of the elderly, namely balance and lower extremity muscle strength so as to optimize the functional abilities of the elderly, especially in walking. In the study of Ambrose et al who conducted a study of 74 people over the age of 70 after receiving exercise for 6 months, the TUG-test time decreased from 14.2 seconds to 13.6 seconds. An increase in body balance also occurred until the sample was able to stand upright and stably.[7]

The increase in the average travel time of the TUG-test was the effect of training backward walk, walking and turning around, heel to toe walking and stair walking in the OHEP which focused on step speed, distance traveled, changes in direction, increased muscle tone and strength. during running practice. In the stair walking exercise, the focus of the exercise was controlling balance, extension and contraction of the lower extremity muscles and ankle dorsiflexion to move the body's center of gravity to control afferent, efferent and contraction of the muscles in the lower extremities. As a result of these exercises, body coordination became better and the body can learn to move the body's center of gravity during walking, so that there will be an increase in walking speed and stride length.[8]

The increase in balance was also accompanied by an increase in lower extremity muscle strength which consists of five types of strengthening exercises with progressively added loads to increase the strength of the hip abductors, knee flexors, knee extensors and body weight used to increase the strength of the plantarflexion and dorsiflexion muscles. ankles. Exercise in the elderly aged 60 years and over by using progressively added weights can increase the muscle strength of the elderly.[9]

Reducing fall risk in the BSE group

Based on the results of the paired sample t test in the control group who was given BSE, the average TUG-test time before training was 15.293 seconds and the average after exercise was 12.980 seconds with the difference in TUG-test time before and after exercise 2.0007 seconds. In addition, obtained p=0.000 (p<0.05) which indicated a significant difference between dynamic balance before and after exercise in the elderly. This showed that BSE can improve dynamic balance in the elderly.

The series of BSE can improve sensory input (visual, vestibular and proprioceptive), sensory processing, sensory integration and motor output regulation.[10,11] The BSE movement was also able to increase the limits of stability, increase joint stability and proprioception of the ankle joint.[12,13]

Increasing dynamic balance through BSE training was achieved by increasing the muscles of the lower extremities and postural muscles thereby creating improvements in limits of stability, increasing the body's automatic postural response, increasing dynamic control and achieving sensory integration and balance recovery reaction. This was in accordance with the results of research conducted by Nugraha et al which stated that giving BSE to the elderly 3 times a week for 4 weeks, where the results showed a p=0.002, so that BSE was proven to be effective in improving dynamic balance in the elderly.[10]

Movements in the ankle and hip strategy will increase the strength of the gastrocnemius, hamstring, trunk extensor muscles, anterior tibial, quadriceps and abdominal muscles that play a role in gait and locomotion. These muscles will support the body and support the limit of stability so that the body is stable to move the center of gravity as far as possible in the anteroposterior and mediolateral directions.[14] The repetition of movements in the ankle and hip strategy exercise will improve the somatosensory, visual and vestibular systems to respond to dynamic balance. The stepping strategy exercise movement will also increase dynamic control which was also related to gait and locomotion). Stepping strategy exercise training provides benefits in the form of adaptation to increasing stride length and decreasing stride width and increasing walking speed.[15]

CONCLUSIONS

Based on the results of the study, it can be concluded that Otago home exercises and BSEs can improve dynamic balance in the elderly and the OHEP is better at improving dynamic balance than BSE in the elderly.

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