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Novel home-based exercise program improves gait and balance among older adults

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Abstract

Objective: To determine if there are improvements in balance and gait abilities in participating in the personalized home-based exercise program. Participants: Older adults' individuals ages 50-70 years. Interventions: Respondents had pre assessment of Tinetti POMA before the program was initiated followed by the home-based exercised program for 3 weeks. Results showed a mean of 25.8571 in the pretest and a mean of 26.4285 in the post-test on scores of the Tinetti POMA. Conclusion: There are positive effects of personalized home-based exercise program in improving the balance and gait. After 3 weeks of experimental research, only 6 participants out of 15 were found to have a significant improvement in their scores and it was shown a significant difference in their scores of Tinetti POMA from the pretest and posttest. Therefore, the experimental study can partly improve the balance and gait among older adults' populations.

Keywords: Balance, Gait, Tinetti Performance Oriented Mobility Assessment Tool, Personalized Home-based exercise program, Elderly Population[SS1]

Introduction

In Older adults' populations, maintaining balance is the fundamental ability in performing any physical activities which decreases the likelihood of having impairments including the risk for falling, osteoporosis, or fracture. For achieving excellent quality of life, this could be achieved by participating to different kinds of activities and showing no further limitations on their functional performance (1).

Falling are commonly on the older populations because as when the age increases, the body physiology begins to diminished its physiologic function and it would then lead to poor physical function and also decrease the functional movements. Therefore, decreases the stability of the body upon walking, and limits the participation of an older adults in physical activities (1,2).

When an older individual tries to participate to any form of exercises, it can partially slow down the negative effects of aging and to lessen the development of any chronic conditions (3). Participating to exercises have been shown in improving the muscle strength, balance, and functional mobility and, hence, improves the quality of life of an older adult. Examples of these exercises are strength training programs, aerobic exercises, walking for several meters or miles, Yoga, Tai Chi, and Aquatic therapy (4,5).

However, despite any form of exercises that could significantly improve the physical function of an olderly, there are still some negative effects of the body due to the external factors such as difficulty in moving on different level of surfaces or adaptation to the environment (6). This could hinder the required performance of an older individuals. Several studies have been shown that

olderly individuals prefer doing the exercise on their house or a private facility because they think it would not require any major transportation but others do prefer doing exercises outside of their house (7–9).

Several studies have discussed that the home-based exercise program appears to be effective in reducing the risk of falls, risk factors, or any chronic impairments and contributes to improving the muscle strength on both upper extremity and lower extremity, ability to maintain balance, and participating any physical activity (9–13).

Methods

Design

This study utilized a quasi-experimental type in which the effectiveness of personalized home-based exercise program in improving the balance and gait abilities among older adults' populations. This study specifically uses pre-test and post-test measures. This research design lacks randomization.

Patients

The respondents were older adults' populations with an age of 50 to 70 years old and no underlying comorbidities that lives on Bankal Lapu-Lapu city and signed informed consent was provided. We excluded respondents who had problems in cardiovascular, current muscular injuries, and neurological deficits.

Sample size

The researchers are planning a study of the difference between two dependent means using the Wilcoxon signed-rank test (matched pairs). The type of analysis used is A priori and dependent T-test which calculates the given that the alpha

error problem is 0.05, 1-beta error problem is 0.80 and since the researcher would like to utilize a large effect size convention which is 0.50, the total sample size was 28, with the actual power of 0.80. The sample size was computed with the use of GPower Software.

Study groups

This research consists only of one group that undergoes pre-assessment and post assessment of Tinetti POMA and a novel home-based exercise program that targets to improve the balance and gait abilities of the respondents.

Intervention

This study was conducted in the Barangay Bankal proper, Lapu-Lapu City and this would be initiated on the 1st week of February 2020 until 3rd week of February 2020 with 30 minutes to 1-hour exercise for 3 times per week on Monday, Wednesday, and Friday schedule and this would last for 4 weeks.

Assessment and treatment outcomes

The Tinetti POMA assessment were used to assess for the balance and gait abilities of the respondents before undergoing the exercise program and after 3 weeks of undergoing the novel home-based exercise program the respondents will assessed again the Tinetti POMA assessment to see if there are changes or improvements in the balance and gait abilities of the respondents. Tinetti POMA assessment tool was chosen to assess for the balance and gait abilities of the older adults' respondents.

Statistical Analysis

The research utilized the pair samples t-test to determine if there is a significant difference in the pre- and post-Tinetti Performance Oriented Mobility Assessment mean score. The significance level was set to .01, a p-value of less than .01 was considered significant. The researchers are planning a study of the difference between two dependent means using the Wilcoxon signed-rank test (matched pairs).

The type of analysis used is A priori and dependent T-test which calculates the given that the alpha error problem is 0.05, 1-beta error problem is 0.80 and since the researcher would like to utilize a large effect size convention which is 0.50, the total sample size was 28, with the actual power of 0.80.

Results

A total of 14 respondents were screened and evaluated with the use of Tinetti performance Oriented Mobility Assessment tool, there are 8 females and 6 males. These participants are prone to the risk of falling, unable to maintain balance, and had difficulty in ambulation in both level surfaces and unlevel surfaces.

Sample size calculation for a definitive trial on the obtained number of participants pre-test Tinetti Performance Oriented Mobility Assessment was conducted, [among the 14 participants only 6 continued to attend the intervention] and this results to a mean of 25.86 and SD=1.7 among the participants (see table 1.), with this the score ranges from 19 to 23 and this means that all of them are at moderate risk for falls. A study by Miller et al. [showed the mean pre-test for the balance and gait using Tinetti Poma was 16. 2 and has Post-test of 23.2] see table 2. On the 3rd week of giving exercise

program a post test on Tinetti POMA was conducted result showed a mean of 26.4285. With this the results showed that novel home-based exercise program improves the balance and gait among the older adults. This correlates with the previous studies that home-based exercise programs can improve the balance and gait among the older adults (4,7–9,14).

Table 1.[SS2]

Paired Sample Statistics				
	Mean	N	Std. Deviation	Std. Error Mean
PRE-TEST TiPOMA	25.8571	14	1.703	0.455
POST-TEST TiPOMA	26.4285	14	1.703	0.477

Table 2.

Standardized Test Scores		
	Mean	N
PRE TEST TiPOMA	16.2	14
POST TEST TiPOMA	23.2	14

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Discussion

This quasi-experimental type suggests that Home Based Exercise Program could have a positive effect on the gait and balance abilities among older adults as measured by the Tinetti Performance Oriented Mobility Assessment tool. However, some older adults might have different responses in terms of performing the daily task which would requires more muscle strength, but others do prefer on the simple things that there's minimal effort, it's because the systems of an older adults starts to change its body physiology. Therefore, they are prone to falls, inability to maintain balance, and difficulty in walking on level and unlevel surfaces.

As when a person's age begins to increase, there are presence of physiologic changes in the body where it could affect the other parts of the system such as cardiovascular, neurologic, gastrointestinal, and musculoskeletal system. In cardiovascular, shows a notable decline in maximum heart rate and directly affects the maximum aerobic capacity that was represented by peak exercise oxygen capacity (15). Moreover, some older adults' individuals would prefer do nothing or rather just lie down in their bed. When an older adult stays longer on the bed, the blood would eventually redistribute from the lower limbs to the thoracic cavity causing 1 liter of fluids in just 24 hours of bed rest resulting increase in cardiac output and reduction of plasma volume afterwards (15,16).

Every time when an elderly feels fatigue or unable to do things on their daily activities. They usually opt to halted of their muscles when a muscle was immobilized for too long, there are changes of its muscle fiber atrophy, muscle fiber type, contraction, structure, and composition which gives impact on the physical performance, locomotion, force of the contraction, velocity, and strength leading to impaired functionality and unable to perform such activities

(15). A study review shows when the body starts to decline the muscle mass and leading to inadequate in muscle strength, therefore, leads to risk of falling, fracture, unable to maintain balance, difficulty in walking, loss of confidence, reduction in the quality of life, and reduction of physical function (17).

Older adults need to be encourage in immersing to a physical activity or exercise because this would contribute to maintaining the physical function, health, and reducing the falls among the elderly populations with or without comorbidities(6). Exercise can provide benefits to the parts of the brain especially on the cerebellum, where it controls the movement, balance, and coordination of a muscles in order to do several motions ((6). In the exercise program, it recommended having balance exercises in order to reduce the risk of falls among the elderly individuals (6). A study shows (18), the exercise could also improve the psychomotor performance which it serves as a good strategy to successfully reduce the risk of falls.

Other author also suggests that the exercises can include with aerobic exercises and resistance exercises (7). A combination of both aerobic and resistance exercises provides favorable effects on the body composition and physical function, and as well as the psychological aspect among the elderly individuals (7,18). Balance training one mode of exercises can provide changes on the brain especially with the elderly populations (7).

Providing interventions for these populations, it must have lower extremity strengthening, motor training on different level of surfaces with perturbations, and cognitive training focuses on balance and gait (8,14,19,20). Prescribing these exercises can be included on the home-based exercise program (21).

Which it would explain on our results that after 3 weeks of balance training, motor training, warm up exercises, and gait training can contribute on the significant improvement of the scoring on the Tinetti POMA (9,10,12–14,21).

Since our study has several limitations. First, the sample size was small and hence inadequate to obtain firm conclusions. The design of the study was to determine if the personalized home based exercise program can sufficiently improve the scoring of the Tinetti POMA. After 3 weeks of intervention the results showed that personalized home-based exercise program improves the balance and gait among elderly populations. This correlates with the previous studies that home-based exercise programs can improve the balance and gait among the elderly populations (4,7–9,14).

Declaration of conflicting interests

The author(s) declared no small conflicts of interest with respect to the research conducted, authorship and publication of this article/research.

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