ORIGINAL ARTICLE

Correlations of Elderly Fitness Exercise with Fitness and Balance

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ABSTRACT

Objectives : To analyze the correlations of elderly fitness exercise with fitness measured by 6-minute walk test (6-MWT) and balance measured by Berg Balance Scale (BBS) of geriatrics in nursing home.
Methods: Cross- sectional observational study of 51 elderly who lived in nursing home that conducted an elderly fitness exercise activity. Study was conducted in December 2009 to January 2010. Attendance of subjects doing elderly fitness exercise was rated by 2 months previously recorded to one month after trial. We recorded the weekly frequency of doing the exercise for 12 weeks (the 3 months). At the observation, fitness was measured by 6-MWT, balance was measured by BBS.
Results: A Positive and an significant correlation between number of exercise in 12 weeks of observation to 6-MWT was analyzed by Pearson correlation 0.418, p=0.002, and also positive and significant correlation to BBS was found 0.353, p=0.011. There were also positive and significant correlation between exercise frequency to 6-MWT which analyzed by Spearman's correlation 0.408, p=0.003 and to BBS as well Spearman's correlation 0.404, p=0.003.
Conclusions: The Elderly fitness exercise improves geriatric fitness that measured by 6-MWT and also improves balance measured by BBS in nursing home. The frequent exercise perfomed also correlates to elderly fitness which measureb by 6-MWT and to balancethat measured by BBS.

Keywords: *Fitness, balance, elderly, 6 minute walk test, berg balance scale, exercise, geriatric fitness exercise.*

INTRODUCTION

According to United Nation (UN) -Population Division, Department of Economic and Social Affairs, the total geriatric population (elderly) ≥ 60 years old is estimated to nearly 600 million and is projected to 2 million by 2050.[1,2]

With increasing age, there are physiological changes and chronic diseases that cause reduction in physical activities. This led to further deterioration and affect the elderly psychosocial condition, where individual feels "older", became depressed, and limit their daily activities due to poor balance, reduced endurance, general weakness, or frequent fall.[3,4] This cycle will continue to a more pronounced decrease in functional capacity and increase morbidity.[3] This condition were encountered in elderly living in nursing homes due to lack of physical activity and sedentary lifestyle.[5]

Due to rapid aging population and to hinder changes in the elderly, exercise program is needed, not just for disabled geriatric but also in healthy elderly to minimize the decline in body function, to increase their health and to

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make a fun living.[3,6]

According to the US Department of Health & Service (2003), data from the Healthy People 2010 showed that 51% of elderly aged 65-74 years old and 65% of elderly ≥75 years old do not spend their leisure time for physical activities. Moreover, about 50% sedentary adults who started exercise, stop exercising within 6 months.[7] Therefore, by understanding the factors that affect elderly in starting the exercise and maintaing exercise will acknowledge for making intervention that keep the elderly to maintain exercising.[7,8]

Yamauchi T et al.[2] studied the benefit of well-rounded exercise program (WREP) in elderly. WREP consists of aerobic, strengthening (resistance), flexibility (stretching) and balance exercises, 3 times per week for each session. He found that WREP improves the elderly fitness and is effective to improve the endurance measured by 12 minutes walk test (12-MWT), functional strength is measured by Arm curl test and Chair stand test, balance is measured by 8-foot Up and Go test, and flexibility is measured by back scratch test and chair sit and reach test.

Audette JF et al.[9] compared the effect of Tai Chi brief model with brisk walk program to aerobic capacity, heart rate variability, strength, flexibility, balance, psychological status and quality of life of elderly woman. They said that Tai Chi brief model is an effective way to improve fitness including the lower extremity strength, balance, and flexibility.

Elderly fitness exercise is an elderly exercise to increase the fitness. This exercise contains the element of aerobic exercise, flexibility, strength, balance, coordination accompanied with interesting rhythm lasted only about 16 minutes.10 This exercise is routinely done in the nursing home for about 1 year. The researcher aims to picture the correlation of the elderly fitness exercise with fitness measured by 6-minute walk test (6-MWT) and balance measured by Berg Balance Scale (BBS).

METHODS

Fifty one elderly who lived in the nursing home Pucang Gading, Semarang who regularly did elderly fitness exercise. The exclusion criteria were the elderly could not walk independently, had pulmonary problems (acute inflammation, resting respiration value >35 times/minute), had pain on lower extremity joint, had orthopedic problems (fracture, amputation), muscular problems (lower extremity weakness [<3]), chest pain, resting heart rate >130 beats per minute or less than 40 beats per minute, resting systolic blood pressure >180 mmHg, resting diastolic blood pressure >100 mmHg, severe visual impairment, severe cognitive impairment (MMSE ≤23), major depression Geriatric Depression Scale (GDS ≥10). Subjects who met the criterias signed the informed consent. Drop out criterias were elderly who not able to complete the study due to death or chest pain complaint, intolerant dyspnea, dizziness, pallor, nausea, leg cramps, papitation, and pallor which is not relieved by rest or reduced step.

6-MWT is a simple test that need a corridor along 100 feet (± 30 meter) with no exercise equipment and trained personnel for test implementation. The length of the corridor must be marked every 30 meter. The starting line, which marks the starting and ending point of single round 60 meter, must be be marked on the floor with light-colored lines.[11] This test measures the distance that the patient can be reached by walking as fast as he can on a hard and flat surface in 6 minutes period. We chose the reference formula of Paul L Enright et al.[13], as follows:

- For women 493 + (2.2 X body height in cm) – (0.93 X body weight in kg) – (5.3 X age)
- For men the value is added by 17. Lower limit of normal range is by reducing 100 meter.

BBS test is conducted to measure balance in elderly patient with disorder of balance function by assessing functional task performance. This scale consists of 14 items scored using 0-4 scale according to performance quality or time needed to complete the assignment, with total score of 56.[14] The subtests of BBS are as follows: Sit to stand, stand without support, sit without support, stand to sit, transfer, sit with closed eyes, stand with feet together, reach forward by hands, take object from the floor, look back, turn back 360^0, place foot alternatively on the bench, stand with 1 foot in front, stand on 1 foot.[15,16] We use the

scoring by Riddle and Stratford which classifies into 5 levels: < 40, 40-44, 45-49, 50-54, ≥ 55.[17-18]

Attendance of subjects doing elderly fitness exercise was rated by 2 months previously recorded to one month after trial. We recorded the weekly frequency of doing the exercise for 12 weeks (the 3 months). At the end of observation, 6-MWT and BBS test were assessed to all subjects who completed the program.

Mean age, BMI, 6-MWT and BBS were analyzed by student t test; correlation between total number of exercise to 6-MWT and to BBS were analyzed with Pearson correlation; while correlations of exercise frequency to 6-MWT and to BBS were analyzed by Spearman's correlation.

RESULTS

Of 108 elderly residents of nursing home Pucang Gading, Semarang only 54 subjects fulfilled the study criteria during the period of October 2009 – January 2010. A total of 3 subjects were drop out due to inability to complete 6 MWT (2 subjects due to dizziness, 1 subject due to knee pain).

Table 1. Characteristics of Subjects

Characteristic	Whole subjects		Male		Female	
	Mean ±SD	N (%)	Mean ± SD	Sig.	N (%)	Mean ± SD
Total		24 (47.1)			27 (52.9)	
Age, years	72.14±7.523 (range 60-90)		74.00±8.68	0.1		70.48±6.01
BMI, kg/m2			20.038±3.41	0.27		21.189±4.23
ADL, walking		11 (21.56)			2 (3.92)	
Educational level						
-Uneducated	26 (50.98)					
-Elementary school	16 (31.37)					
-Junior High School	6 (11.76)					
-High School	3 (5.88)					
-Academic / University	0 (0)					
MMSE	51 (100)					
-Normal	0 (0)					
-Abnormal						
Random blood sugar	51 (100)					
-Normal	0 (0)					
-Mild	0 (0)					
-Moderate -Severe						
Comorbid	1 (1.96)					
-Hypertension	3 (5.88)					
-Knee OA						
History	0 (0)					
-Parkinson	0 (0)					
-Stroke	0 (0)					
-Vertigo	0 (0)					
-Cardiac	1 (1.96)					
-Hip Dislocation						
Deformity	3 (5.88)					
-Knee varus	3 (5.88)					
-Knee valgus	1 (1.96)					
-Thoracic scoliosis	1 (1.96)					
-Thoracic kyphosis						
Medications	1 (1.96)					
-Anti-hypertension	0 (0)					
-Anti-histamine						

A positive and significant corelation between total number of exercise in 12 weeks of observation to 6-MWT was analyzed by Pearson correlation 0.418, p= 0.002 and a positive and significant correlation of total numbers of exercise in 12 weeks of observation to BBS was analyzed by Pearson corelation 0.353, p= 0.011.

After categorized into category I: 0-1x/ week, II: 2-3x/week, III: 4-5x/week, a positive and significant correlation between exercise frequency and 6-MWT was analyzed by Spearman correlation 0.408, p= 0.003 (figure 1 and 2) and an significant correlation between exercise frequency and BBS analyzed by Spearman correlation 0.404, p= 0.003 was found (figure 3 and 4). Whereas exercise frequency of 4-5 x/week obtained a higher mean results of 6-MWT and BBS category compared with exericse frequency of 2-3x/week

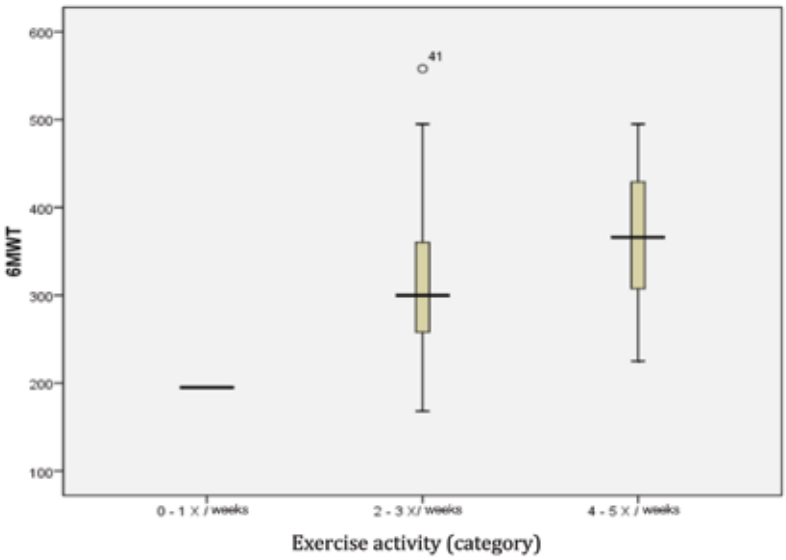

Figure 1. Correlation of exercise frequency with 6-MWT

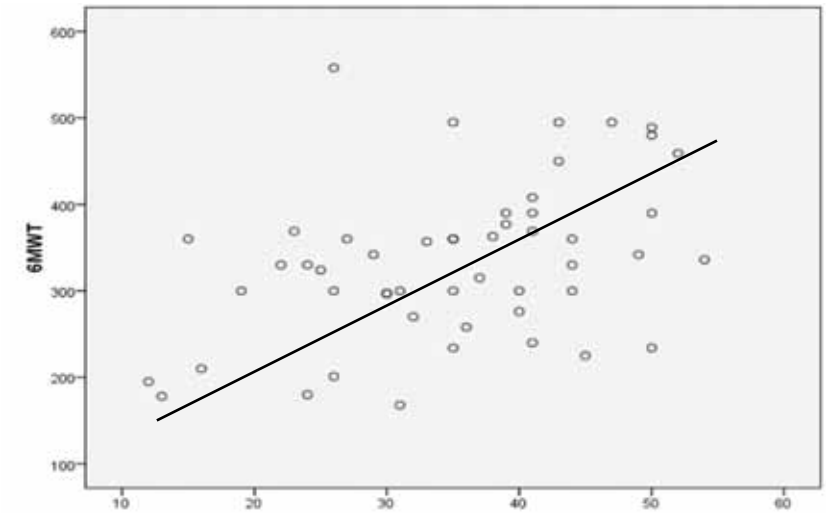

Figure 2. Graphical scattered of correlation of exercise with 6-MWT

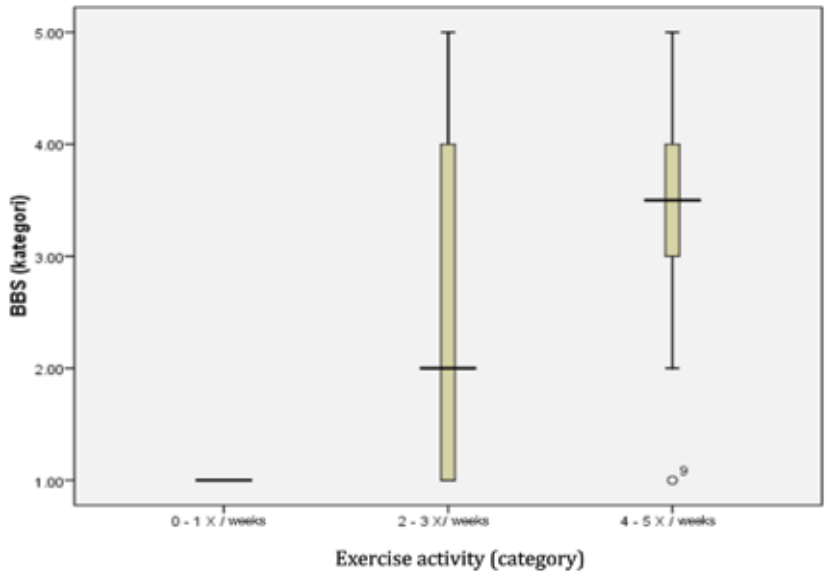

Figure 3. Graphical correlation of exercise frequency with BBS category

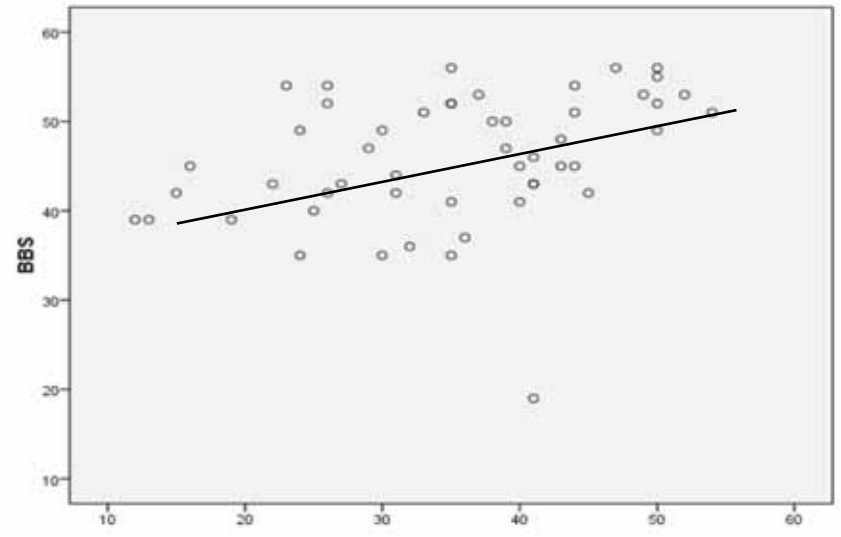

Figure 4. Graphical scattered of correlation of exercise with BBS

DISCUSSION

Mean age of study subjects was 72.14 ± 7.523 years old with minimal age of 60 years old and maximal age of 90 years old. This is consistent with results from the United Nations "World Population Prospects as Assessed in 1980" Population Studies No. 78 U.N. New York, 1981 that the 60 years life expectancy in a less-developing country is 14.9 years and in a developing country is 18.5 years. In Indonesia, life expectancy for a person who can reach 60 years old is an average of 15 years, in which he can reach the age of 75 years.[1]

Of 54 subjects participated in the study, only 3 (5.5%) subjects were drop-out due to inability to complete 6-MWT because of dizziness and knee pain. This result was not much different with Paul L Enright et al. that there was no unexpected event correlated with the test (no need of evaluation or emergency therapy). Of 2281 subjects participated in 6-MWT only 164 (7.1%) were unable to complete the test due to lower limb pain, muscle or joint pain, fatigue,

and dizziness.[13] This test is safer, easier, more tolerable, and reflect daily activities better than the other walking test.[12]

Mean 6-MWT of all subjects was 334.[24] ± 91.494 meter. If compared to reference value of Paul L Enright et al. there was 31 (60.78%) subjects had result within normal limit. This may be due to most of subjects did the exercise. Mean BBS was 45.88 ± 7.235. This is slightly different with mean result of BBS from Andi SS (40.47 ± 11.875). This might be caused by the subjects in this study were able to walk independently while in Andy study, 15 subjects (39.47%) used gait aids and all subjects did not exercise.[19] Mean number of exercise frequency during 12 week observation was 35.04 ± 10.699 times with minimal number of exercise 12 times in 12 weeks and maximal 54 times in 12 weeks. Only 1 subject is categorized in exercise frequency 0-1 x/week, 50 other subjects did the exercise.

There was positive and significant correlations between number of exercise in 12 weeks of observation with 6-MWT or BBS. This is consistent with the study by Yamauchi T et al., where elderly were divided into intervention and control groups. In the intervention group, subjects were given a well-rounded exercise program (WREP) consists of aerobic, strengthening (resistance), flexibility (stretching) and balance exercises, each 3 times per week for 12 weeks. Intervention group has improved fitness and effective to improve endurance measured by 12 minutes walk test (12-MWT), functional strength was measured by Arm curl test and Chair stand test, balance was measured by 8-foot Up and Go test, and flexibility measured by the back scratch test and chair sit and reach test. While in the control group there was no improvement (stagnant).[2]

After categorized into category I: 0-1x/week, II: 2-3x/week, III: 4-5x/week, we found positive and significant correlations of exercise frequency either to 6-MWT or to BBS. This showed that the more frequent the exercise frequency is (4-5 x/week) the better the value of 6-MWT and BBS. These findings support the result of Yoichi Nakamuraac et a.l[20] that there were improvements in coordination, dynamic balance, and fitness in the group who exercised 3 times a week compared to the other group.[20] This is then recommended by the American College of Sports Medicine (ACSM) that fitness exercise for healthy adults is 3-5 x/week for 20-60 minutes daily.[21,22]

The limitations of this study is that we did not compare the exercise group and the non-exercised group, did not further analyze the effect of motivation, body height, and body weight separately.

CONCLUSIONS

There were correlation between elderly fitness exercise and fitness measured by 6-MWT and balance measured by BBS test in the elderly living in the nursing home. Frequency of doing elderly fitness exercise in 12 weeks of observation is positively correlated with elderly fitness measured by 6-MWT, while balance fucntion in the elderly was measured by BBS. The frequency of elderly fitness exercise (4-5 x/week) is positively correlated with either the value of 6-MWT or BBS. In other words, we say the more frequent the exercise performed, the better fitness and balance for elderly.

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