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Research Article

Influence of Fitness-empowering Elderly Intervention Programs on Fitness Levels in Semarang City, Indonesia

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Abstract

Background and Objective: Elderly fitness should not only improve by physical activities alone, but improvements are generally better if done through teaching physical and psychological activities based on mental and physical unity. This study was aimed to assess the influence of the fitness-empowering elderly intervention programs on the level of fitness of the elderly. **Materials and Methods:** The test was conducted on 60 respondents who were divided into 3 groups, group 1 underwent elderly calisthenics and interactive counseling skills, group 2 elderly calisthenics and group 3 was a control group. The independent variables were calisthenics for elderly and interactive counseling skills, the dependent variables VO₂Max, muscle flexibility, resting pulse, self-efficacy, health commitment. Data were analyzed by testing differences between groups, using the ANOVA test followed by the *post hoc* Tukey test and by the Kruskal-Wallis test followed by the Mann-Whitney test. **Results:** There was a significant difference in mean measurement results between before and after the intervention of the fitness empowerment elderly program in the form of elderly calisthenics and interactive counseling skills after 6 weeks with a frequency of 3 times per week including VO₂Max, muscle flexibility, self-efficacy and health commitment. After the intervention can improve the measurement results between groups. **Conclusion:** The fitness empowerment elderly program can increase VO₂Max, muscle flexibility, self efficacy and health commitment.

Key words: Fitness, role empowerment, psychological activities, calisthenics activities, interactive counseling, muscle flexibility

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The studied fitness empowerment elderly program, is a form of physical activity and mental activity collaboration that combines elderly calisthenics for physical fitness with role empowerment activities through interactive counseling skills (KKI) in the form of interactive game, counseling and transpersonal psychotherapy to measure self-efficacy and health commitment¹. The fitness empowerment elderly program which is abbreviated with the SIAP GAN Program, is a form of physical activity and psychoactivity activity collaboration that combines elderly calisthenics for physical fitness with role empowerment activities through interactive counseling skills (KKI) in the form of interactive game, counseling and transpersonal psychotherapy to measure self-efficacy and health commitment¹.

Life expectancy for Indonesians in 2018 is 74.08 years. Statistics for 2020 estimate the elderly share of the population will be 11.34%². Increasing the number of elderly people can cause new health problems that will increase socio-economic needs and impact national health services³. In general, the elderly experience a decrease in muscle mass, aerobic ability and physical fitness, as well as an increase in body fat^{4,5}. Elderly fitness should not only involve interventions of physical activity alone but must include both body and soul, which are an inseparable unity^{6,7}. To optimize the fitness of the elderly, most important is the presence of understanding, intention, willingness, consistency, commitment and strong self-confidence in doing fitness training⁸.

The purpose of this study was to examine the intervention of the elderly empowerment fitness program (elderly calisthenics and interactive counseling skills) given at a frequency of 3 times/week for 6 weeks on the level of fitness in the elderly.

MATERIALS AND METHODS

This study was conducted in the elderly (60-74 years) who are members of the elderly group in the working area of the Tlogosari Kulon Health Centre, the Bangetayu Health Centre and the Pandanaran Health Centre, Semarang, Central Java, Indonesia which were conducted in December, 2018 to January, 2019. Each group consists of 20 respondents which are determined based on inclusion and exclusion criteria. So, the total respondents in this study were 60 elderly.

Group 1 (G1) with elderly exercise intervention and interactive counseling skills, frequency three times per week for 6 weeks; group 2 (G2) with elderly gymnastic intervention, with the same frequency and the control group (G3) without

treatment. Inclusion criteria included the age of the study subjects being 60-74 years, being able to hear and see, no history of cardiac and neurological disorders, no physical disabilities that interfere with activity, have physical activity and nutritional patterns that are commensurate and do not smoke actively or passively. Maximum lung capacity (VO₂Max) was measured by the 6min walk test (6 MWT). Muscle flexibility was measured using a sit and reach test. Resting pulse was measured using a timer by recording the pulse rate measured at rest or after doing activities or sports, which is done in 5 min third (15 min) after the training break. Interactive counseling skills were measured using the visual analog scale (VAS) and inter-participant value (NAP) on the ability to explain and the ability to motivate.

Statistical analysis: Non-normal data distributions were analyzed by the Kruskal-Wallis test and continued with Mann-Whitney inter-group difference test with, while data that were normally distributed with homogeneous variation were analyzed by the ANOVA test followed by a Tukey *post hoc* HSD test. Statistically significant differences were indicated at $p < 0.05$.

RESULTS

Maximum lung capacity (VO₂Max): Table 1 shows different tests between the intervention groups showed a significant difference in effect between group 1 vs group 2 ($p = 0.015$), a mean difference of 1.332. Between group 1 and group 3 ($p < 0.001$), mean difference of 2.695. Group 2 and group 3 ($p = 0.013$), mean difference of 1.363. Based on these data it can be concluded that the elderly calisthenics group and KKI, compared to the elderly calisthenics groups only and the elderly calisthenics groups compared to the control group, can increase muscle flexibility.

Muscle flexibility: Table 2 shows that there is a significant difference in effect between group 1 vs group 2 ($p = 0.014$), mean difference 5.475. Group 1 and group 3 ($p = 0.026$), mean difference 5.040. group 2 and group 3 ($p = 0.971$), mean difference -0.435. That means the elderly calisthenics group and KKI, compared to the elderly calisthenics groups only and control group, can increase muscle flexibility.

Table 1: Mean different and VO₂Max p values between groups after the intervention

Value of VO ₂ Max	G1><G2	G1><G3	G2><G3
Mean difference	1.332	2.695	1.363
p-value	0.015*	0.000*	0.013*

* $p < 0.05$, with *post hoc* Tukey HSD test

Table 2: Mean difference and p-value of muscle flexibility between groups after the intervention

Value of muscle flexibility	G1><G2	G1><G3	G2><G3
Mean difference	5.475	5.040	-0.435
p-value	0.014*	0.026*	0.971

*p<0.05 with *post hoc* Tukey HSD test

Table 3: Mean difference and p-value of self-efficacy between groups after the intervention

Value self-efficacy	G1><G2	G1><G3	G2><G3
Mean difference	1.315	1.010	-0.305
p-value	0.002*	0.019*	0.678

*p<0.05 with *post hoc* Tukey HSD test

Table 4: Mean difference and p-value of health commitment between groups after the intervention

Value health commitment	G1><G2	G1><G3	G2><G3
Mean difference	4.350	9.350	5.000
p-value	0.020*	0.000*	0.007*

*p <0.05, with *post hoc* Tukey HSD test

Self-efficacy: In the Table 3, difference tests between the intervention groups showed a significant difference in effect between group 1 vs group 2 (p = 0.002), mean difference 1.315. Group 1 and group 3 (p=0.019), mean difference 1.010. Group 2 and group 3 (p = 0.678), mean difference -0.305. It can be concluded that in the elderly calisthenics group and KKI, compared to the elderly calisthenics groups only and control group, can increase self-efficacy.

Health commitment: Table 4 shows that the difference tests between groups after the intervention showed that there were significant differences between group 1 compared to group 2 (p = 0.020), mean difference 4.350. Between group 1 and group 3 (p<0.001), mean difference 9.350. Between group 2 and group 3 (p = 0.515), mean difference 5.000. This means that the elderly calisthenics group and KKI, compared to the elderly calisthenics groups only and control group can increase health commitments.

DISCUSSION

This is in line with Schurtz's⁹ conducted on subjects aged ≥55 years in Pitt County, United States, which showed that there is a significant relationship between physical health and VO₂Max. Research conducted on women aged 55 years in Poland shows similar things, namely that the effect of interventions giving physical activity can increase VO₂Max values¹⁰. Other researchers also stated that in men aged 40-67 years in Finland with interventions given can increase VO₂Max¹¹. Greenlee *et al.*¹² research results show in line with the 16 week program High-Intensity Cardio Resistance Training (HICRT) significantly increases VO₂Max.

Gormley *et al.*¹³ when the volume of exercise is controlled, high-intensity exercise is more effective at increasing VO₂Max than moderate-intensity.

A number of other studies show a strong relationship between greater VO₂Max and reduced risk of morbidity and mortality^{14,15}. In addition, the study of Arifin¹⁶ states that there is an influence of elderly exercise intervention on the increase in VO₂Max. According to Lin *et al.*¹⁷ there is a correlation between elderly gymnastic routines with elderly endurance as measured by a 6 min walk test distance.

According to Rivera-Brown and Frontera¹⁸ regular exercise can increase the ability of the heart and the capacity to transport oxygen by the blood and maximum respiratory volume per minute.

Irez's *et al.*¹⁹ states on female elderly subjects which showed results that exercise can increase muscle flexibility, as well as the publication of Williams *et al.*²⁰ which states that stretching exercises increase tendon flexibility, increase range of motion and joint function. For example, the Pilates training program increases muscle flexibility among elderly women²¹. The findings show that a 60 min static stretch of the lower limb and body muscles produces the same effect as two 30 min stretches and four 15 min during a flexibility training session that involves a sedentary elderly woman^{21,22}. Supported by research Kloubec²³ conducted on active middle-aged men and women, given Pilates exercises for 12 weeks, for 60 min sessions week, can significantly improve abdominal endurance, hamstring flexibility and upper body muscular endurance.

Participants in the two intervention groups experienced an increase in self-efficacy in the post-intervention assessment compared to the control group²⁴. This is also supported by the results of similar studies on the elderly in the Czech Republic which show that self-efficacy has a strong effect on the desire for physical activity²⁵. An 18 month panel study conducted on elderly subjects indicate that an increase in physical activity is significantly associated with an increase in self-efficacy²⁶. In a longitudinal study of 78 elderly people living in retirement communities, the data reveal that changes in a person's self-efficacy affect exercise behavior consistently over 4 years of study²⁷. According to Azizan *et al.*²⁸ the addition of a behavioral program is superior compared to exercising alone on increasing exercise adherence and the level of self-efficacy in the elderly.

A moderate level of physical activity that combines the components of multitasking exercises has a positive effect on daily activities, which are important for physical, mental and social demands²⁹. Muchlas³⁰ Commitment will encourage self-confidence and enthusiasm to carry out activities towards change for the better.

In a study conducted in Italy, Pini *et al.*³¹ the findings confirm that the relationship between the number of weekly activity sessions and commitment to exercise is significant and positive. Wilson *et al.*³² their findings show that sports behavior has a moderate to strong relationship with commitment measures. According to Sakti¹ research self-efficacy and increased commitment and emotional conditions that are controlled or decreased as an effect of the ASA Psychological Program can reduce IFN- γ cytokine levels. This indicates that there has been a positive effect on brain function which activates T cells and produces IFN- γ . It is recommended for future researchers to take measurements related to the groningen fitness test for the Elderly including leg extension tests, circumduction, balance board (platform) tests, block transfers and reaction time tests.

CONCLUSION

The intervention of the elderly fitness empowering program (elderly calisthenics and interactive counseling skills) for 6 weeks with a frequency of 3 times week and the duration of 30 min per exercise, effects an increase in maximum lung capacity (VO₂Max), muscle flexibility, self-efficacy and health commitment, but does not effect a decrease in the frequency of resting pulses.

SIGNIFICANCE STATEMENT

This study discovers the possible collaboration physical interventions that is the elderly calisthenics and psychological interventions in the form of intensive skills counseling can improve physical and psychology fitness, which is beneficial for the elderly health improvement program. This study will help the researchers to uncover the critical areas of physical and mental fitness of the elderly, that many researchers were not able to explore. Thus, a new theory about the collaboration of physical and psychological interventions can be put forward.

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