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Research Article

The Effect of Low-Impact Aerobic Exercise on Reducing Stress Levels in the Elderly

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Abstract

Aims: Increasing a person's age results in a significant decline in body development, which is one of the causes of stress conditions in the elderly. In addition to a decrease in physical condition, the elderly who experience a decrease in social activities, one of which is the state of retirement. The elderly who used to work experienced drastic changes in their activities. There needs to be special treatment that can divert the stress experienced by the elderly rather not get worse. This study aims to identify the effect of low-impact aerobic exercise on reducing stress levels in the elderly.
Methods: This research is a quasi-experimental research (One Group Pre-Post-test design), sampling using purposive sampling of 30 respondents. The population in this study is the elderly in the Antapani District. The measurement tool used is the PSS-10 (Perceived Stress Scale) questionnaire.
Results: The research results show that the majority of respondents in this study were female, with an average age of 60 years. Then on the Wilcoxon test there is a difference in the average value of the pre-test and post-test and the difference is quite large.
Conclusion: There is an effect of low-impact aerobic exercise on reducing stress levels in the elderly. Suggestion: It is hoped that this exercise will be carried out regularly once a week. This is because in addition to body fitness, and to eliminate boredom, it can also reduce stress in the elderly.

Keywords:
Aerobic, Elderly, Retirement, Stress Level

INTRODUCTION

Aging is a chronic condition of human natural development, with specific physiological, psychological, and social changes occurring (1). It is characterized by the gradual accumulation of damage to cells, persistent functional deterioration, and increased susceptibility to disease (2). At this stage of life, Physical and mental capacities steadily decrease, disease risk rises, and eventually, death occurs. Globally, the pace of population aging is much faster than in the past. According to the data from World Population Prospects: the 2019 Revision, the aging population reached 9% of the total population (3). The number of people aged 60 years and over in fact exceeds the number of people aged under 5 years. By the rapid increase of population, it is predicted that the number of people aged 60 years and over, make up 22% of the world's population by 2025 due to the fast aging of the global population (4).

As population aging becomes more and more pronounced, the concern for the

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physical and mental health challenges needs to be addressed. The non-communicable diseases such as heart disease, type-2 diabetes mellitus, hypertension, and decreased visual and hearing function are highly prevalent among the elderly (5). Age-related diseases and disabilities are becoming more in number, and the elderly are increasingly vulnerable to them (6-9). In society, old age, particularly those who have already retired, has always been a source of concern due to a lack of professional, social, and economic power. Several studies showed that aging often brings cognitive and health problems that lead to disability and reduced quality of life among the elderly (6,10,11). Furthermore, mental health issues among elders were also prevalent not just in the community but also in old age homes (12). Therefore, along with continuing to put concern on increasing their life expectancy, it's also important to comprehend the methods for keeping the mental and physical well-being of the elderly in good shape (13,14).

Physical exercise plays an important role in maintaining fitness and promoting health-related quality of life among older adults (14,15). Physical exercise involves the training of at least one-sixth of the body's major muscles for a certain period of time frequently and periodically (16). Despite the time period, exercise is believed to be an important, easy, cheap, and available treatment option for the elderly (17). Continuous exercise in the elderly had a significant positive effect on improving health. Previous studies found that aerobic exercise may improve cardiorespiratory function, avoid age-related conditions, and help to enhance cognitive and physical performance (18,19) in addition to psychological well-being (20,21). Furthermore, exercise can also improve general life satisfaction among the elderly, as well as quality of life (22).

Due to the lack of health function among the elderly, the form of exercise needs to be considered. Therefore, exercise with less impact was more suitable for the elderly in improving their health status (23-25). Some researchers have discovered that physical exercise, particularly low-intensity aerobic exercise can successfully reduce the anxiety level of older adults (25,26). However, the study to assess the effectiveness of low-impact aerobics on the level of stress among the elderly is still limited. The study was to identify the effect of low-impact aerobic exercise in reducing the level of stress among the elderly. Despite improving health function, low-impact exercise might be expected to minimize injury.

METHODS

Design and Sampling

This study was quantitative research using a quasi-experimental design (One Group Pretest-Posttest Design) in January – March 2023. The participants in this study were 30 elderly who were recruited by criteria aged 60 – 74 years old, in healthy condition, retired status, and having stress level score at least in the low category.

Data collecting procedure

Those eligible participants were asked to follow all the protocols. The research objectives and benefits were explained to the participants. The participation was voluntary and the Respondents' personal information will be kept confidential. All participants were invited to attend baseline assessment using the Perceived Stress Scale (PSS-10) questionnaire as well as demographic characteristics.

Participants were scheduled for 3 times per week for 15 – 20 minutes of exercise. The exercise was conducted for four weeks with three parts of exercise in each session. The three parts included warm-up, strengthening exercise, and cooling down exercise. Warm-up exercises include marching walk exercises and light-intense movements involving the neck, shoulder, and waist muscles. A little more rigorous motions involving the arm, upper body, waist, thigh, and calf muscles are included in strengthening exercises. The last part of

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the exercise was the very low intense movement of the shoulder, upper arms, and waist muscle which involved breathing control to lower heart rate and respiratory frequency. The shoulder and waist muscles are used during cooling motions.

Table 1. Low-impact aerobic exercise series

No	Exercise	Duration	Frequency	Period
1.	**Warm-up** Marching walking exercise with low intensity. Head and neck movement with 2x8 counts Shoulder movement Waist movement	**3-5 min**		
2.	**Strengthening exercise** Stepping with forward and sideways directions. Movements of shoulder and upper arms Movements of legs and arms with slight jumps simultaneously Brisk walking	**10-15 min**	3 times per week	4 weeks
3.	**Cool down** Marching walking at very low intensity for 1 min A very slow movement of the shoulder, upper arm, and waist muscle involving breathing control	**3-5 min**		

Instrument

The data on perceived stress was collected using the PSS-10 Indonesian version translated by a previous study (27). It was 5 Likert scale questionnaires from never (0) to very often (4) assessing the perceived stress of the participants. The cut-off scores are presented in Table 2. Data were collected before the series of low-impact aerobic exercises and after the exercise ended.

Table 2. Score criteria for the PSS-10

Interpretation	Score
Mild	1-13
Moderate	14-26
Severe	>26

Data analysis

Data were analyzed using SPSS version 23. Descriptive analysis was used to identify the characteristic demographics and the prevalence of PSS among participants. The normality distribution was identified using the Shapiro-Wilk test. The statistic to compare PSS before and after the exercise series was conducted by using the Wilcoxon signed-rank test with a *p*-value < 0.05 as a significant difference.

RESULTS

A total of 30 subjects participated in this study, with no subjects dropping out during whole sessions. The mean age of participants was 60.3 years ± 2,88 ranged from 58 to 74. The majority

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of respondents were females (90%), with secondary education (83%), retired from civil servants (22%), and married (70%). Regarding low-impact exercise, the majority of participants (93%) reported not knowing about this exercise, and none of them had practiced low-impact aerobic exercise.

Table 3. Characteristic of respondents (n= 30)

Characteristics	n (%)	Mean (SD)	Range (min-max)
Age		60,3 ± 2,88	58 - 74
Sex			
Male	3 (10%)		
Female	27 (90%)		
Marital status			
Married	21 (70%)		
Single/divorced/widowed	9 (30%)		
Education			
Primary	-		
Secondary school	25 (83%)		
College/university	5 (17%)		
Occupation prior to retirement			
Civil servant	22 (73%)		
Private employee	8 (26,7%)		
Knowledge of low-impact aerobic exercise			
No			
Yes	28 (93%)		
	-		
Experience of low-impact aerobic exercise			
No			
Yes	30 (100%)		
	-		

In this study, 30 participants were screened by PSS-10 for stress levels. Among the participants, 93% showed moderate stress at baseline assessment, and after the exercise program, those with moderate stress decreased to 23% (Table 4).

Table 4. Overall stress level among participants before and after the program

PSS-10 Category	Pre-test		Post-test	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Mild	2	7%	23	77%
Moderate	28	93%	7	23%
Severe	-	0%	-	0%

Table 5. The difference between before and after the program

	Mean (SD)	Min - Max	*Mean difference*	*t*	*p-value*
Pre-test	20.5 (0.9)	(20 – 23)	- 7.9	-4.81	0.000*
Post-test	12.6 (2.1)	(10 – 19)			

*) *p*-value ≤ 0.05

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The Wilcoxon signed-rank test was conducted to test any significant difference in the PSS score before and after the exercise (Table 5). Table 5 shows the score of PSS-10 after exercise (Mean = 12.6) was significantly lower than the score before exercise (Mean = 20.5); t= -.481, *p*= 0.000.

DISCUSSION

Alongside understanding the demographic characteristics of older adults, the current study indicated that the majority of the elderly were female, married, had attained secondary school, and retired from civil service. Those over the age of 60 will experience physical, cognitive, and socio-economic challenges that can affect stress levels. Several studies show that women experience more stress than men (28, 29). The menopause process as one aspect that affects the condition, is often accompanied by psycho-vegetative symptoms, including stress and anxiety symptoms (30). Menopause creates physical and psychological symptoms in women, as a result of decreased estrogen levels such as hot flushes, night and day sweats, and sleeping difficulties, placing women at a higher risk of psychiatric symptoms throughout this stage of life (31). Previous study indicates that lower education was a common risk factor for mental health problems, especially among females, respectively (14,32). Regarding retirement status, a change in health-related behavior may occur resulting in changes in mental health (33).

PSS-10 score was reported to significantly decrease after 4 weeks of exercise in this study. The result showed similar findings to a previous study carried out in Malaysia, which stated that regular exercise had significantly improved mental health status and quality of life (14,34). Regular physical exercise was reported to improve blood circulation, resulting in increased oxygen and nutrients required for body metabolism (35). Low-intense physical activity such as walking, aerobic exercise, cardiovascular activity, and gardening was reported to lower depressive symptoms (36). It is suggested that regular exercise has been shown to prevent mental health problems and enhance sleep quality in the elderly (37).

Aerobic exercise movements will induce muscle contractions that increase oxygen consumption. During the exercise, the secretion of molecules that affect depression was increased (38,39). The effect may also be related to higher levels of brain-derived neurotrophic factor, noradrenaline, and b-endorphins in the blood. Those molecules play an essential part in developing and surviving neurons (16,36).

At the same time, it is widely understood that depressed people have lower serotonin and dopamine levels. Thus, aerobic exercise activity stimulates dopamine and serotonin levels, which offer sensations of happiness and joy, and hence has the potential to reduce stress (40). Furthermore, exercise has been shown to lower stress hormone levels as well as relieve muscle tension which can help with anxiety (41). Score-related stress declined after 4 weeks of exercise in the current study.

CONCLUSION

This study indicated that performing low-impact aerobics exercises for a minimum of 4 weeks may help to reduce stress levels among the elderly. It is suggested that regular exercise should be considered as a method for maintaining the elderly physical and psychological health. In addition, a balanced diet and adequate sleep time were also essential for a better outcome. A similar study of randomized control trials should be conducted in the future to evaluate the effectiveness of low-impact exercise among older adult in nursing homes and those living with their family.

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