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## Effect of Terra Exercise on Increasing Quality of Life Scores for Postmenopausal Women

Nawang Sukestiningsih<sup>1</sup>, Denny Agustiningih<sup>2</sup>, Wahyudi Istiono<sup>3</sup>

<sup>1</sup> Primary Health Care Center/*Pusat Kesehatan Masyarakat (Puskesmas)* Bagelen; Indonesia

<sup>2</sup> Department of Physiology; Faculty of Medicine, Public Health and Nursing; Universitas Gadjah Mada; Indonesia

<sup>3</sup> Department of Family and Community Medicine, Faculty of Medicine, Public Health and Nursing; Universitas Gadjah Mada; Indonesia

Corresponding Author:

Nawang Sukestiningsih: Primary Health Care Center/*Pusat Kesehatan Masyarakat (Puskesmas)* Bagelen, Jl. Yogyakarta KM. 11 Bener, Purworejo, Jawa Tengah – 54174, Indonesia  
 E-mail: [nawangsukestiningsih@gmail.com](mailto:nawangsukestiningsih@gmail.com)

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### ABSTRACT

**Background:** The number and proportion of the Indonesian female population aged 60 years and over from year to year have experienced a significant increase. Women who have gone through menopause and enter old age are described as having many physical and psychological changes, sometimes resulting in a crisis and psychological symptoms. Eighty percent of women report discomfort that can significantly reduce their quality of life. Terra exercise is an exercise movement that is adapted to the anatomical and physiological conditions of the elderly person's body (low impact). Terra exercise is used to train stamina both physically and mentally. **Objective:** This study aimed to examine the effect of Terra exercise on the quality of life of postmenopausal women in Kemanukan Village, Bagelen District, Purworejo Regency. **Method:** This study used a quasi-experimental pre-test-post-test design with a control group. The samples were selected by purposive sampling with the following inclusion criteria: postmenopausal women aged 60-75 years, who did not experience kidney failure, heart disease, rheumatism, blood pressure below 160/90 mmHg, did not have a mental disorder (schizophrenia) nor violent behavior, have a level of independence in the category of sufficient or more, can communicate verbally, and willing to be respondents with a signature/thumbprint of approval to follow the study. Quality of life was measured using the Older People's Quality of Life Questionnaire (OPQOL-35). Hypothesis testing used paired t-test and Mann-Whitney tests to see the average differences between treatment groups. **Result:** There was a significant change in the mean pre-test-post-test scores of quality of life of the intervention group with Terra exercise. **Conclusion:** Terra exercise can improve the quality of life of women after menopause.

**Keywords:** *post-menopause, quality of life, Terra exercise, elderly persons*

### INTRODUCTION

The number and proportion of the Indonesian female population aged 60 years and over from year to year has experienced a significant increase. Based on the 2000 population census the number of women aged over 60 years reached 15.5 million people or 7.6% of the total population while in 2020 it is estimated to increase to 30 million or 11.55% of the total population<sup>1,2</sup>. Purworejo Regency has increased aging population since 2010 with the percentage of elderly reaching more than 10%. This is the same as the figure from the Province of Central Java which also has increased aging population since 2010. In 2016 the proportion of the elderly population in Purworejo Regency reached 16.3% with the proportion of elderly women at 53.3%<sup>3</sup>.

If the average age of Indonesian women experiences menopause at 51.4 years, women will pass 18 years of life in the post-menopausal period. Therefore, there must be an effort to maintain their quality life<sup>1</sup>. Women

who are menopausal and entering old age, feel physical and psychological changes that sometimes result in a psychological crisis and symptoms. Eighty percent of women report discomfort that can significantly reduce their quality of life<sup>4</sup>.

Effective preventive interventions in efforts to improve health are physical exercise<sup>5</sup>. There is a dose-response relationship between physical exercise and the benefits of physical exercise including physical, biological and psychological changes<sup>6</sup>. Much research has been done to see the importance of physical exercise for quality of life, which emphasizes the importance of physical exercise as a way to improve conditions and slow down physical degeneration<sup>7</sup>.

Terra exercise is an exercise movement that is adapted to the anatomic and physiological conditions of the elderly persons' body (low impact). This exercise is a form of physical and mental exercise, which involves a

combination of body movements with breathing regulation techniques and the concentration of the mind regularly, correctly, continuously, continuously, and harmoniously<sup>8</sup>. Regular physical activity and relaxation can affect the limbic system in the body which in turn affects the body's hormonal system so that it can play a role in improving the quality of one's life. Terra exercise contains two therapeutic elements namely physical activity and relaxation<sup>9</sup>.

Physical training for the elderly at the *Puskesmas* Bagelen and the elderly Integrated Service Post/Pos *Pelayanan Terpadu (Posyandu)* in the working area of the *Puskesmas* are still based on the ability and agreement of both the time and type/type of exercise training and there is no physical training done specifically for post-menopausal women. There are even elderly *Posyandu* who have not yet done physical training. This research is expected to be able to identify the effect of Terra exercise on the quality of life of postmenopausal women.

**RESEARCH METHODS**

This research was a quantitative study with a quasi-experimental pre-test-post-test design with a control group. Subjects were postmenopausal women who met the inclusion criteria. The sampling method in this study was purposive sampling.

The inclusion criteria in this study were: (1) Postmenopausal women who did not experience kidney failure, heart disease, rheumatism (as evidenced by a medical register or record at *Kemanukan Pustu* or main *Puskesmas*); (2) Postmenopausal women with blood pressure below 160/90mmhg (measured for a moment); (3) Postmenopausal women aged 60-75 years; (4) Not having a mental illness (schizophrenia) nor violent behavior (asked and known from the health cadre or local village midwife); (5) Having a level of independence in the category of more than or equal to sufficient (as evidenced by a 6-minutes walk test); (6) Can communicate

verbally; and (7) Willing to be a respondent with a signature/thumbprint for approval to follow the study.

The exclusion criteria in this study were: history and/or medical records of any spinal disease or abnormality. In addition to the inclusion and exclusion criteria, respondents could be excluded from the study if for the intervention group they did less than 20 Terra exercises, or three times in a row were not present in the Terra exercise program. The sample size in this study was 30 respondents for each treatment group, but until the end of the study only 29 respondents in the intervention group could complete the training program, so for the data analysis, 29 respondents were in each treatment group.

The provision of Terra exercise intervention was conducted by 1 exercise instructor who had a certificate of exercise training with at least 1 year of teaching experience and was able and competent in providing Terra exercise training. The Terra exercise training program was conducted in the courtyard of the *Kemanukan Village Hall*. The Terra exercise training program in the intervention group was done three times a week intermittently for eight weeks with a duration of 35 minutes at each meeting starting at 7.30 a.m.

Data analysis used STATA 12. Paired t-tests were done to see the difference in the average score of quality of life pre-test and post-test. Mann-Whitney test was used to compare changes in post-test and pre-test rates between treatment groups.

Research subjects willing to take part in this research were required to sign/thumbprint an informed consent form. Ethical clearance was issued by the Medical and Health Research Ethics Committee (MHREC) of the Faculty of Medicine, Public Health and Nursing; Universitas Gadjah Mada with reference No. KE/FK/1221/EC/2017.

**Table 1. Distribution of respondents' sociodemographic characteristics**

Sociodemographic Profile	Control		Intervention	
	Frequency	Percentage	Frequency	Percentage
<b>Education</b>				
Elementary School	3	10.34	7	24.14
Junior High School	16	55.18	15	51.72
Senior High School	9	31.03	7	24.14
College	1	3.45	0	0
Total	29	100	29	100
<b>Occupation</b>				
Farmer	10	34.5	12	41.4
Retired	10	34.5	7	24.1
Housewife	9	31.0	10	34.5
Total	29	100	29	100
<b>Marital Status</b>				
Widow	10	34.5	13	44.8
Married	19	65.5	16	55.2
Total	29	100	29	100

**RESULTS**

**Respondent Characteristics**

Table 1 shows the sociodemographic characteristics of the respondents. It shows that the majority of respondents' education was junior high school.

Table 2 shows the results of respondent characteristics according to age, parity, and independence of respondents.

**Quality of Life**

The quality of life of the control and intervention groups

**Table 2. Characteristics of respondents according to age, parity, and independence**

Characteristic	Control		Intervention	
	Frequency	Percentage	Frequency	Percentage
<b>Age</b>				
60-64	13	44.84	11	37.93
65-69	10	34.48	12	41.39
70-74	5	17.24	5	17.24
≥ 75	1	3.44	1	3.44
Total	29	100	29	100
<b>Parity</b>				
1	0	0	0	0
2	7	24.14	6	20.69
≥ 3	22	75.86	23	79.31
Total	29	100	29	100
<b>Independence</b>				
Enough	17	58.61	12	41.39
Good	15	51.72	14	42.28
Total	29	100	29	100

**Table 3. Mean pre-test and post-test change**

Domain	Pre-test		Post-test	
	Control (mean± SD)	Intervention (mean± SD)	Control (mean± SD)	Intervention (mean± SD)
Whole life	14.58±1.70	13.72±0.53	14.50±1.68	15.62±1.26
Health	15.68±1.94	15.10±1.34	15.68±1.94	16.07±1.06
Social relationship	21.13±1.92	21.68±1.79	21.13±1.92	22.38±1.88
Independence	15.03±1.93	14.68±1.23	15.10±1.93	15.69±1.44
Housing and environment	15.55±1.78	16.55±1.76	15.55±1.78	17.72±1.50
Emotional psychology	15.31±1.56	12.03±1.55	15.37±1.54	14.24±1.64
Finance	13.96±2.38	15.51±1.68	14.17±2.20	15.48±1.43
Leisure	22.34±1.54	22.76±1.97	22.68±1.22	24.27±1.64

**Table 4. Average different test based on the treatment group**

Analysis	Mean Difference	Standard Deviation	p-value	CI 95%	
				Lower	Upper
Pre-test-Post-test of Intervention Group	9.4138	6.3556	0.0000*	6.9962	11.8314
Pre-test-Post-test of Control Group	0.6552	1.1425	0.0045*	0.2206	1.0898
Pre-test – Post-test change of both groups		NA	0.0000**	NA	NA

\*Paired t-test; \*\*Mann-Whitney  $p < 0.05$  (Significant); CI: Confidence Interval

was measured by OPQOL-35. Table 3 shows the changes in the mean pre-test and post-test scores by treatment group.

**Average Difference Test**

There were changes in the pre-test and post-test mean of the intervention group of  $9.41 \pm 6.35$ . A comparison of changes in the pre-test-post-test mean of control and intervention groups also showed differences (Table 4).

The pre-test-post-test mean data distribution in each treatment group with Saphiro-Wilk tests obtained  $p$  value  $> 0.05$  and the data distribution was normal so that the pre-test-post-test mean difference test in each treatment group used paired t-tests. The pre-test-post-test mean difference test between the two treatment groups used Mann-Whitney because the distribution was abnormal and not homogeneous (normality test with Saphiro-Wilk obtained  $p$ -value  $< 0.05$  and homogeneity test with Levene test obtained equity of mean  $< 0.05$ ). In this study quality of life assessment covered eight domains (Table 3).

There was an increase in the pre-test-post-test mean of the intervention group by  $9.41 \pm 6.35$ . A comparison of changes in the pre-test-post-test mean of control and intervention groups also showed significant differences. There was a difference in changes in the pre-test-post-test mean in the

intervention group and the control group by  $8.75 \pm 6.15$ . The intervention had significant influence/difference in the score, which can be seen from the  $p$ -value.

There was an overall tendency to increase the score of each domain in the intervention group. A comparison of the mean pre-test and post-test scores in the intervention group showed a significant difference.

**DISCUSSION**

The results of this study indicate there were changes in overall quality of life in the intervention group. Physical exercise can have a positive impact on the quality of life of postmenopausal women. Physical exercise that is done regularly and continuously gives an increase in a higher quality of life score<sup>10</sup>. Physical and mental health will affect postmenopausal women’s perceptions of financial well-being, social relations, and the environment.

In the health domain, the mean increased from  $15.10 \pm 1.34$  to  $16.06 \pm 1.06$ . This shows that aerobic exercise for 6 weeks can improve cardiovascular fitness, mental health, and Body Mass Index<sup>11</sup>. In cardiovascular adaptation, physical exercise will improve the functional abilities of the heart and increase the efficiency of the heart’s work<sup>12</sup>.

In the mental/psychological domain, there were changes in mean from  $12.03 \pm 1.54$  to  $14.24 \pm 1.64$ . Physical exercise in postmenopausal women influences improving mood, physical health, and cognitive function. Women who do not exercise have poor physical and mental health status<sup>13</sup>. Physical exercise develops mental fitness, increases self-confidence, and increases self-esteem because the movements involved also aim to reduce anxiety, stress, and reduce levels of depression<sup>14</sup>. In postmenopausal women quality of life and depression levels will improve after 12 weeks of physical exercise<sup>15</sup>.

Exercise with a frequency of three times a week is suitable for the elderly and will result in a significant increase in overall body fitness<sup>16</sup>. There are three mechanisms at play, namely angiogenesis in the brain, reverse synaptic changes and removal of amyloid proteins<sup>17</sup>.

Physical exercise can cause a series of psychological and neurobiological mechanisms that influence depression. The biological effect of physical activity is stimulating the release of endorphins which are endogenous opioid polypeptides produced by the pituitary gland and hypothalamus. Endorphins have an analgesic effect and can also produce fresh feelings of wellbeing in individuals<sup>17</sup>.

Physical exercise obtained from Terra gymnastics is likely to induce cellular and molecular processes that can encourage angiogenesis, neurogenesis, and brain synaptogenesis. Neurobiological mechanisms responsible for the effect of physical exercise on cognitive function are increased brain blood flow in several cortical and subcortical areas which will later result in increased synthesis and use of neuron-transmitters, decreased beta-amyloid protein formation, and increased synthesis and release of Brain-Derived Neurotrophic Factor (BDNF)<sup>17</sup>.

Physical exercise such as Terra exercise can increase vascularization in the brain, increase dopamine levels and molecular changes in neurotrophic factors that are beneficial as neuroprotective functions<sup>18</sup>. In physical exercise, several molecular systems that can play a role in the beneficial effects to the brain are neurotrophic factors. Neurotrophic factors, especially BDNF, can increase the resistance and growth of several types of neurons. BDNF acts as the main mediator of synaptic efficacy, nerve cell linkages, and nerve cell plasticity. It is suspected that the neurotrophin response mediated by exercise may be limited to the motor and sensory systems of the brain. Changes in mRNA levels are found in neurons, especially in the gyrus dentatus and hilum. BDNF is a factor that has a better role in mediating the long-term benefits of exercise on the brain<sup>19</sup>.

The health component is a major factor associated with active aging and elderly independence. The elderly who have the highest level of independence are those who are physically and psychologically in good health. Seniors with good health status can do physical activities such as taking care of their own needs, working, and doing social activities<sup>20</sup>.

The second element of Terra exercise is relaxation with deep breathing. Breathing is a regulator of joy, sadness, pleasure, anger, alertness, and other emotions. In quality and quantity, breathing has real beneficial effects and directs human health. Research shows that the act of breathing with concentration (inner imagery) can control the shifts in the frequency of brain waves as desired from beta (13-32Hz) that is the conscious state (full conscious) to alpha waves (7-14 Hz) that is half-conscious, relaxed or meditated (brake sleep). Those who experience alpha waves report feeling happy, calm, relaxed and have an increased awareness of thoughts and feelings<sup>21</sup>.

In the Terra exercise, deep and slow breathing will change the breathing pattern of thoracic breath into diaphragmatic breath. Deep breathing can widen and flex blood vessels, activating afferent impulses from baroreceptors thus reaching the heart center which will stimulate parasympathetic nerve activity and inhibit the sympathetic center (cardio accelerator), thus causing systemic vasodilation which can cause a decrease in heart rate<sup>22</sup>. Regular deep breathing, in addition to increasing baroreceptor sensitivity and releasing endorphin neurotransmitters, stimulates the autonomic nerve response which influences inhibiting the sympathetic center (increasing bodily activity) and stimulating parasympathetic activity (decreasing bodily activity or relaxation)<sup>23</sup>. This condition will increase physiological adaptation and comfort in individuals<sup>22</sup>.

Terra's exercise program conducted in a group will provide a reciprocal relationship that affects all participants and this is called social interaction. Good social relationships will provide higher self-esteem, social support, and a better quality of life<sup>24</sup>. Estelle, Kirsch, and Pollack's research explains that social involvement has a positive effect on emotional well-being and physical health<sup>25</sup>. Another study by Gouveia, Matos, and Schouten explains that parents who interact well socially have a positive impact on improving their quality of life<sup>26</sup>.

Social activities are one of the daily activities done by someone. Social activities have a significant relationship with the level of physical fitness which can certainly affect the quality of life<sup>27</sup>. The existence of elderly social activities in the form of the presence of religious services and the presence of emotional support can help the elderly seek welfare and purpose in life. Elderly interactions and family ties greatly affect their quality of life<sup>28</sup>.

Health factors will affect the process of adjustment in the home environment. The home environment is the smallest unit of society, so it has a very important role to improve the quality of life. One study's results showed that family function had a significant relationship with quality of life with a 2.3 times increase in improving quality of life<sup>29</sup>.

Terra exercise needs to be done as a promotive and preventive effort to improve the quality of life of postmenopausal women by empowering the elderly *Posyandu*. There needs to be an increase in the attention of stakeholders to provide support for postmenopausal women to diligently do Terra exercise with the goal of developing an elderly population

who are healthy, independent, and productive.

## CONCLUSION

The Terra exercise program 3 times a week for 8 weeks can improve the quality of life of postmenopausal women.

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## Ethical Approval and Informed Consent

This research has been approved by the Medical and Health Research Ethics Committee (MHREC) from the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada with reference No. KE/FK/1221/EC/2017.

## Funding

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## Availability of Data and Material

Data and material can be accessed via the corresponding author.

## Conflict of Interest

None.

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