

A Study on the Low Intensity Aerobic Exercise and Postural Correction Exercise on Fatigue Substance and Aging Hormone

Beak Soon-Gi¹ and Kim Do-Jin^{2*}

¹Department of Beauty and Health, Jungwon University, Korea; bsg@jwu.ac.kr

²Department of Community Sports and Recreation, Daelim University College, Korea; taehab@hanmail.net

Abstract

This study aimed to investigate the changes in fatigue substance and aging hormone in the body of middle aged women after 12 weeks of low intensity aerobic exercise and postural correction exercise. Hence, experimental group and control group were set to compare the effects of treatment. The exercise sessions were 4 times a week for 12 weeks counting total of 48 sessions. Low intensity aerobic exercise was to walk treadmill and postural correction exercise was to relax each joint centered on upper body and lower body. Through this process, fatigue substances such as lactate, LDH, and CK showed interaction effects. Aging hormones such as DHEAs and melatonin showed interaction effects as well. Low intensity aerobic exercise and postural correction exercise showed positive effect on the fatigue substance and aging hormones in the body.

Keywords: Aging Hormone, Fatigue Substances, Low Intensity Aerobic Exercise, Postural Correction Exercise

1. Introduction

Once human body is stimulated with motion stimulus, metabolism rises and numerous physiological regulatory phenomena occur in the body structures and organs for immune system and homeostasis. Regulating qualitative and quantitative elements of exercise is crucial element to enjoy safe yet helpful effects of exercise.

Physical changes of women remarkably occur after the age of 40. In general, sense organs such as eyesight, hearing and taste decline, skin ages, wrinkles and gray hair begin to be created, breasts shrink, teeth changes, motor ability reduces due to a fall in physical strength and memory and cognitive ability reduce.

Also, the autonomic nervous system in which the endocrine system and the interbrain serve as the backbone centering around the pituitary gland, shows hormone changes by the imbalance of the endocrine system and autonomic nerve changes by psychological stress¹.

Reference² reported that aerobic exercise improves cardiopulmonary functions and factors, which negatively affect the heart and lung diseases and prevents a variety of obesity-related complications.

Reference³ argued that high-intensity exercise leads to early exhaustion and increased appetite because of an increase in the use of carbohydrates and for promoting the use of fat in obese people, low-intensity exercise is required rather than high-intensity exercise.

Maintaining a correct posture helps smooth physical functions and maintaining a wrong posture long causes a decline in physical functions. Especially, this highly affects physiological and endocrine system functions.

In this perspective, investigating the effect of low intensity aerobic exercise and postural correction exercise as female physical activity is meaningful.

Hence, this study aims to examine the changes of fatigue substance and aging hormones in the body through 12 weeks of low intensity aerobic exercise and postural correction exercise.

* Author for correspondence

2. Study Method

2.1 Subject of Study

The research subjects were middle aged women in 50s living in Gyeonggi-do Korea who do not exercise regularly, do not take dietary supplement, and wish to attend 12 weeks of low intensity aerobic exercise and postural correction exercise. The Experimental Group (EG) participates in the low intensity aerobic exercise and postural correction exercise whereas Control Group (CG) does not participate in the treatment program of this study. 10 subjects were assigned to each group but 1 subject from CG quit from the program. Therefore, total of 19 subjects participated in this program Table 1.

Table 1. Physical characteristic of subjects (M $\pm$ SD)

Group	N	Age (yr)	Height (cm)	Weight (kg)	Fat (%)
EG	10	53.80 $\pm$	159.82 $\pm$	70.17 $\pm$	31.22
		1.85	2.77	4.55	$\pm$ 3.05
CG	9	54.15 $\pm$	159.13 $\pm$	69.45 $\pm$	30.85
		2.04	2.16	3.98	$\pm$ 3.84

EG: Experimental Group CG: Control Group

2.1.1 Experiment Program

The experiment program was conducted 48 times, 4 times a week for 12 weeks. The program was composed of 30 minutes of low intensity aerobic exercise and 30 minutes of postural correction exercise. The treadmill walk was used as low intensity aerobic exercise whereas postural correction exercise composed of programs that relax each joints centered on upper body and lower body.

The 12 weeks were divided into three stages and classified as initial stage, middle stage, and last stage to give changes to the exercise intensity Table 2.

Table 2. Exercise program

Category	Type	Methods
Aerobic Exercise (30min)	Low Intensity Exercise	Treadmill walking (1RM 50-60%, 3set)
	Correction Exercise	Scapula, Backbone, Hip joint, Shoulder rotation, Straighten oneself up, Left and right, Knee bend
Warm-up/ Cool-down (5min)	Stretching	Upper & Lower body stretching

2.1.2 Measurement Factor

EG conducted low intensity aerobic exercise and postural correction exercise whereas CG was set to be comparison group to verify the effectiveness of 12 week program. The fatigue substance and aging hormones were measured through blood test after 12 weeks. The collected bloods were then requested to specialized institution for blood analysis.

2.1.3 Data Treatment

PASW 18.0 statistical program was used on the pretest and post test data to identify the effect of 12 week treatment. Descriptive statistics was suggested for each measurement period and 2-way RGRM ANOVA was applied to find the interaction of the treatment effect. The significance level was set to be 0.05.

3. Results

3.1 Change in Fatigue Substance

Among the factors related with fatigue substance, lactic acid turned out to have significant interaction effect between EG and CG with $F(1,17) = 5.994$, $p < .05$ whereas lactate dehydrogenase (LDH) showed significant interaction effect with $F(1,17) = 53.105$, $p < .001$ Table 3, Table 4. Creatine Kinase (CK) showed significant interaction effect between EG CG with $F(1,17) = 165.609$, $p < .001$ Table 5.

Table 3. Lactic acid ANOVA

Source	SS	df	MS	F	p
group	.518	1	.518	.470	.502
error	18.718	17	1.101		
factor	.052	1	.052	2.458	.135
group* factor	.127	1	.127	5.994	.025
error	.360	17	.021		

Table 4. Ldh ANOVA

Source	SS	df	MS	F	p
group	3133.930	1	3133.930	.449	.512
error	118595.604	17	6976.212		
factor	1919.471	1	1919.471	44.521	.001
group* factor	2289.540	1	2289.540	53.105	.001
error	732.928	17	43.113		

Table 5. CK ANOVA

Source	SS	df	MS	F	p
group	3082.528	1	3082.528	.788	.387
error	66498.266	17	3911.663		
factor	1518.945	1	1518.945	130.799	.001
group* factor	1923.137	1	1923.137	165.605	.001
error	197.417	17	11.613		

3.2 Change in Aging Hormones

Among the aging hormones, DHEAs (dehydroepiandrosterone) showed significant interaction effect between EG and CG with $F(1,17) = 6.778$ $p < .05$ whereas melatonin showed significant interaction effect with $F(1,17) = 7.338$, $p < .05$ Table 6, Table 7.

Table 6. Dheas ANOVA

Source	SS	df	MS	F	p
group	119.586	1	119.586	.374	.549
error	5442.582	17	320.152		
factor	186.404	1	186.404	10.288	.005
group* factor	122.807	1	122.807	6.778	.019
error	308.018	17	18.119		

Table 7. Melatonin ANOVA

Source	SS	df	MS	F	p
group	2.136	1	2.136	.138	.715
error	263.214	17	15.483		
factor	12.951	1	12.951	7.549	.014
group* factor	12.588	1	12.588	7.338	.015
error	29.164	17	1.716		

4. Discussion

The aim of this study is to analyze the changes in fatigue substances and aging hormones in middle-aged women when low-intensity aerobic exercise and posture corrective gymnastics are applied to them.

In this study, there were significant differences in fatigue substances and aging hormones before and after the 12-week low-intensity aerobic exercise and posture corrective gymnastics.

Reference⁴ reported that exercise therapy is effective in correcting a posture by enhancing spine flexibility and strengthening muscles and ligaments around the spine.

Reference⁵ reported that for proper posture correction, an effective exercise strategy is needed and a special

exercise program should be developed for symmetrical muscle strengthening.

Reference⁶ said that fatigue substances are created by anaerobic metabolism of glucose when the ATP demand of muscle cells exceeds the amount re-synthesized in mitochondria during exercise. He added that as by-products created by decomposed blood sugar in the energy metabolism process of muscles, they lead to acidification in the body and as the major cause for muscle fatigue, they are essential in performing efficient exercise.

Reference⁷ reported that intermittent treadmill exercise applied to football players was effective in reducing lactic acid concentration. Also⁸, announced that there were significant differences in lactic acid changes between the groups, which performed the plyometric program and did not and this is similar to this study finding. LDH controls the formation and change of lactic acid in muscle cells during a muscular activity and increases after exercise.

Reference⁹ displayed that no significant differences in LDH changes were found after an 8-week exercise program was applied to mice for 5 days a week at a speed of 30m per minute and at a gradient of 10% for 90 minutes.

Reference¹⁰ reported that no significant differences in LDH changes were found after aerobic exercise. Reference¹¹ Jeffry explained that as an indirect indicator of muscle injury, an increase in blood activity of CK and LDH helps to measure tissue damage and enzyme activity can be used as basic data for preventing excessive exercise and injury.

Reference¹² revealed that there were no significant differences in DHEAs when a long-term exercise program was applied to middle-aged and old women, whereas¹³ reported that aerobic exercise and exercise using an elastic band led to a significant increase in melatonin, compared to the control group and this is similar to this study finding.

This study demonstrates the effects of low-intensity aerobic exercise and posture corrective gymnastics and it is thought there should be a discussion on diverse treatments.

5. Conclusion

The mechanism of fatigue initiation in the muscle is closely related to the accumulation of metabolite and energy exhaustion. Also, the aging accompanied by changes of

hormone are important factors that are not only related to the physical stress but may also determine the quality of lives of the women. Thus verification of physical stimulation and effects of exercise have importance.

This study has significance in combining aerobic exercise with postural correction exercise in improvement of fatigue substance and understanding of hormone changes as a means of consideration of such perspectives.

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