

## Effect of Regular Exercise on Physiological, Immunological and Hemopoietic Factors in Adults

Kyung-Mo Oh<sup>1</sup>, Kyung-Yae Hyun<sup>2</sup>, Gil-Hyun Lee<sup>2</sup>, Joon-Sun Lee<sup>2</sup>, Hwa-Sik Choi<sup>3</sup>,  
Dae Sik Kim<sup>4</sup> and Seok-Cheol Choi<sup>5\*</sup>

Depart. of Physical Education, Pukyong National University, Busan 608-737, Korea<sup>1</sup>, Depart.  
of Clinical Laboratory Science, Dong-Eui University, Busan 614-714, Korea<sup>2</sup>, Depart. of  
Clinical Laboratory Science, Shin-Han University, Uijungbu, 480-701, Korea<sup>3</sup>, Depart. of  
Clinical Laboratory Science, Dongnam Health College, Suwon 440-714, Korea<sup>4</sup>, Depart. of  
Clinical Laboratory Science, Catholic University of Pusan, Busan 609-757, Korea<sup>5</sup>

\*, corresponding author: kyhyun@deu.ac.kr

**Abstract.** This study was designed to investigate the effects of regular exercise on the physiological, immunological and hemopoietic factors in adults (aged 30-60 years). The body weight, were significantly lower in the exercise (n=60) group than in the control group (n=60) (P<0.05). Serum high sensitivity C-reactive protein, tumor necrosis factor- $\alpha$  (Inflammatory factors) and leukocyte apoptosis levels were lower, while erithropoietin (hemopoietic factor) concentration was significantly higher in the exercise group than in the control group (P<0.05). These results suggest that regular exercise promises prevention of metabolic syndrome, improved immunological function, and antiinflammatory effect.

**Keywords:** Regular exercise, Physiological factor, Immunology, Apoptosis

### 1 Introduction

Overweight and obesity will be anticipated to be increasing up to fifty 50% after ten years and the people with obesity have discharged more 36% of medical expenses than non-obese them. Recently, for the prevention and/or treatment of the complications with obesity, diet, sports, or climbing have done. Regular exercise of them exerts for the prevention, ameliorative effect and treatment of hypertension, arteriosclerosis, diabetes, colorectal cancer, breast cancer, chronic obstructive pulmonary disease, or metabolic syndrome (Blair et al., 2001). These arguments lead to need of the present study. This study was designed to investigate whether adults with regular exercise have differences in the physiological, immunological and hemopoietic factors compared with adults without them.

### 2 Materials and methods

## 1. The subjects and grouping

One hundred-twenty healthy volunteers (age thirties-sixties) were participated in this study and were divided nonexercise (n=60) and exercise group (n=60). Nonexercise group was adults who had not exercise. Exercise group was defined adults who had regular exercise (at least four day a week). The definition of exercise applied in this study included weight training (30-60 min) with aerobic exercise (15-30 min). There was similar in age, occupation (blue color), working hours a day, and dietary nutrients and alcohol intake between two groups. The exclusive criteria were people with recently operation, diabetes, neuromuscular disorders, cardiovascular and cerebrovascular diseases, hematological and immunological disorders, cancers, movement problems, or respiratory diseases. This study was accepted from IRB of the Catholic University of Pusan.

## 2. Variables

### 4) Immunological factors and erythropoietin

The sera were analyzed for determination of high sensitivity C-reactive protein HS-CRP, inflammatory marker) [by immunoturbidimetric method with CRPLX Tinaquant<sup>®</sup> C-RP Kit (Latex) (Roch/Hitachi, Co., Tokyo, Japan) and Hitachi 7600 (Hitachi Co., Tokyo, Japan)], tumornecrosis factor- $\alpha$  (TNF- $\alpha$ , cytokine) and erithropoietin (erythropoietic factor) [by ELISA method with Human TNF- $\alpha$  Immunoassay Kit (R&D system Inc, DTA00C, CA., USA) and human erythropoietin platinum ELISA (eBioscience, BMS2002, Austria)] The apparatus was xMark Microplate Absorbance Spectrophotometer (Bio-Rad, No.168-1150, USA).

## 3 Results and Discussion

### 1. Demographic data

The body weights were significantly lower in the nonexercise (control) group than in the exercise group ( $P < 0.01$ ). However, There were significant differences in the other variables between the two groups ( $P > 0.01$ ) (Table 1). The lower body weights in the exercise group are considered be attributable to regular exercise, suggesting that regular exercise can provide appropriate body weights, which prevent obesity, metabolic syndrome and adult disease (Lamina and Agbanusi, 2013).

### 2. Immunological markers and erythropoietin

Hs-CRP and TNF- $\alpha$  concentrations were lower ( $P < 0.05$ ,  $P < 0.01$ ), whereas erythropoietin concentrations were higher in the exercise group than in the nonexercise group ( $P < 0.05$ ) (Table 2). Hs-CRP and TNF- $\alpha$ , which are released in

variable inflammatory conditions, are inflammatory markers. Obesity contribute to increase of adipose tissues that release proinflammatory cytokines (TNF- $\alpha$  and interleukin-6). The regular weight training combined with aerobic exercise may prevent the development of neural system disorders and be ameliorate inflammatory reaction.

**Table 1.** Characteristics of control and exercise groups

Variable	Group	
	Nonexercise (n=60)	Exercise (n=60)
Age (years)	47.41 $\pm$ 15.75	45.80 $\pm$ 16.71
Gender (M : F)	43 : 17	39 : 21
Height (cm)	167.75 $\pm$ 13.20	166.42 $\pm$ 14.05
Body weight (kg)	74.20 $\pm$ 14.12	66.16 $\pm$ 13.00**
Smoking (piece/day)	6.70	5.96
Drinking (16.9%/w)	3 bottle/2.50 time/w	3 bottle/2.61 time/w

Data were expressed the mean $\pm$ standard deviation (SD).

\*\*, P<0.01 (compared with the control group).

Abbreviation: w, week.

**Table 2.** Comparison of cytokine and inflammatory substance of between control and exercise groups

Variable	Group	
	Nonexercise	Exercise
Hs-CRP (mg/dL)	0.10 $\pm$ 0.02	0.06 $\pm$ 0.00**
TNT- $\alpha$ (pg/mL)	0.08 $\pm$ 0.01	0.07 $\pm$ 0.01*
Erythropoietin (unit/mL)	1.70 $\pm$ 0.02	2.30 $\pm$ 0.01*

Data were expressed the mean $\pm$ SD.

\*, P<0.05; \*\*, P<0.01 (compared with the control group). Abbreviation: Hs-CRP, high sensitivity C-reactive protein; TNF- $\alpha$ , tumor necrosis factor-alpha.

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