

Effects of 8-Week High Intensity Combined Exercise on Body Composition, Blood Lipid and CRP in Obese Middle Aged Men

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Abstract

Background/Objectives: This study was built up to delve into the effects of high-intensity combined exercise on body composition, blood lipid and CRP for 8 weeks obese men living in Korea. For this purpose, treatment effects were divided into 8 weeks high intensity complex exercise group and control group.

Method/Statistical Analysis: The purpose of this research was to study obesity men in their 50s. The study selected subjects who did not participate in periodic physical activity program in the last year. A total of 16 subjects were divided into 8 high-intensity combined exercise group and 8 control group. Basic statistical analysis was performed on high intensity combined exercise group and control group. 2-way ANOVA was performed to investigate the effects of 8 weeks high intensity compound exercise.

Findings: 8 weeks of high-intensity combined exercise among obese middle-aged men in their 50s showed significant differences in body weight, muscle mass, body fat (%) and WHR, and significant differences in TG, TC, HDL-C, and LDL-C in blood lipids. The CRP showed significant interaction effects in the high intensity combined exercise group and the control group.

Improvements/Applications: High intensity combined exercise showed positive changes in body composition, blood lipid and CRP in middle-aged men. This suggests that high-intensity exercise may have effect to men in their 50s with extended life.

Keywords: High Intensity Combined Exercise, Body Composition, Blood Lipid, CRP, Obese Middle Aged Men.

Introduction

The World Health Organization announced that 1.9 billion adults are now overweight and 600 million of them are now suffering from obesity worldwide. In

addition, obesity has now become a global epidemic^[1-2]. In Korea, 17.8% of the 11,467 billion won of socioeconomic costs are caused by obesity problem accounted for over a year, and 52.9% of the total losses are concentrated in the 30s to 50s, which is so-called as a productive population. Therefore, it has become a more crucial problem, and it is urgent to prepare for the obesity measures of Korean men in their 50s who are being hit by obesity^[3]. As such, obesity is now being considered as a major risk factor for heart disease, high blood pressure, diabetes and stroke, and is closely associated with decreased life expectancy, cognitive dysfunction and poor quality of life^[4]. Obesity is a major cause of various non-communicable diseases (NCDs), including

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life-threatening and non-fatal diseases. Obesity is also leads one of the factors which leads to premature death and physical disability in adulthood [5].

In middle age, they experience physical aging and experience significant physiological changes, such as changes in appearance, weak physical function, vitality and metabolism, and memory and intelligence decline due to cognitive decline. In addition, a decrease in immune function along with cell aging reduces the resistance to disease or external stress, increasing the likelihood of developing chronic diseases[6].

In this period, not only physical strength rapidly declines, but various physiological functions shows declining aspect, which increases the risk of adult disease. Gradually obesity, hypertension, cardiovascular disease, diabetes, etc. may occur[7]. In particular, middle-aged men having white-collar jobs have a sedentary lifestyle and are prone to obesity due to lack of physical activity and sedentary life style and negative changes in body composition[8]. Likewise, increased sedentary activity is accompanied by decreased energy consumption, energy imbalance, and fat accumulation- and ultimately brings fat tissue enlargement, a major feature of obesity caused by calorie intake and consumption imbalance, leads

to negative changes in each organ in the body. It also negatively affects individual psychological factors and finally leads to a deterioration in overall quality of life[9]. Appropriate physical activity improves dyslipidemia, weight and BMI[11],and resistance exercise reduces the risk of developing cardiovascular disease by increasing insulin sensitivity and lowering LDL-C levels[10].

Therefore, this study is an effective exercise prescription program for obesity middle-aged men’s obesity management and cardiovascular disease by comparing and analyzing the effects on high blood lipid, CRP and body composition after 8 weeks of high-intensity combined exercise for obese men in their middle age. The purpose of this study is to present the basic data.

Method

1. Subject of Study: This study was conducted to study was to study obesity men in their 50s. The study selected subjects who did not participate in periodic physical activity program in the last year. A total of 16 subjects were divided into 8 high-intensity combined exercise group (HCG) and 8 control group (CG). The physical characteristics of the study subjects are shown in Table 1.

Table 1: Physical Characteristic of Subjects (M±SD)

Group	N	Age (yr)	Height (cm)	Weight (kg)	Muscle (kg)	Fat (%)
CG	8	54.22±1.27	172.68±3.01	85.95±5.62	59.63±2.36	30.37±3.71
HCG	8	53.29±1.01	173.08±3.24	84.03±4.94	57.73±4.33	31.28±3.61

2. Exercise Program: In this study, the exercise method was 4 days a week for 8 weeks. The high-intensity combined exercise group had undergone a program which included 10 minutes of warm-up, 20 minutes of resistance, 20 minutes of aerobic exercise, and 10 minutes of cool down. The control group was required to maintain daily life as usual for 8 weeks.

In the high-intensity combined exercise group, the warm-up exercise was performed by stretching the upper body and the lower body. The resistance exercise and the aerobic exercise, which were the main exercise, reset the exercise intensity every week. Resistance exercise was performed at 80% level based on 1RM, and aerobic exercise was set

at 80% target heart rate through Polar Heart Rate Analyzer (Polar Electro, Finland). High-intensity combined exercise programs are explained in details at <Table 2>.

Table 2: Exercise Program

Division	Intensity	Combined Exercise
Periods (8week)	Resistance exercise (1RM 80% each 1week/10 repetition 2set/20min)	Squat, Press (bench, leg, shoulder), Leg curl, Barbell curl, Lat pull down, Lunge
	Aerobic exercise (target heart rate 80% each 1week, 20min)	Treadmillrun and walking

3. Measurement method and equipment: The body composition was performed using Inbody

770 Bio Space (Korea). Blood lipid and CRP test was performed before and after 8 weeks of high-intensity combined exercise. The blood was taken to maintain an empty stomach for 12 hours and stable for 30 minutes before the blood was drawn. Blood was collected from the brachial vein by using a disposable syringe. The collected blood was centrifuged at 3000 RPM using a centrifuge and commissioned to a nuclear medical institution for analysis.

4. Data Analysis: Basic statistical analysis was performed on high intensity combined exercise group and control group. 2-way ANOVA was

performed to find out the effects of 8 weeks high intensity compound exercise. The significance level was conducted at .05.

Result and Discussion

1. Body COmposition: According to <Table 3>, there was an interaction effect on body weight (p = .001), body fat(p = .001), WHR (p = .012) and muscle mass (p = .001) in the 8-week high-intensity combined exercise group (HCG) and the control group (CG). This suggests that high-intensity combined exercise has a meaningful effect on body composition change.

Table 3: Body Composition ANOVA

Factor	Group	Pre	Post	P
Weight (kg)	CG	85.95±5.62	86.61±5.52	Group*period: .001 Group: .040 Period: .001
	HCG	84.03±4.94	77.41±3.47	
Fat (%)	CG	30.37±3.71	30.52±3.79	Group*period: .001 Group: .399 Period: .001
	HCG	31.28±3.61	26.18±4.68	
WHR (waist-hip ratio)	CG	.90±.01	.90±.01	Group*period: .012 Group: .575 Period: 1.00
	HCG	.90±.018	.89±.01	
Muscle (kg)	CG	59.63±2.36	59.51±2.66	Group*period: .001 Group: .642 Period: .001
	HCG	57.73±4.33	59.78±3.92	

2. Blood Lipid: According to <Table 4>, there was an interaction effect on TG(p = .006), TC(p = .001), HDL-C(p = .005) and LDL-C(p = .001) in the 8-week high-intensity combined exercise group (HCG) and the

control group (CG). This suggests that high-intensity combined exercise has a significant effect on blood lipid change.

Table 4: Blood Lipid ANOVA

Factor	Group	Pre	Post	P
TG (mg/dl)	CG	109.50±47.07	107.87±46.80	Group*period: .006 Group: .882 Period: .004
	HCG	133.62±58.49	90.37±23.96	
TC (mg/dl)	CG	170.50±29.17	172.50±38.18	Group*period: .001 Group: .297 Period: .001
	HCG	174.00±28.56	138.00±16.81	
HDL-C (mg/dl)	CG	56.12±8.23	56.87±9.10	Group*period: .005 Group: .082 Period: .001
	HCG	46.12±5.22	54.00±5.45	
LDL-C (mg/dl)	CG	105.37±27.30	109.25±29.22	Group*period: .001 Group: .685 Period: .002
	HCG	113.37±22.40	91.62±12.16	

3. CRP (C-reactive protein): According to <Table 5>, there was an interaction effect in CRP in the 8-week high-intensity combined exercise group (HCG) compared to the control group (CG). This suggests that high-intensity combined exercise has a significant effect on CRP.

Table 5: CRP ANOVA

Factor	Group	Pre	Post	P
CRP (mg/dl)	CG	.115±.05	.112±.05	Group*period: .014 Group: .626 Period: .011
	HCG	.146±.10	.055±.01	

Discussion

This study was conducted to compare the differences in blood lipids, CRP, and body composition of 8-week high-intensity complex exercise for obese middle-aged men. For the purpose of presentation, the following is a comparative analysis based on the results of this study and previous studies.

Looking at previous studies on changes in body composition through combined exercise in middle-aged men, Mateus et al^[11] reported that aerobic(50–85% of VO² peak) and resistance (6–10 RM) target obese middle-aged men. Sixty minutes of training, three times per week, and 24 weeks of training showed positive effects on body composition. Donges et al^[12] reported significant improvement in body weight and body fat percentage of body composition after 12 weeks of muscle strength, aerobic exercise and combined training in sedentary middle-aged men. Mohammadi, Khoshnam & Khoshnam^[13] reported significant improvements in body composition in three groups of 12 weeks of aerobic, strength and combined exercise in middle-aged men. Changes in body composition are age-related and have a strong genetic predisposition. It is also affected by environmental factors such as nutrition, disease and physical activity and changes with age, especially in men. Changes in body composition depend on the type, intensity and duration of exercise program^[14].

These results indicate that intense activity can be an effective stimulus to body composition changes, especially high intensity activity, which greatly reduces body weight, BMI, body fat percentage, body fat and waist. This is consistent with the findings presented in the study^[15] that vigorous exercise can be the target of total energy intake and that energy consumption during exercise may be more effective than moderate activity.

Therefore, high-intensity combined exercise performed in this study may play an important role in maintaining health by improving the body composition of obese middle-aged men through the direct metabolism of body fat due to the direct burning of body fat and the increase of muscle mass.

Looking at previous studies on changes in blood lipids through complex exercise in middle-aged men, Seo^[16] reported positive changes in blood lipid after 12 weeks of complex exercise for middle-aged men. The study of Nam & An^[17] reported the effect of blood lipids after a combined exercise for 8 weeks in middle-aged obese men. Atashak, Stannard & Azizbeigi^[18] reported that eight weeks of combined exercise program intervention in overweight middle-aged men was effective in reducing blood lipid LDL-C and TG and increasing HDL-C.

In addition, a study by Byun & Woo^[19] found that 8 weeks of combined exercise in obese men was effective in significantly reducing blood lipid TC, LDL-C, and TG. In this study, a 8-weeks High intensity combined exercise program was conducted to the obese male participants who were in their middle ages, and the program showed significant differences in high-density lipoprotein cholesterol (HDL-C), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C) and total cholesterol (TC) among blood lipids.

These results happen since exercise brings 1) the increase of lipid utilization activity in mitochondria through exercise, 2) the enhancement of glycogen synthase function, 3) the influx of active muscles of free fatty acids in blood and 4) activates the use of lipoprotein and phosphorlipid as energy sources^[20]. Therefore, the high-intensity combined exercise performed in this study is effective in improving the blood lipid of obese middle-aged men and is considered a suitable exercise program to prevent health promotion and cardiovascular disease.

Several previous studies were conducted on the change of C-reactive protein (CRP) through complex exercise in middle-aged men and Libardi et al^[14] conducted a study concentrating on strength, endurance and complex training of middle-aged men. However, as a result of examining the effect on the level, there was no statistically significant difference before and after exercise training. Another group of researchers, Mohammadi, Khoshnam & Khoshnam^[13] reported a

significant improvement in CRP in three groups after 12 weeks of aerobic, strength and combined exercise in middle-aged men. In addition, Jung & Lim^[21] reported that 12 weeks of combined exercise for middle-aged obese men significantly reduced their CRP levels.

In this study, a 8-weeks High intensity combined exercise program was conducted to the obese male participants who were in their middle ages, and the program showed significant differences in CRP. Results of the studies suggest that CRP was reduced by inhibition of inflammation due to the decrease of fat cells - which was all due to high-intensity combined exercise programs^[22]. Therefore, the high-intensity combined exercise performed in this study is thought to help improve the circulatory system by reducing CRP levels and suppressing cardiovascular inflammation in obese middle-aged men.

Conclusion

It is associated with blood-related atherosclerosis as the leading cause of death and deterioration of health in middle-aged men. This study was conducted for 8 weeks of high-intensity combined exercise in obese men in their 50s. High intensity combined exercise showed positive changes in body composition, blood lipid and CRP in middle-aged men. This suggests that high-intensity exercise will have effects to men in their 50s with extended life.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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