Iran J Public Health, Vol. 45, No.7, Jul 2016, pp.949-950

Letter to the Editor

Effectiveness of a 12-week Program of Combined Exercise in Reducing Visceral Fat as Measured by Computerized Tomography Imaging

Moon Seok KWON [1], ***Wi-Young SO*** [2], ***Do-Jin KIM*** [3], ****Taikyeong Ted. JEONG*** [4]

1. *College of Science and Technology, Konkuk University, Chungju-si, Korea*
2. *Sports and Health Care Major, Korea National University of Transportation, Chungju-si, Korea*
3. *Dept. of Rehabilitation Sports, Bucheon University, Bucheon-si, Korea*
4. *Dept. of Computer Science and Engineering, Seoul Women's University, Seoul, Korea*

***Corresponding Author:** Email: ttjeong@swu.ac.kr

(Received 18 Jan 2016; 12 Feb 2016)

Dear Editor-in-Chief

According to the 2014 WHO report on obesity, the incidence of obesity has risen, affecting more than 600 million people worldwide, with 1.9 billion classified as being overweight (1). Specifically in Korea, the 2013 Korean National Health and Nutrition Examination Survey reported the prevalence of obesity to be 37.6% in men and 25.1% in women over the age of 19 yr, which has increased every year (2). It is clear that obesity has become a serious social health problem, both locally in Korea and worldwide, and is a significant risk factor for a number of serious health conditions and chronic diseases (3-4).

Exercise has been shown to promote physical health, including weight management (5). Recently, there is emerging evidence of additional benefits of exercise programs that combine aerobic and resistance training for weight management (6-7). However, there is little evidence regarding the effectiveness of a combined program of exercise in directly reducing visceral fat. Therefore, this study aimed to examine the effect of a 12-wk program of combined exercise training in lowering the visceral fat content, measured with computerized tomography (CT) imaging, in a group of Korean female college students.

Prospective participants were female college students who visited S rehabilitation hospital in Seoul, Republic of Korea, for a weight management intervention. Prospective participants did not engage in a regular program of exercise and had no health problems. Sixteen participants were enrolled into our study, to yield a statistical power of 0.80, with an alpha error probability of 0.05 and an effect size of 0.4, calculated for a 2 X 2 repeated analysis of variance design (G-power program 3.1.3, Germany). The relevant demographic characteristics of the study group were an average age of 21.19±1.33 yr, average height of 160.43±5.35 cm, average weight of 65.64±5.07 kg, and average body mass index of 25.50±1.51 kg/m^2. Participants were randomly assigned to two groups, the combined exercise (n=8) or the control (n=8) group.

Participants in our exercise group completed our combined program of exercise, consisting of a 30-min period of treadmill running, performed at an intensity of 60 to 80% of maximal heart rate reserve, followed by a 30-min program of resistance training including the following exercises: 3 sets of 10-15 repetitions of squats, leg extensions, lunges, chest press, lat-pull downs, and abdominal crunches; the entire set was performed 5 d per week for 12 wk.

Outside of this prescribed program of exercise, all participants were instructed to maintain their typical diet and activity pattern throughout the study period. Participants, or their parents as age-appropriate, provided written consent.

Visceral fat was measured with CT imaging (WCT-300-135 Alexion, TSX-032A, Toshiba, Tochigi, Japan). The cross-sectional area of visceral fat (cm^2) and subcutaneous fat (cm^2) was measured between the fourth and fifth lumbar vertebrae, with participants lying in a supine position. The visceral-to-subcutaneous fat ratio (%) was calculated as the cross-sectional area of subcutaneous fat divided by the cross-sectional area of visceral fat.

Between-group differences in visceral fat, subcutaneous fat, and the ratio of subcutaneous-to-visceral fat, as measured before after the intervention period, were evaluated by using repeated measures analysis of variance (ANOVA). All analyses were performed with SPSS version 18.0 (SPSS, Chicago, IL, USA), with the level of statistical significance level set at $P<0.05$.

Change in visceral and subcutaneous fat for the control and combined exercise training groups are reported in Table 1. A group × time interaction was identified, with significant lowering in the cross-sectional area of visceral fat ($F=34.608$, $P<0.001$) and subcutaneous fat ($F=6.903$, $P=0.020$), as well as in the visceral-to-subcutaneous fat ratio ($F=28.828$, $P<0.001$) for the combined exercise group. Based on this evidence, we conclude that our 12-wk program of combined program of whole-body aerobic and resistance training exercises directly reduced visceral fat and subcutaneous fat in a group of Korean female college students.

Table 1: Changes in visceral fat and subcutaneous fat after 12 wk of combined exercise training

Categories	Exercise	Pre-exercise	Post-exercise	Interaction (Group × Time)	
				F	*P*
Visceral fat (cm^2)	Control	36.92 ± 15.70	36.04 ± 15.62	34.608	<0.001***
	Combined	42.09 ± 16.13	24.00 ± 10.03		
Subcutaneous fat (cm^2)	Control	223.87 ± 41.67	220.47 ± 36.33	6.903	0.020*
	Combined	232.59 ± 44.58	203.29 ± 33.69		
Visceral-subcutaneous fat ratio (%)	Control	0.17 ± 0.07	0.17 ± 0.07	28.828	<0.001***
	Combined	0.18 ± 0.05	0.12 ± 0.04		

Note: *$P<0.05$, ***$P<0.001$; tested by repeated analysis of variance

Acknowledgement

The authors declare that there is no conflict of interests. This work has been supported by the Basic Science Research Program through NRF of Korea 2014R1A1A2059115, and was supported by a research grant of Seoul Women's University in 2016.

References

1. World Health Organization (2015). *Obesity and overweight*. Available from: http://www.who.int/mediacentre/factsheets/fs311/en/
2. Korea Centers for Disease Control and Prevention (2014). 2013 *Korea Health Statistics: Korea National Health and Nutrition Examination Survey (KNHANES VI-1) (in Korean)*. Korea Centers for Disease Control and Prevention.
3. Wyatt SB, Winters KP, Dubbert PM (2006). Overweight and obesity: prevalence, consequences, and causes of a growing public health problem. *Am J Med Sci*, 331 (4): 166-174.
4. Sørensen TI, Virtue S, Vidal-Puig A (2010). Obesity as a clinical and public health problem: is there a need for a new definition based on lipotoxicity effects? *Biochim Biophys Acta*, 1801 (3): 400-404.
5. Poirier P, Després JP (2001). Exercise in weight management of obesity. *Cardiol Clin*, 19 (3): 459-470.
6. Sanal E, Ardic F, Kirac S (2013). Effects of aerobic or combined aerobic resistance exercise on body composition in overweight and obese adults: gender differences. A randomized intervention study. *Eur J Phys Rehabil Med*, 49 (1): 1-11.
7. Santa-Clara H, Fernhall B, Baptista F, Mendes M, Bettencourt Sardinha L (2003). Effect of a one-year combined exercise training program on body composition in men with coronary artery disease. *Metabolism*, 52 (11): 1413-1417.