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The Effect of Continues Aerobic Training with Green Tea Supplementation on Lipid Profiles of Inactive Obese Females

[1]Jamshid Banaii Boroujeni, [1]Bahman Zadeh Hendijani[*], [2]Mohammad Karimi, [1]Saeed Keshavarz

[1] Department of physical education and sport science, Najafabad Branch, Islamic Azad University, Najafabad, Iran.
[2]Faculty of Science, Qom University of Technology, Qom, Iran.

ABSTRACT

Background. Obesity, through creating disorder in blood lipids and also, increase insulin resistance, has a main role in appearance high risk disease such as cardiovascular disease, diabetes and various kind of cancer.
Objectives. The aim of this study was to survey effect of eight weeks continuous aerobic training accompanied with green tea consumption on lipid profile of inactive obese female.
Methods. In this quasi-experimental research, 40 inactive obese female with body mass index equal or greater than 30 kg/m2 selected as subjects. After receiving written consent, the subjects divided randomly into four equal groups; 1) continuous aerobic training, 2) green tea consumption, 3) continuous aerobic training accompanied with green tea consumption and 4) control. Continuous aerobic training was done for eight weeks, three sessions per week and intensity of 65-75 percent of MHR. Green tea supplement consume three bags (2 gram) in three meals per day. For combination group, both of intervention did. Before and after eight weeks intervention of training and green tea consumption, blood sampling done at 12h fasting state.
Results. It showed that continuous aerobic training with consumption of green tea supplement lead to significant reduction in body weight and fat percentage ($p<0.05$) and no significant effect on lipid profile ($p>0.05$).
Conclusion. In general, inactive obese female may benefit of positive effects of continuous aerobic training accompanied with green tea consumption on body weight and fat percentage. However, to determine effects of continuous aerobic training on lipid profile of inactive obese women more research is needed.

KEY WORDS: ***Obesity, Lipid Profile, Continuous Training, Aerobic Training.***

INTRODUCTION

Hypokinetic and obesity are as main global problems in health field that their prevalence in developed and developing societies is spreading (1). Rate of obesity prevalence is quickly increasing and as obesity spread risk of glucose tolerance and diabetes and other related disease are increasing (2). Obesity mainly is due to increase in energy intake accompanied with decrease in energy expenditure that leads to increase in fat mass (3). Generally, obesity is in result of imbalance in between energy intake and energy expenditure but nevertheless comparison between food intake and amount of activity, other factors such as genetic may has role. Generally, obesity determine with increase in body mass (4). Obesity defines as increas fat

*. Corresponding Author:
Bahman Zadeh Hendijani
E-mail: bahman.hendijani58@gmail.com

mass more than ideal limit (5). On the other hand, body mass index (BMI) equal or more than 30 kg/m^2 that indicate obesity (6). There are different methods to treatment of obesity. However, base on previous studies, the main principle in treatment of obesity is change in life style through diet and physical activity and behavior (7). Although, weight reduction through decrease in calorie intake may be more effective than increase in calorie expenditure through physical activity but, weight reduction through exercise is more useful than diet (8).

In many studies doing aerobic exercises accepted as a perfect approach for weight reduction and also, improvement in blood lipid profile and insulin sensitivity approved (9). Numerous studies recommended continue aerobic exercises with moderate intensity for weight reduction (9). However, because of time lasting of these kind of training program, some of them were been unsuccessful (10). Keating et al. (2014) in a study indicated that interval training with high intensity, just from time perspective has Preference toward continues training on lipid profile and fat distribution of overweigh people. But after 12-week intervention, some improvement observed in aerobic continues training (11). However, it seems that the findings about more perfect effects of continue or interval training is not clearly determined and needs more studies. Some studies emphasized on combination of training and nutritional supplements in reduction of blood lipids (12). One of these nutritional supplements is compositions that contain flavonoides such as green tea. Consumption of foods contain flavonoides may lead to decrease in mortality due to disease (13). As food that is Profuse of flavonoide may referred to tea and cola (14). These Substances mainly contain Catechins such as epigallocatechin-3-gallate (EGCG), epigallocatechin (EGC) and epicatechin (EC). Tea, especially green tea that it's most abundant catechin is EGCG, because of its preventive effect on cancer and cardiovascular disease, has been studied (15). Although, there is evidences that indicated that EGCG has metabolic role and may be effective in body fat reduction (16). Also, EGCG causes to reduction in food intake and decreases levels of blood triglycerides and cholesterol and increases HDL (14). Some studies showed that catechins of green tea lead to clearing risk factors related to atherosclerosis and hypertension through reduction of LDL oxidation, cholesterol absorption and decreases systolic and diastolic pressure (17, 18). Also, some studies do not approve the effect of green tea on lipid profile. Monteiro et al. (2008) in a study reported that consumption of drink contain 690 mg catechins for 12 weeks causes to decreases subcutaneous fat of Japanese healthy men but it has no significant effect on lipid profile (19). Furthermore, other studies showed that green tea in addition to effect on fat metabolism may have effect on glucose action and insulin resistance. It has been show that green tea flavonoides causes to improvement in insulin action and ability to produce insulin (20, 21). In relation to consumption of green tea supplement accompanied with exercise and its effect on metabolic performance especially effect on lipid profile, there is limited studies. Some previous studies indicated positive effect of aerobic exercises on lipid profile and other ones don't. In the present study the main question is that green tea supplementation accompanied with continues aerobic exercises, how affected lipid profile of inactive female?

MATERIALS AND METHODS

Participants. In a quasi-experimental study with pretest-posttest design, 40 inactive obese female with body mass index (BMI) equal or greater than 30 kg/m^2 were selected as subject. In a justification session, some information about the aim of study, process and blood sampling and etc given to the subjects and then all subjects read and signed informed, voluntary consent forms. It was necessary that all subjects don’t have regular exercise at least in the recent year. Health status such as cardiovascular system, muscular and skeletal system was evaluated by physician. The subjects don’t have especial diet and they don’t using any supplement.

Research Protocol. Body weight, BMI and body fat percentage were evaluated using body composition machine (Inbody-720 made in Korea) and bioimpedance method. Body weight with less than 0.1 kg error and fat percent calculated. Body mass index was calculated

through dividing body weight (kg) on height square (m^2). Then the subjects were divided into four equal groups of 1) continuous aerobic exercise, 2) green tea supplementation, 3) continuous aerobic exercise accompanied with green tea supplementation and 4) control. Continuous aerobic exercise performs for eight weeks, three sessions per week and intensity of 65-75 percent of maximum heart rate. Green tea supplement consumed three times per day and each time 2 gr dry tea bags. For group 3, both of interventions were used. Before and after eight weeks intervention of exercise and green tea supplementation, blood samples were collected of all participants at 12h fasting state.

Statistical Analysis. Data were analyzed using one-way ANOVA and Tuky post hoc. The level of significant was set at $P<0.05$.

RESULTS

Demographic and physiological characteristics presented as mean±SD in table 1. Table 2 lists the descriptive values of LDL, HDL and TC of participants before and after intervention. The results of one-way ANOVA reveal that there is no significant difference between groups in LDL (P=0.43), HDL (P=0.13) and TC (P=0.86) after eight weeks intervention.

Table 1. Demographic and physiological characteristics of subjects

Group Variable	control	exercise	supplement	Exercise and supplement
Age (years)	32.9±2.0	33.5±1.8	31.3±1.7	32.2±1.9
Height (cm)	167.7±2.6	169.7±2.9	169.2±3.7	166.9±3.8
Weight (kg)	89.5±3.9	93.9±3.8	91.8±6.6	92.6±7.4
BMI (kg/m^2)	31.8±1.4	32.6±1.2	32.0±1.2	33.1±1.7

Table2. Mean ± SD for LDL, HDL and TC (mg/dl) in studied groups

	Pre-test			Post-test		
group	LDL	HDL	TC	LDL	HDL	TC
continuous aerobic exercise	115.5±22.2	43.2±5.8	182.8±20.7	110.0±24.1	44.8±7.1	175.6±17.7
green tea supplementation	98.2±20.4	48.4±3.5	171.7±30.2	95.5±17.3	49.0±3.0	169.4±26.8
continuous aerobic exercise + green tea supplementation	111.2±27.5	46.2±5.6	175.1±28.2	108.3±28.1	47.6±6.5	170.8±23.7
control	105.9±26.9	42.3±3.8	180.6±20.6	108.8±28.1	41.5±4.5	178.3±18.5

DISCUSSION AND CONCLUSION

The results of the present study indicated that eight weeks of continuous aerobic exercise accompanied with green tea supplementation lead to decrease in body weight and BMI and also, no significant change in lipid profile of inactive female. Our finding is in agreement with those reported by Yarahmadi et al. (2014) (22), Haghighi et al. (2012) (23), Kishali et al. (2011) (24), Jurima et al. (2006) (25) and disagrees with those reported by akbarnejad (2011) (26) and abdolmaleki (2014) (27). The present study indicated that eight weeks of green tea supplementation (690 gr per day) don't created significant change in lipid profile but causes to weight and BMI reduction. Sayana et al. (2000) in a research on mice founded that the mice that had diet with 2 gr green tea for 16 weeks, experiences weight and fat mass reduction (28). Auvichayapat et al. (2008) in a study found that 12 weeks consume of green tea capsules contain 100 mg of EGCG per day, causes to decrease in leptin levels. They related this reduction to the increase in energy expenditure and decrease in fat percentage (29). Regarding serum leptin levels has high relationship with fat tissue (30). Nagao et al. (2007) showed that consumption of beverage contain 690 catechins for 12 weeks lead to significant decreases in body fat and subcutaneous fat of Japanese healthy male but has no significant effect on blood lipid profile (31). They explained that perhaps used amount

of catechins was not sufficient for Micelle Formation. This researcher in another study found that catechins cause to decrease in LDL (31). Maki et al. (2009) surveyed the effects of beverage contain of green tea catechins on body composition and fat distribution in obese and overweigh adults during physical activity. The subjects were 128 inactive healthy male and female with aged 21-65 year old that exercised for 12 weeks with moderate intensity (three sessions per week). Data were recorded with pedometer and the subjects divided into two equal groups of control and green tea. Beverage of green tea was containing 625 mg catechins with 39 mg caffeine and beverage of control group was containing 39 mg caffeine. They founded that the group that received beverage contain caffeine, had decrease in concentration of free fatty acids and serum TG and also, abdominal and total fat decreased significantly. Indeed, total cholesterol and lipoproteins didn't change (32). In mentioned study, caffeine and catechins had been consumed simultaneously that may be the reason for decrease in FFA and TG. In Maron study (2003), distillate of green tea rich in Thioflavin (375 mg) for 12 weeks causes to decrease LDL levels (16.3%) and total cholesterol (11.3 %) in subjects with high blood lipids (33). The researchers reported that added Thioflavin to the distillate of green tea is the reason of this finding. Catechins of green tea through several mechanisms affected body composition that one of them is prevention of Catechol-o-methyltransferase (COMT). COMT is an enzyme that blunts norepinephrine activity and causes to long period of time for norepinephrine activity. It seems that sympathetic nervous system has major role on fat recruitment from different sites in body. Indeed, catechins may have different effects on fat collecting from different sites through increasing sympathetic effects. Nagao et al. (2005), in a study demonstrated that daily consumption of 690 mg of catechins, accompanied with significant reduction in body weight, BMI, waist circumference free fat mass and subcutaneous fat areas (34). Researchers reported that the major reason of increasing in energy cost and lipid oxidation due to consumption of green tea distillate is the role of this substance in prevention of COMT activity. Indeed, other mechanisms such as redox regulatory system have been argued. Boschmann and Thielecke (2007) reported that EGCG has potential in increasing lipid oxidation in male and may have been anti-obesity effects (35). Indeed, they surveyed the combination of 300 mg EGCG and 200 mg caffeine per day. The researchers reported the preventive effect of EGCG on COMT activity and preventive effect of caffeine on stimulation of phosphodiesterase as a mechanism of increase in lipid oxidation, because stimulation of phosphodiesterase causes that intracellular cyclic AMP decreases. Both of these mechanisms lead to long-term stimulating of adrenergic receptors (especially β-adrenergic receptors) and increase intracellular cyclic AMP. Hence, energy and lipid oxidation increases. In this study following eight weeks of continuous aerobic training accompanied with green tea consumption, significant decreases in body weight and BMI observed that are justifiable. In conclusion, it seems that in this study perhaps the amount of green tea consumption and/or period of exercise were not sufficient to significant change in lipid profile of inactive female. Indeed, training indices such as intensity, duration and frequency of training may be effective in the results.

APPLICABLE REMARKS

- It seems that in this study perhaps the amount of green tea consumption and/or period of exercise were not sufficient to significant change in lipid profile of inactive female.

REFERENCES

1. Marinou K., Tousoulis D., Antonopoulos A.S., Stefanadi E., Stefanadis C. (2010). Obesity and cardiovascular disease: From pathophysiology to risk stratifycation. Int J Cardiol;138:3-8.
2. Regitz-Zagrosek V., Lehmkuhl E., Weickert M.O.(2006). Gender differences in themetabolic syndrome and their role for cardiovascular disease. Clin ResCardiol;95:136–147.

3. Sharman, M.J.,Volek, J.S. (2004). Weight loss leads to reductions in inflammatory biomarkers after a very-low-carbohydrate diet and a low-fat diet in overweight men. Clinical Science, 107: 365–369.
4. Weber-Hamann B, Hentschel F, Kniest A et al. (2002). Hypercortisolemic depressionis associated with increased intra-abdominal fat. Psychosom Med; 64:274–277.
5. Gee M., Mahan L.K., Escott-Stump S.(2008). Weightmanagement. In: Mahan LK, Escott-Stump S,editors. Krause's Food & Nutrition Therapy. 12thed. p. 532.
6. Flegal K., Carroll M., Ogden C., Johnson C. (2002). (1999-2000). Prevalence and trends in obesity among US adults, JAMA; 288:1723–7. [PubMed: 12365955]
7. Barry, D., Pietrzak, R. H.,& Petry, N. M. (2008). Gender differences in associations between body mass index and DSM-IV mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Ann Epidemiol, 18(6):458–466. [PubMed: 18329894]
8. Ross, R., Dagnone, D., Jones, P., Smith, H., Paddags, A., Hudson, R., &Janssen, I. (2000). Reduction in obesity and related comorbid conditions afterdiet-induced weight loss or exercise induced weight loss in men, Annals of Internal Medicine, 133, 92.
9. Laaksonen D.E., Atalay M., Niskanen L.K., Mustonen J., Sen C.K., Lakka T.A., Uusitupa M.I. (2000). Aerobic exercise and the lipid profile in type 1 diabetic man: a randomized controlled trial.MedSci Sports Exerc.; 32(9):1541-8.
10. Boutcher S.H., Dunn S.L. (2009). Factors that may impede the weight loss response to exercise-based interventions.Obes Rev; 10:671-80.
11. Keating S.E., Machan E.A., O'Connor H.T., Gerofi J.A., Sainsbury A., Caterson I.D., et al. (2014).Continuous exercise but not high intensity interval training improvesfat distribution in overweight adults. J Obesity,: 834865.
12. Badalzadeh R., Shaghaghi M., Mohammadi M., Dehghan G., Mohammadi Z. (2014).The Effect of Cinnamon Extract and Long-Term Aerobic Training on Heart Function, Biochemical Alterations and Lipid Profile Following Exhaustive Exercise in Male Rats. Adv Pharm Bull.; 4(Suppl 2): 515–520.
13. Mink P.J., Scrafford C.G., Barraj L.M., Harnack L., Hong C.P., Nettleton J.A., Jacobs D.R. Jr. (2007). Flavonoid intake and cardiovascular disease mortality: a prospective study in postmenopausal women. Am J Clin Nutr. 85(3):895-909.
14. Cardoso G.A., Salgado J.M., Castro Cesar M., Donado-Pestana C.M. (2013).The Effects of green tea consumption and resistance training on body composition and resting metabolic rate in overweight or obese women. J Med Food; 16:120-127.
15. Babu P.V., Liu D. (2008). Green tea catechins and cardiovascular health: an update.Curr Med Chem.; 15(18):1840-50.
16. Wolfram S. (2007). Effects of green tea and EGCG on cardiovascular and metabolic health. J Am Coll Nutr. 26(4):373S-388S.
17. Deka A., Vita J.A. (2011). Tea and cardiovascular disease.Pharmacol Res.; 64(2): 136-45.
18. Sone T., Kuriyama S., Nakaya N., Hozawa A., Shimazu T., Nomura K., et al. (2011). Randomized controlled trial for an effect of catechin-enriched green tea consumption on adiponectin and cardiovascular disease risk factors. Food Nutr Res.; 55.
19. Monteiro R., Assuncao M., Andrade J.P., Neves D., Calhau C., Azevedo I. (2008). Chronic green tea consumption decreases body mass, induces aromatase expression and changes proliferation and apoptosis in adult male rat adipose tissue. J Nutr; 138:2156-2163.
20. Chacko S.M., Thambi P.T., Kuttan R., Nishigaki I. (2010). Beneficial effects of green tea: a literature review. Chinese Medicine, 5: 13.
21. Wu L.Y., Juan C.C., Hwang L.S., Hsu Y.P., Ho P.H., Ho L.T. (2004). Green tea supplementation ameliorates insulin resistance and increases glucose transporter IV content in a fructose – fed rat model. European journal of nutrition, 43: PP: 116-124.
22. Yarahmadi H, Haghighi AH, Shojaei M, Beheshti Nasr SM. (2014). Effect of nine weeks of moderate aerobic training on insulin resistance and appetite level in obese women. Quarterly of the Horizon of Medical Sciences; 20(1): 9-15.
23. Haghighi AH, Ildarabadi A, Hamedinia MR. The effect of aerobic training and green tea supplement on serum leptin and insulin resistance in overweight and obese men. Sport Biosciences; 2012, 4(15): 23-43.
24. Kishali N.F. (2011). " Serum leptin level in healthy sedentary young men after a short-term exercise". African journal of pharmacy and pharmacology, 5(4): pp: 522-526.
25. Jurima e J., Hofmann P., Ju rima e T., Maestu J., Purge P., Wonisch M., et al. (2006). " Plasma adiponectin response to sculling exercise at individual anaerobic threshold in college level male rowers". International Journal of Sport Medicine, 27; pp: 272-277.

26. Akbarnejad A., Soori R., Sayah M., Bigdeli M., Ehteram H. (2012). Comparison effect of interval and continues training on some cardiovascular risk factors in young obese women. Olum zisti varzeshi. 9: 77-93.[persian]
27. Abdolmaleki A., Samavati-Sharif M.A., Nikbakht P., Amini R. (2014). Effect of 12 weeks of interval training with low volume and continues training on levels of adiponectin and lipid profile of young obese men. ilaam medical sciences journal. 22(5): 47-59.
28. Sayana K., Zheng L.S., Oguni I. (2000). "Effects of green tea on growth, food utilization and lipid metabolism in mice ". In Vivo (Athens, Greece), 14(4), pp: 481-484.
29. Auvichayapat P., Prapochanung M., Tunkamnerdthai O., Sripanidkulchai B.O., Auvichayapat N., Thinkhamrop B., et al. (2008). "Effectiveness of green tea on weight reduction in obese thais: a randomized, controlled trial". Physiology and Behavior, 93: pp: 486-491.
30. Friedman J.M., Hallas J.L. (1998). " Leptin and the regulation of body weight in mammala ". Nature, 395: pp: 763-770.
31. Nagao T., Hase T., Tokimitsu I. (2007). A green tea extract high in catechins reduces body fat and cardiovascular ricks in humans. Obesity; 15:1473-1483.
32. Maki K.C., Reeves M.S., Farmer M., Yasunaga K., Matsuo N., Katsuragi Y, *et al.* (2009). Green tea catechin consumption enhances exercise-induced abdominal fat loss in over weight and obese adults**.** J Nutr; 139:264-270.
33. Maron D.J., PingLu G., ShengCai N., GuiWu Z., HuaLi Y., Chen H, *et al.* (2003). Cholesterol-lowering effect of a tea flavin enriched green tea extract. Arch Intern Med; 163: 1448-1453.
34. Nagao T., Komine Y., Soga S., Meguro S., Hase T., Tanaka Y., Tokimitsu I. (2005). Ingestion of a tea rich in catechins leads to a reduction in body fat and malondialdehyde-modified LDL in men. Am J Clin Nutr; 81:122-129.
35. Boschmann M., Thielecke F. (2007). The effects of Epigallocatechin-3-gallat on thermogenesis and fat oxidation in obese mem: Apilot study. J Am Coll Nutr; 26:389S-395S.