

The Effect of Eight Weeks of Interval Aerobic Training with Green Tea and Ginger Consumption on Lipid Profiles of Overweight Women

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Received: 12 April 2019

Accepted: 10 June 2019

Published online: 20 July 2019

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Competing interests: The authors declare that no competing interests exist.

Citation: Zalakian Z, Naghibi M. The effect of eight weeks of interval aerobic training with green tea and ginger consumption on lipid profiles of overweight women. Rep Health Care. 2019; 5 (3): 52- 59.

Abstract

Introduction: Obesity is a complex chronic disorder with multifactorial etiology that includes genetics, hormones, diet, age, physical activity and the environment. The purpose of this study was to investigate the effect of 8-weeks of interval aerobic training with green tea and ginger on lipid profiles of overweight women in Behbahan city.

Methods: In this study, 40 overweight women (age: 44.05 ± 9.40 years; weight: 73.77 ± 9.22 kg; height: 1.57 ± 0.05 m, and body mass index: 29.79 ± 3.10 kg / m²) were divided in 4 groups of 10 subjects: 1) control, 2) training, 3) training and supplementation, and 4) supplementation. The subjects participated in the study for 8 weeks and 3 sessions each week, and blood samples were taken to measure the TG, TC, LDL and HDL factors as pre-test and post-test. Paired samples t-test and ANOVA at a significant level of $P \leq 0.05$ was used to examine the difference between the groups and the effect of training and supplementation.

Results: The findings of this study showed that interval aerobic training with supplementation of green tea and ginger has beneficial effects on the lipid profile. Also, contrary to TG ($P=0.17$), TC ($P=0.004$), HDL ($P=0.51$), and LDL ($P=0.02$) in paired samples t-test, were not totally significant between the groups.

Conclusion: Interval aerobic training with green tea and ginger consumption had no statistically significant effects on the lipid profile of overweight women, but interval aerobic training and green tea and ginger consumption, separately or combined can have effects on lipid profile of overweight women.

Keywords: Training, Green Tea, Ginger, Lipid Profile, Overweight Women

Introduction

Obesity is a complex chronic disorder with multifactorial etiology that includes genetics, hormones, diet, age, physical activity and environment (1). Inactive lifestyle and obesity are recognized as one of the ten acute health problems by the World Health Organization (WHO). In obese people, harmful fats such as low density lipoprotein (LDL), total cholesterol (TC) and triglyceride (TG) are more than normal, and since increase in these lipids as well as decrease in high-density lipoprotein (HDL) are among the main risk factors for coronary heart disease in women,

therefore improvement of lipid profiles is important (2). On the other hand, as the age increases, mobility decreases and this causes weight gain and body fat, abdominal fat and deterioration of the fat profile. The metabolism and the amount and type of lipids, in particular blood lipoproteins, play an important role in the incidence and exacerbation of cardiovascular disease (3). Some researchers have determined the association of body fat, especially in the abdomen, with the mortality rate (4). Therefore, considering the disadvantages and risks of obesity, lifestyle modification is recommended as the first line

approach. Most lifestyle interventions include behavioral elements, diet, and physical activity, but evidence suggests that regular exercise reduces cardio metabolic risk independent of dietary intervention. Exercise as a human body constraint can create a negative energy balance and then activate the mechanisms involved in regulating and balancing energy (5). Using different training programs along with variables such as intensity, duration, and cost of training energy can produce different responses in the metabolism of lipids and lipoproteins. Among the trainings, aerobic training includes the type of exercise in which the body uses the oxygen continuously during the training (3). In the interval type, the stages of activity are intermittently accompanied by rest or decreased activity (2). This training results in physiological adaptations such as increased oxidation enzymes, decreased fat tissue, decreased inflammatory factors, increased anabolic hormones (overproduction), increased capillary density, increased mitochondrial numbers, increased maximum oxygen consumption, and cardiovascular function (6). In addition to exercise and physical activity, green tea and ginger as herbal supplementations are also used to reduce body weight and body fat. Green tea contains a significant source of catechins, theaflavins and thearubigins (7). The prevailing hypothesis is that these catechins have an effect on the activity of the sympathetic nervous system (SNS), an increase in energy costs, and an increase in fat oxidation (8). Ginger is also a medicinal plant widely used worldwide as an important herb and traditional plant (9, 10). For many centuries, ginger has been one of the most important components of Chinese, Indian and Greek herbs for the treatment of various diseases (11). Studies have shown that ginger can have effects on the types of disease in patients with hypoglycemic, hypocholesterolemic, and hypolipidemic potential (12). When these effects are combined with beneficial effects of exercise in

suitable sports activities, they may probably have more effects than one of them alone. Moreover, these combinations of trainings and supplementations can have effects on some of the risk factors, such as overweight and WHR (13), among the individuals with liability to disease, and with this method many of their psychophysical problems may be blocked. This study aimed to improve the lipid profile, by investigating the effects of interval aerobic training along with green tea and ginger supplementation, to prevent such diseases as cardiovascular disease that comes after obesity.

Methods

In this study, 40 overweight women (BMI>30) in Behbahan city participated as volunteers. The samples were then randomly assigned into four groups of 10 subjects: control, aerobic training, training with dietary supplement and dietary supplement. The training group performed aerobic training for 8 weeks and three sessions per week. The training with supplementation group, in addition to training, received herbal supplements of ginger and green tea at specified doses. The supplement group only consumed the relevant herbal supplements, and the control group was not included in any training program and did not consume any herbal supplement. 24 hours before and after the 8 weeks of training, (in fasting status) the blood samples of the subjects were recorded for measuring blood factors as pre and post-tests. The training protocol was performed three sessions a week and 45 minutes per session, including 10 minutes of warm up, 30 minutes of running and walking intermittently (400 m running at an intensity of 60-80% of maximum heart rate and walking immediately until the beats were below 50% maximum) and then cooling down was performed for 5 minutes, including stretching and relaxing movements. The intensity of the training gradually increased every two weeks, so that it started at an intensity of 60% of the maximum heart rate in the first two weeks and 5% was added to the

intensity of activity every two weeks, and as a result, in the last two weeks, the intensity of the training reached up to 80% of the maximum heart rate. The formula $(220 - \text{age})$ was used to calculate maximum heart rate (14). In the present study, the supplement group received daily three capsules of green tea supplement, each capsule contained 500 mg before the lunch, dinner and breakfast (15) and also, they consumed three grams of ginger capsule (zinetuma) daily (each capsule contained one gr of ginger along with 250 ml of water before each main meal (12). To measure lipid profiles (TG, HDL, LDL and TC) in mg/dl, *Pars Azmoon* kit, made in Iran, by photo metric manual was used. The mean and standard deviation were used to describe the descriptive data. The Kolmogorov-Smirnov test was used for the normalization of the data, and paired samples t-test was used to assess the difference between the groups, and the effect of the training and the supplementations on the variables was analyzed by the ANOVA, also Scheffe's post hoc test was used to compare the data at the significance level of $P \leq 0.05$.

Results

Descriptive statistics of the subjects in the pre-test and post- test, and the results of the paired samples t-test to determine the effects of training and supplementations on the research variables in the selected groups are presented in Table 1. The results of paired samples t-test showed that the effect of interval aerobic training with supplementation of ginger and green tea (G1) on TC with $t=3.82$ and $P=0.004$, and on LDL with $t=2.71$ and $P=0.02$ is significant, but on the other variables is not significant; The effect of interval aerobic training without supplementation (G2), only on LDL with $t=2.66$ and $P=0.02$ is significant, but on the other variables is not significant; the consumption of supplements without training

(G3) on TG with $t=2.33$ and $P=0.04$, on TC with $t=4.62$ and $P=0.001$, and on LDL with $t=21.40$ and $P=0.001$ is significant, but on HDL is not significant; in the control group (CG), without any training and supplementation, after eight weeks, TG with $t=-4.20$ and $P=0.002$, and TC with $t=-3.35$ and $P=0.008$ were shown to have significant increase, but the effects on the LDL and HDL were not significant. The results of ANOVA to examine the effects of trainings and supplementation on LDL, HDL, TG, and TC of subjects are presented in Table 2. According to Table 2, the results of the ANOVA show that the differences in the groups were not significant, and therefore, interval aerobic training with supplementations cannot have a significant effect on the subjects' variables.

Discussion

The results of this study showed that interval aerobic training with supplementation of green tea and ginger (G1) has a beneficial effects on the lipid profile of subjects, but these effects were not significant, whereas each of the groups during the study showed variations on the some variables, significantly. These findings are consistent with the results of some studies such as (4, 13, 16, 17, 18). In justifying these results, factors such as the low duration and intensity of training can be pointed out. Research in this area suggests that longer trainings, i.e., more than eight weeks, can be more effective. In this regard, more studies that have reported the effectiveness of training have used training programs lasting more than eight weeks, e.g., 12, 16, 20, or 24 weeks (19). Twelve-week-long fitness training program of two alternating styles (low and high impact) has a beneficial effect on overweight young women (20).

Table 1. Results of the paired samples t-test for the effect of training and supplementation on the variables of the research in the selected groups in the pre-test and post-test

Group	Variable	Pre-test	Post-test	t	Sig
Training with supplement	TG (mg/dl)	103.60±19.00	95.30±26.69	1.46	0.17
	TC (mg/dl)	191.70±43.23	171.00±31.93	3.82	0.004
	LDL (mg/dl)	114.90±30.56	100.70±23.71	2.71	0.02
	HDL (mg/dl)	53.00±9.18	52.00±6.92	0.67	0.51
Training without supplement	TG (mg/dl)	137.80±75.46	115.90±48.93	2.21	0.054
	TC (mg/dl)	197.70±54.01	175.20±46.03	2.20	0.055
	LDL (mg/dl)	116.30±41.80	109.30±40.99	2.66	0.02
	HDL (mg/dl)	50.60±11.02	51.00±8.44	0.21	0.83
Supplement without training	TG (mg/dl)	129.80±68.01	110.40±59.33	2.33	0.04
	TC (mg/dl)	201.80±25.46	179.20±23.68	4.62	0.001
	LDL (mg/dl)	126.70±21.15	105.30±20.05	21.40	0.001
	HDL (mg/dl)	51.20±10.81	55.10±10.26	-1.86	0.09
Control	TG (mg/dl)	118.30±33.20	120.90±33.96	-4.20	0.002
	TC (mg/dl)	175.80±17.68	178.90±17.94	-3.35	0.008
	LDL (mg/dl)	106.10±17.67	107.80±16.94	-0.58	0.57
	HDL (mg/dl)	48.30±6.08	46.70±6.00	0.94	0.37

Table 2. Results of ANOVA to examine the effects of trainings and supplementation on the research variables

Variable	Sum of squares	df	Mean of squares	F	Sig	Partial Eta Squared
TG (mg/dl)	1383.07	3	1227.69	0.63	0.60	0.66
TC (mg/dl)	442.67	3	147.55	0.14	0.93	0.01
HDL (mg/dl)	361.40	3	120.46	1.84	0.15	0.13
LDL (mg/dl)	425.07	3	141.69	0.19	0.90	0.01

On the other hand, aerobic and strength trainings will not be so effective on lipid profiles, especially HDL, in people with normal TG levels. In other words, trainings affect mostly the lipid profile of subjects (women) who have higher LDL or TG or lower HDL than the baseline (21). In this study, the results showed that there is little

difference between empirical groups when comparing the TG, TC and LDL levels. These finding is in harmony with some other studies (22, 23, 24). The results of a study indicated that garlic supplementation and exercise training improved all lipid profiles including TG, HDL, LDL, Chol/HDL and VLDL, while the combination of high intensity interval

training and garlic supplement may had a more significant effect on lipid profiles (25). The rate of triglycerides, total and low density lipoprotein cholesterol levels decreased in the three empirical groups of this study (G1, G2 and G3) but it increased in the CG, also, high density lipoprotein levels increased in the empirical groups but decreased in the CG. In a study, Dorota *et al.* (2015) concluded that after 12 weeks, total and low-density lipoprotein cholesterol levels had decreased in the experimental groups, but increased in the control group. High-density lipoprotein cholesterol levels increased in the experimental groups, but decreased in the control group. Plasma triglycerides decreased in the experimental group 1 and increased in the control group (20). This result is in harmony with the same study (26). In the present study, the TG of the participants was normal, and therefore, the index was not significantly changed after training. Also, a number of studies show the effect of volume (27) and the intensity of training on the improvement of lipid profiles. So with increased volume and intensity of training, there is a significant effect on lipid profile improvement (28). Khammassi *et al.*, (2018) observed that following 12 weeks of high intensity interval training, TC and TG decreased significantly, while LDL and HDL cholesterol levels remained unchanged. HIIT may be particularly useful in overweight/obese youth to improve body composition, aerobic fitness and lipid profile (22). On the other hand, the amount of supplementation and low number of research samples are factors that can affect significant changes in TG (1). Also, other reasons for the lack of changes in the serum lipids in the current study can be attributed to the absence of a detailed diet program for all subjects (29). Studies done with regard to further time and speed for trainings and supplementations also show a significant effect on lipid profiles. On the other hand, the catechin in green tea has 20-15% of the weight of green tea that has a hypocholesterolemic property (4) and reduces

intestinal absorption of cholesterol (6), which can be a potential cause of the effect of green tea on lipids. In a study, too little EGCG absorption in green tea has been mentioned as the reason for the lack of significant changes in TG (4). On the other hand, in aerobic activities, it is expected that, during this activity, fatty acids will be used as the main fuel by the muscle and it will reduce body fat. Therefore, considering that aerobic training was used in this study, the reason for the reduction of lipid profile can be attributed to aerobic training. This finding has opposite to results of some studies such as Zolfaghari *et al.* (2013) who compared the effects of green tea extract, aerobic training and their combination on CRP levels in obese women. The results of their study indicated that the body composition including weight, BMI, and fat percentage in the groups did not decrease significantly (13). On the other hand, one of the effects of green tea consumption is its anti-obesity role. The prevailing hypothesis is that catechins into the green tea have an effect on the activity of the sympathetic nervous system (SNS), an increase in energy costs, and an increase in fat oxidation (27). Kannon *et al.* (2014) concluded that post- exercise revealed significant reduction in the LDL-C. With the high intensity exercise group. There was a significant difference in BMI and lipid profile in both the moderate and high intensity exercise. High intermittent intensity can be considered for individuals who have time constraints and lead a sedentary life style and moderate intensity exercise advised for individuals who are willing to create time for their health benefits. A programmed protocol of exercise will help in the reduction of lipid parameters (3). In addition to green tea, ginger also has a fat-oxidizing effect and is used as a supplement to weight loss (28, 29, 30 and 31). Therefore, considering the known effects of ginger and green tea supplements on fat burning and weight loss, the reduction of the TG,TC and LDL can be justified. The results of Soleimani *et al.* (2019) showed that consumption of 10 weeks of ginger

supplement after aerobic exercise training on TG, LDL, TC and HDL in obese women had a significant impact (16).

Conclusion

As a whole, the findings of this study showed that eight weeks of interval aerobic training with supplementation of green tea and ginger have not been effective on lipid profiles including triglyceride, total cholesterol and low density and high density lipoprotein, while, each of these methods alone, without comparing with other methods in this study, have significant effects on lipid profiles.

Ethical issues

Not applicable.

Authors' contribution

All authors equally contributed to the writing and revision of this paper.

Acknowledgments

Thanks and appreciations are offered to all colleagues and researchers who helped the researchers with this article.

References

- Lee H, Lee IS, Choue R. Obesity, inflammation and diet. *Pediatr Gastroenterol Hepatol Nutr.* 2013; 16 (3): 143- 152.
- Okura T, Nakata Y, Tanaka K. Effect of exercise intensity on physical fitness and risk factors for coronary heart disease. *Obes Res.* 2012; 11 (9): 1131- 1139.
- Kannan U, Vasudevan K, Balasubramaniam K, Yerrabelli D, Shanmugavel K, Ashok John N. Effect of exercise intensity on lipid profile in sedentary obese adults. *J Clin Diagn Res.* 2014; 8 (7): BC08- BC10.
- Haghighi OH, Eslami Nik A, Hamedinia M. The effect of eight weeks of aerobic training and green tea consumption with moderate and high doses on body composition and lipid profiles of overweight and obese women. *Mashhad Med Univ Sci J.* 2015; 58 (7): 359- 369.
- Geetanjali B, Swa S, Pradeep N, Savita V. Effect of menopause on lipid profile in relation to body mass index. *J Chron Young Sci.* 2014; 5 (1): 8.
- Kriketos AD, Gan SK, Poynten AM, Furler SM, Chisholm DJ, Campbell LV. Exercise increase adiponectin levels and insulin sensitivity in humans. *Diabet Care.* 2007; 27: 629- 630.
- Marandi SM, Ghadiri N, Abadi B, Esfarjani F, Mojtahedi H, Ghasemi G. Effects of intensity of aerobics on body composition and blood lipid profile in obese/overweight females. *Int J Prev Med.* 2013; 4 (1): 118- 125.
- Rains TM, Agarwal S, Maki KC. Antiobesity effects of green tea catechins: A mechanistic review. *J Nutr Biochem.* 2011; 22(1): 1-7.
- Isa Y, Miyakawa Y, Yanagisawa M, Goto T, Kang MS, Kawada T, et al. 6-Shogaol and 6-gingerol, the pungent of ginger, inhibit TNF- α mediated downregulation of adiponectin expression via different mechanisms in 3T3-L1 adipocytes. *Biochem Biophysical Res Com.* 2008; 373: 429- 34.
- Zhou Hl, Deng YM, Xie QM. The modulatory effects of the volatile oil of ginger on the cellular immune response in vitro and in vivo in mice. *J Ethnopharmacol.* 2006; 105: 301- 5.
- Badreldin HA, Gerald B, Musbah O, Nemmar A. Some phytochemical pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): A review of recent research. *Food Chem Toxicol.* 2008; 46: 409- 420.
- Atashak S, Ja'fari A, Azarbaijani MA. The effects of long-term resistance trainings on the levels of adiponectin and lipid profile of obese men. *Razi J Med Sci.* 2011; 18 (86): 1- 11.
- Zolfaghari M, Taghian F, Hedayati M. Comparison of the effects of three methods of using green tea extract, aerobic

- training and their combination on the level of CRP in obese women. *Razi J Med Sci.* 2013; 110 (20): 21- 28.
14. Yosefi A, Abedi B, Sayyah M. Effect of eight weeks of aerobic training with Moqlenjan supplementation on lipid profile and glycemic indices of overweight men. *Rep Health Care.* 2017; 3 (3): 71- 80.
 15. Abedi B, Pour Fakhimi Abarghouie G, Ghadami A, Amini Rarani S. The effect of resistance training and supplementation of green tea on the lipid profile and insulin resistance in obese and overweight men. *J Suppl Med.* 2017; 1: 176- 177.
 16. Soleimani A, Khosravi A, Asadi E. The effect of ten weeks ginger consumption on lipid profile and body composition in obese women following the exercise Pilates. *Tehran Univ Med J.* 2019; 77 (3): 193- 198.
 17. Souri R, Hasani Ranjbar Sh, Wahhabi K, Shabkhiz F. The effect of aerobic training on serum (RBP4) and insulin resistance index in type 2 diabetes. *Iranian J Diabetes Lipid Dis.* 2011; 3 (10): 388- 397.
 18. Atashak S, Rashidi S. Effect of eight-week high-intensity interval training and ginger supplementation on primary dysmenorrhea in nonathletic female students. *IJOGL.* 2018; 20 (12): 23- 31.
 19. Strasser B, Siebert U, Schobersberger W. Resistance training in the treatment of the metabolic syndrome: A systematic review and meta-analysis of the effect of resistance training on metabolic clustering in patients with abnormal glucose metabolism. *Sport Med.* 2010; 40 (19): 397- 415.
 20. Dorota KN, Robert N, Zbigniew J, Aleksandra Z, Marta B, Izabela DK, et al. Effect of 12-week-long aerobic training programme on body composition, aerobic capacity, complete blood count and blood lipid profile among young women *J. Biochemia Medica.* 2015; 25 (1): 103- 113.
 21. Olson TP, Dangel DR, Leon AS, Schmitz KH. Changes in inflammatory biomarkers following one-year of moderate resistance training in overweight women. *Int J Obes (Lond).* 2007; 31: 996- 1003.
 22. Khammassi M, Ouerghi N, Hadj-Taieb S, Feki M, Thivel D, Bouassida A. Impact of a 12-week high-intensity interval training without caloric restriction on body composition and lipid profile in sedentary healthy overweight/obese youth. *J Exerc Rehabil.* 2018; 14 (1): 118- 125.
 23. Nayebifar S, Esmaeil Afzalpour ME, Kazemi T, Abtahi Eivary SH, Mogharnasi M. The effect of a 10-week high-intensity interval training and ginger consumption on inflammatory indices contributing to atherosclerosis in overweight women. *J Res Med Sci.* 2016; 21: 116.
 24. Taravati T, Irandoust K, Rahimi AR. The effects of 8 weeks high intensity interval training (hiit) with garlic complement On some lipid profiles in obese inactive women. *Acta Medica Mediterranea.* 2017; 33: 271- 274.
 25. Sedaghat H, Fattahi Bafghi A, Emami A. The effect of combined exercise training course with curcumin supplementation on lipid profiles of inactive middle- aged men. *I J Diabetes Obes.* 2018; 10 (2): 61- 66.
 26. Hosseini Kakhak SA, Alizadeh H, Nemati M, Hamedinia MR. The effect of combined aerobic-resistance training on lipid profiles and liver enzymes in patients with non-alcoholic fatty liver under diet. *Sports J Physiol.* 2015; 27: 65- 84.
 27. Rabei SZ, Salesi M. The effect of 8 weeks aerobic exercise training on cardiovascular risk factors in men with type 2 diabetes mellitus. *Rep Health Care.* 2015; 1 (3): 99- 103.
 28. Ramezanpour M, Matboo M, Hejazi SM. The effect of four weeks of aerobic training and L-Carnitine supplementation on serum lipid profile and blood glucose in diabetic men. *J School Med Mashhad Univ Med Sci.* 2015; 58 (6): 321- 321.
 29. Fukino Y, Shimbo M, Aoki N, Okubo T, Iso H, Ikeda A, et al. Randomized

- controlled trial for an effect of green tea-extract powder supplementation on glucose abnormalities. *European J Clin Nutr.* 2008; 62 (8): 953- 960.
30. Basu A, Du M, Sanchez K, Leyva MJ, Betts NM, Blevins S, et al. Green tea minimally effects biomarkers of inflammation in obese subjects with metabolic syndrome. *J Nut.* 2011; 27: 206- 213.
31. Aghaei F, Shadmehri S, Pirbeygi Darvishvand Z. The effect of aerobic training with green coffee on body composition and lipid profile in overweight women. *Rep Health Care.* 2018; 4 (2): 38- 46.