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Research Article

A study of the effects of concurrent training and buttermilk consumption on lipid profile and blood pressure in girls

Masoumeh Hosseini*[1], Mohammadreza Goshtasbi[1], Roya Zohrabi [1], Payam Esmaelian[1]

1. Department of Physical Education and Sport Sciences, East Tehran Branch, Islamic Azad University, Tehran, Iran.

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Abstract

Background: The aim of this study was to investigate the effect of concurrent training and buttermilk consumption on lipid profile and blood pressure in girls.

Materials and Methods: In this semi-experimental study, 40 overweight non-athletic students aged 18 to 25 years were selected as the research sample. Subjects were randomly divided into 4 groups: concurrent training, buttermilk consumption, concurrent training + buttermilk and control. The subjects did resistance + aerobic exercise three times a week for 8 weeks. Buttermilk groups consumed 300 ml buttermilk for 8 weeks and 3 meals a day.

Results: The results showed that concurrent training and buttermilk consumption has a significant effect on reducing waist circumference, systolic and diastolic blood pressure, low-density protein, triglycerides and a significant increase in high-density protein in overweight girls, p≤0.05.

Conclusion: Concurrent training can improve lipid profile indicators. Buttermilk can be a suitable facilitator to increase the effectiveness of these training

Keywords:
concurrent training, buttermilk, lipid profile.

***Corresponding author:** Masoumeh Hossieni
Address: Department of Exercise Physiology and Sport Sciences, East Tehran Branch, Islamic Azad University, Tehran, Iran.
Email: mhbisadi@yahoo.com **Tell**: +982133584011
M H: 0000-0001-8457-1924

1. Introduction

Excessive weight increases the risk of coronary heart disease, elevated blood triglycerides, type 2 diabetes, bone and joint inflammation, sleep disorders, and nutritional disorders. (1). Reducing physical activity and increasing calorie intake are among the most contributing factors to obesity (2). With the increase in visceral adipose tissue, free fatty acids derived from adipose tissue move to the liver. On the other hand, the increase in abdominal subcutaneous fat brings lipolysis products into the blood circulation and prevents liver metabolism (3). The main risk factors for coronary heart disease in women include increased LDL, total cholesterol and decreased HDL (4) levels. Obese people have harmful fats such as total cholesterol, LDL and triglycerides that are more than normal. These fats are deposited in the vein walls and cause blockage of the arteries and narrowing of the veins. This results in high blood pressure. How fat is distributed in the body, compared to body mass index, plays a more decisive role in identifying the risk of diseases (3 و۱). People with more fat accumulation in the abdominal area are at higher risk of high blood pressure and cardiovascular diseases (1). The World Health Organization has announced at least 30 minutes of moderate-intensity physical activity per day, at least 5 days per week, to maintain health and prevent non-communicable diseases because it decreases the risk of metabolic syndrome by reducing abdominal obesity and leading to a decrease in blood pressure systole and diastole (5). By creating neural adaptations, resistance exercises cause more and larger motor units to be called and increase the activity of the main moving muscles. Aerobic exercises cause capillary supply, improve muscles' oxidative metabolism capacity by increasing myoglobin reserves and improve mitochondria efficiency by changes in activity of oxidation enzymes (6). Fermented drinks are composed of beneficial probiotic bacteria. They also reduce food intake and blood triglyceride, cholesterol, and leptin levels, and stimulate energy metabolism and improve blood HDL levels (7). These bacteria are called "probiotics" and the yeasts present in them are capable of making folic acid, which is a coenzyme that is a set of vital reactions for cell growth and is rich in group B vitamins, calcium, amino acids and folic acid, and a small percentage of fat and lactose (8). Although this effect has not been confirmed in some studies (9). This study explained the effect of concurrent training and buttermilk consumption on lipid profi

2. Materials and Methods

The statistical population of the current research was overweight non-athletic female students with an age range of 18 to 25 years with a body mass index of 25-30 kg/m2 who had not engaged in any regular exercise program at least six months before participating in the research exercise program. Forty people were selected as the research sample. After explaining the purpose of the research and the working method, by taking the BMI and medical examination of the volunteers, first, the necessary information about how to conduct the research was given to the subjects, and by means of a questionnaire, information was obtained about the level of physical activity and health of the subjects and the consent form for participating in the test was presented to the subjects. The subjects were randomly divided into 4 concurrent training group (10 people), buttermilk consumption group (10 people), concurrent training + buttermilk group (10 people) and control group (10 people).

Before starting the research, anthropometric parameters (height, weight, waist circumference, body fat percentage) and blood pressure were evaluated. To measure weight and height, a SICA model manufactured in Germany was used. To assess blood pressure, an Omron digital sphygmomanometer manufactured in Japan was utilized. Body mass index was calculated based on body weight by height (kg/m^2) (2). Waist circumference was determined by a tape measure (2). A South Korean body composition 720 machine was used to measure body fat. In order to determine the levels of low-density and high-density proteins and triglycerides in the subjects, Parsian Company kits made in Iran were used. It was recommended to avoid any heavy physical activity and consumption of alcohol, drugs, supplements and medicines during the implementation of the test protocol. Instead, they should follow the usual diet. To check the biochemical variables, 24 hours before the start of the exercises in a fasting and sitting position, 5 ml of blood was taken from the vein of the right hand of each subject at 8 am by a laboratory specialist. After this stage, the subjects were influenced by independent variables for eight weeks. 48 hours after the last session of the research protocol, all subjects were again measured as in the first stage and blood was taken. Subjects in the buttermilk consumption group consumed 300 ml of buttermilk 3 times a day for 8 weeks (10).

Exercise protocol

The subjects performed three concurrent training sessions (resistance training + aerobic training) every week for 8 weeks. First, they warmed up and stretched for 10 minutes. Resistance training with weight included chest press movements, side band stretching, leg press, and hip flexion and extension with an intensity of 60-70% 1RM. In order to comply with the overload principle, at the end of every two weeks, the 1RM test was taken from the subjects again. The intensity of the program for the next two weeks was determined for each subject based on 60-70% of the new 1RM. After completing resistance training and with a 10-minute rest interval, aerobic training including jogging and running was performed. Heart rate was monitored using a polar heart rate monitor. In order to comply with the overload principle, one minute was added to training time every week. This was done so that in the final weeks, the training time reached 19 minutes (Table 1) (11).

Table 1: training protocol

Resistance training	First and second week	third and fourth week	fifth and sixth week	seventh and eighth week
Turn	2 turns (8 to 11 repetitions)	2 turns (8 to 11 repetitions)	2 turns (8 to 11 repetitions)	2 turns (8 to 11repetitions)
Rest between each turn	90 seconds	90 seconds	90 seconds	90 seconds
Rest between each exercise	3 minutes	3 minutes	3 minutes	3 minutes
aerobic training				
Time	12to13 minutes	14 to 15 minutes	16 to 17 minutes	18to 19 minutes
Distance	600-–1300 meters	1300-1700 meters	1700-1900 meters	1900-2300 meters
Intensity	60-65% heart rate reserve	60-65% heart rate reserve	60-65% heart rate reserve	60-65% heart rate reserve

Statistical analysis

The normal distribution of the data was checked by the Kolmogorov-Smirnov test and the homogeneity of variance was checked by the Levine test. Covariance statistical tests and Tukey's post-hoc test were used. All statistical analyses were performed at a significance level of $p \leq 0.05$.

3. Results

The characteristics of the subjects are presented in Table *2*.

Table 2: Statistical description of subjects' characteristics according to centrality and dispersion indices

Index group*		**height (cm)**	**age (years)**	**weight (kg)**	**Body mass index (kg.m^2)**
control	pre-test post-test	۸۲,۱±۱۶۲	۶,۲±۴۵,۲۱	73.۰۳,۲±۶۴ 74.۰۲,۲±۴۱	26.±۷۵..۴۶ 94.26±..۴۸
buttermilk	pre-test post-test	۱۶۰±۰۷,۱	21.۴5±1.3	75.36۸۸,۱± 74.۹۱,۱±۰۵	27.±۰۸..۷۰۶ 26.±۶۵..۶۶
Exercise	pre-test post-test	۱۶۲±۳۵,۱	۳±۱۸,۲۱.45	78.۷,۱±۲۷ 76.۱۶,۲±۶۸	27.±۶..۷۵ 2.26±..۷۰۳
Exercise + buttermilk	pre-test post-test	۱۶۱±۷۵,۱	±۸۱,۲۲2.۰۶	76.۰۱,۲±۳۴ 72.۷۸,۱±۶۰	06.27±..۳۳ 25.±۹۹..۴۲

Table 3: Research variables in four groups

Index group*		waist circumference (cm)	blood pressure (diastole cmHg)	blood pressure (systole cmHg)	LDL (mg.dl)	HDL (mg.dl)	Triglyceride (mg.dl)
control	pre-test post-test	10.±٨٠1.٢٣ 7 10.±٩٠1.82 8	8.1±63.0 8.3±42.0	12.3±..56 12.4±..13	110.4±2.٧ 111.8±3.3	49.4±3.٣٨ 49.2±3.٧5	129±3.32 130.±٤5.6
buttermilk	pre-test post-test	110.4±1.٤8 103±5.1٨	8.6±0.٤1 8.2±0.20	12.2±6.1 11.8±21.1	109±3.4 107 ±2.19	50.±١٦8.2 52.±٦٦3.2	125±6.5 122±7.8
exercise	pre-test post-test	113±2.7 102.1±3.6	8.2±0.4 7.7±0.1	12.7±1.١2 12.1±0.٧٢	108±3.2 102±2.4	52.6±8.1٤ 55.2±2.٥9	128.4±7 123±6.٧2
Exercise + buttermilk	pre-test post-test	112.5±1.٠٩ 86.2±4.٢٠	8.5±0.٢3 7.6±0.١٣	12.92±25.1 11.8±0.٤٨	112±2.١٠ 103±2.٦1	51.1±3.٥٣ 55.3±2.٥٧	129±7.4 121±9.6

4. Discussion

Based on the obtained results, concurrent exercise and buttermilk consumption had a significant reducing effect on the waist of overweight girls. This result was consistent with Lu et al (2013) and Kaduka et al (2010) (12, 13). Concurrent exercises with moderate intensity even without diet can improve the indicators of lipid profile. These exercises improve performance due to neural adaptations, delay fatigue and enable people to perform at higher levels of performance, which leads to increased energy consumption (14). Fat increases in training muscles and the density of beta-adrenergic receptors increases at the cellular level of fat tissue, leading to an increase in its sensitivity to lipolysis. In these exercises, the activity of the lipoprotein lipase enzyme and the capacity of beta oxidation of fat in the muscle increases, the important effect of which is the increase in the share of fat and as a result, the proportional decrease in the share of glucose in providing energy (15). On the other hand, buttermilk's high protein content increases metabolic activity. It helps people stay fuller for longer and improves energy expenditure. Buttermilk contains vitamin K, calcium and probiotics. These three useful elements help to increase metabolic activity, shrink fat cells and cleanse the body of excess weight and toxins (16). However, our results were inconsistent with Safari et al (2019) (17). These researchers showed that buttermilk supplement and aerobic exercise did not significantly affect waist circumference. It is possible that the difference in the subjects and the intensity of the exercises and the use of combined exercise in the present study is the reason for the difference in the reported results. Other results of the present study showed that systolic and diastolic blood pressure decreased significantly after concurrent exercise + buttermilk consumption, which is in line with the results of Omidi et al (2017), Bayat et al (2018) ,Marvin et al (2018)(18, 19, 20).

High blood pressure in overweight and obese people is often caused by increased peripheral vessel resistance and stiffness (18). It seems that regular physical activity as a non-pharmacological agent can improve hypertension. By increasing blood flow, aerobic activity increases the stress level (stimulator of nitric oxide production) in blood vessels and if the endothelium is healthy, it leads to dilation of blood vessels, which ultimately results in blood pressure reduction. In addition, exercise may be effective in restoring endothelial function and lowering blood pressure. This is done by modulating other risk factors, such as lowering cholesterol, lowering blood sugar and reducing hyperinsulinemia, which play an active role in hypertension (19). The results of the study by Kay and Ni (2020) showed that milk fermented with Lactobacillus strains may reduce blood pressure. In addition, the consumption of probiotics can lead to an increase in vitamin D levels, which helps prevent high blood pressure (21). Lewis et al.'s studies (2020) showed that probiotics and their products can moderate blood pressure by decreasing LDL levels, controlling blood sugar and decreasing insulin resistance (22). However, the obtained results are inconsistent with Sarmadian et al (2015) (23). It seems that the intensity of the exercises and the age of the subjects affected the results.Other results of the current research showed that concurrent exercise and buttermilk consumption caused a significant decrease in low-density protein and triglyceride levels and increased increase in high-density protein in overweight girls. The results obtained are in line with Porzangneh et al(1400)(24) and inconsistent with Sarmadian et al(2015)(23). In Sarmadian et al study, no significant difference was found in body composition variables and levels of triglycerides, total cholesterol, HDL-C, and LDL-C after the implementation of the exercise program.

The reason for this discrepancy may be the low intensity of the exercises or the initial levels of lipid variables. Physical activities affect the lipid profile according to its initial values. Exercise duration is another important factor. In concurrent exercises, muscle mass is used more and the effect on HDL is more effective than usual exercises (24). Physical activity increases adiponectin, AMPK, LPL, insulin resistance and serum triglycerides. One of the key sources of energy during aerobic and combined activity is serum triglycerides. (25). Adiponectin is a peptide that improves metabolic factors, but its amount decreases in people with metabolic syndrome. Physical activity depletes ATP reserves and causes AMP condensation. Increasing the amount of AMP resulting in the activity of AMPK. This can stimulate the oxidation of fatty acids in the liver and skeletal muscles, stop cholesterol synthesis, and stimulate the breakdown of triglycerides. During inactivity, lipoprotein lipase activity decreases and HDL levels decline by 20% compared to the active state (24, 25). Muscle LPL increase after short-term physical activity and its effect on reducing dyslipidemia and arteriosclerosis have been widely reported (26).

Conclusion

The results of the present study showed that concurrent training can improve the lipid profile. At the same time, buttermilk consumption can be a suitable facilitator to increase the effectiveness of these trainings and reach the desired and expected level.

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Compliance with ethical standards

Conflict of interest None declared.

Ethical approval the research was conducted with regard to the ethical principles.

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: M.H, M.G, R.Z, P.E ; Methodology: M.H, M.G, R.Z, P.E; Software: M.H, M.G, R.Z, P.E; Validation: M.H, M.G, R.Z, P.E ;Formal analysis: M.H, M.G, R.Z, P.E ;Investigation: M.H, M.G, R.Z, P.E; Resources: M.H, M.G, R.Z, P.E ;Data curation: M.H, M.G, R.Z, P.E ; Writing - original draft: M.H, M.G, R.Z, P.E; Writing - review & editing: M.H, M.G, R.Z, P.E; Visualization: M.H, M.G, R.Z, P.E; Supervision: M.H, M.G, R.Z, P.E ;Project administration: M.H, M.G, R.Z, P.E; Funding acquisition: M.H, M.G, R.Z, P.E.

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