VOLUME 10 (SPECIAL ISSUE 2) 2024

ISSN 2454 - 3055

Manuscripts under Special Issue are published under the theme "Modern Aspects of Applied Biology"

Guest Editor: Dr. S. Mohanasundaram

Department of Biochemistry and Crop Physiology, SRM College of Agricultural Sceices, SRM Institute of Science and Technolgy, Tamil Nadu, India

Assistant Guest Editors: Dr. Sunil Alphonse

Government College of Physical Education, Khozikode, Kerala, India

Dr. K. Geetha

Meenakshi Academy of Higher Education and Research, Kanchipuram, India

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 10 (Special Issue 2), 98-104 (2024)

International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Influence of Specific Circuit Training with External Resistance using Bulgarian Bag on Selected Components of Blood Lipid Profiles of Kabaddi Players

Nithin B.S., Ram Mohan Singh R.* and Abhijith M.

Department of Physical Education and Sports, Pondicherry University, Puducherry, India

**Corresponding Author*

Received: 14th September, 2024; **Accepted:** 5th October, 2024; **Published online:** 27th November, 2024

https://doi.org/10.33745/ijzi.2024.v10ispl2.017

Abstract: Bulgarian Bag Circuit Training (BBCT) offers players the opportunity to boost their strength and power at the same time to improve performance. Yet, it remains unclear whether athletes participating in BBCT can trigger favourable alterations in serum lipid profiles parameters. This study evaluated the influence of Bulgarian Bag Circuit Training (BBCT) on specific elements of blood lipid profiles among collegiate kabaddi players. Thirty collegiate kabaddi players (age: 20.77 ± 1.73 years, weight = 72.29 ± 6.06 kg, height = 174.00 ± 4.90 cm, BMI = 23.87 ±1.74 kg/m^2) were divided into two groups: intervention group BBCT (n = 15) and control group CLT (n = 15). The control group continued regular game practice, while the intervention group underwent specific training programmed BBCT. Blood lipid profiles including high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), triglycerides (TG), and total cholesterol (TC) were analysed before and after a 12-week training period. Paired sample t-tests demonstrated significant within-group differences in both the BBCT and CLT groups' lipid profiles after the 12-week training period ($p < 0.05$). In the CLT group, LDL levels decreased by approximately 1.24%, TC levels by 0.77%, and TG levels by 1.29%, with HDL levels increasing by approximately 2.57%. Conversely, athletes in the BBCT group exhibited more pronounced improvements, with LDL levels decreasing by approximately 3.59%, TC levels by 3.47%, and TG levels by 3.94%, while HDL levels increased by approximately 7.92%. The present study suggests that BBCT intervention significantly influences players blood lipid profiles, eliciting favourable changes in LDL, HDL, TG, and TC levels. Incorporating BBCT into training regimens may offer a promising approach to enhancing metabolic health and optimizing performance outcomes in kabaddi players.

Keywords: Bulgarian Bag Circuit Training, Blood lipid profiles, Kabaddi, Resistance Training

Citation: Nithin B.S., Ram Mohan Singh R. and Abhijith M.: Influence of Specific Circuit Training with external resistance using Bulgarian Bag on selected components of blood lipid profiles of kabaddi players. Intern. J. Zool. Invest. 10(Special Issue 2): 98-104, 2024.
https://doi.org/10.33745/ijzi.2024.v10ispl2.017

This is an Open Access Article licensed under a Creative Commons License: Attribution 4.0 International (CC-BY). It allows unrestricted use of articles in any medium, reproduction and distribution by providing adequate credit to the author (s) and the source of publication.

Introduction

In recent years, the integration of innovative training modalities into players' conditioning programs has gained considerable attention among sports scientists and coaches. One such

modality, circuit training with external resistance using the "Bulgarian Bag," has emerged as a promising approach to enhance players' physical fitness across various domains. The Bulgarian Bag, a crescent-shaped tool filled with sand or other materials, offers unique advantages for functional training, dynamic movements, and multidirectional exercises, making it particularly appealing for players seeking to enhance their athletic performance (Sung *et al*., 2017).

Kabaddi, a traditional sport with origins in India, demands a unique blend of physical attributes, including strength, speed, agility, endurance, and mental toughness. Given the dynamic nature of kabaddi gameplay, players require training regimens that not only develop their physical qualities but also enhance metabolic health and respiratory function. Circuit training with the Bulgarian Bag presents a viable training modality that targets multiple components of physical fitness while simulating the dynamic movements and functional challenges encountered during kabaddi matches (Singh and Gehlot, 2019).

Bulgarian bag expert Steve Nave regards this fitness tool as cutting-edge, emphasizing its dynamic nature and ability to mimic natural human movements. With its crescent shape and versatile handles, the Bulgarian bag enables a wide range of multidirectional movements and rotational exercises (Bidi *et al*., 2019). Its design facilitates fluid transitions between exercises, making it ideal for circuit training protocols emphasizing strength and cardiovascular conditioning. This unique functionality engages all planes of movement under load, enhancing power generation and neurological coordination. By incorporating Bulgarian Bag circuit training into kabaddi conditioning programs, coaches can optimize performance outcomes while addressing metabolic health and cardiovascular fitness (Afsin *et al*., 2021)

Despite the widespread use of circuit training with the Bulgarian Bag in players' conditioning, research specifically addressing its effects on players' blood lipid profiles, including HDL, LDL, TC, and TG, remains limited. Therefore, this study aims to fill this gap by investigating the influence of kabaddi-specific circuit training incorporating external resistance in the form of a Bulgarian Bag on specific aspects of players' blood lipid profiles.

By examining the impact of Bulgarian Bag circuit training on LDL, HDL, TG, and TC levels, this research seeks to provide evidence-based insights into the potential benefits of this training modality for players' cardiovascular health and metabolic function. Drawing upon principles of exercise physiology and lipid metabolism, this study aims to contribute valuable knowledge to the field of sports science and players performance optimization (Braith and Stewart, 2006).

Materials and Methods

This study involved thirty male kabaddi players, aged between 18-24 years, who had been actively participating in training and competitive events for more than the past five years. Participants were selected from the pool of players at SRM Institute of Science and Technology and randomly assigned to two groups: BBCT (n = 15) and CLT (n = 15). After receiving detailed information about the study's purpose and potential risks, all participants voluntarily consented to take part in the research (Demirel *et al*., 2018). Before the experiment, participants completed written informed consent forms. It is important to note that no acute or chronic sickness was found in any of the subjects. Ethical approval for the research was obtained from the Institutional Ethical Committee (Human Studies) under reference number HEC/PU/2023/07/07-08-2023 on August 7th, 2023.

Participants conducted tests intended to evaluate certain elements of their blood lipid profiles, such as HDL, LDL, TC, and TG, to gauge the effectiveness of the training program (Duca *et al*., 2020). These examinations were conducted before and after a twelve-week training cycle for both the experimental and control groups.

Table 1: Methodological Framework of the kabaddi specific circuit training Program Training Protocol

Number of Circuits	3
Exercises in Each Circuit	3 - 6
Repetitions	12 - 18
Pace of Exercises	Moderate and Fast
Interval Duration Between Circuits	2 min

Participants arrived at the laboratory between 7:00 AM and 9:00 AM on the test day, following a fasting period of 10-12 h overnight. After 15 min of rest in a seated position, venous blood samples were collected from the antecubital vein using appropriate vacutainers. Laboratory analysis of total cholesterol and triglycerides was performed using enzymatic methods, while HDL was analyzed through direct assay with a selective inhibition method. LDL analysis was conducted using a heparin and citrate precipitation method (Facey *et al*., 2016). These analyses were carried out at the laboratory department of SRM Medical College, Chennai, India.

Training protocol for the experimental group (BBCT)

The Bulgarian Bag circuit training program was meticulously crafted to cater to the dynamic demands and specific movements inherent in the sport of kabaddi. Tailored to the unique requirements of kabaddi gameplay, this training regimen was strategically devised to prepare athletes for upcoming championships. The experimental training with Bulgarian Bag aimed to shape HDL, LDL, TC and TG (Koh and Miller, 2013). Methodological guidelines of the kabaddi specific training are presented in Table 1.

Subjects participated in kabaddi specific training three times a week, for twelve weeks. Each training session lasted 60 min and was composed of four basic stages:

1. Warm up with functional movements and bodyweight exercises.
2. Specific circuit training involving the Bulgarian Bag performed at a high intensity.
3. Specific circuit training with the Bulgarian Bag conducted at a moderate intensity.
4. Cool-down phase incorporating stretching exercises and relaxation techniques post-training.

Training protocol for the control group (CLT)

The Participants assigned to the CLT group did not undergo any specific training program, but instead, they practiced the regular game as part of their usual activities.

Statistical Analysis

The data were subjected to descriptive statistical analysis, including calculation of means and standard deviations (SD). A sample size of thirty participants was deemed appropriate for the study design. Statistical analyses were performed using IBM SPSS Statistics software (Version 26). Normality of the variables' distributions was assessed using the Shapiro-Wilk test (Suel, 2013). Baseline group differences were evaluated using independent sample t-tests. Intervention effects were assessed through paired sample t-tests within each group, focusing on lipid profile parameters such as HDL, LDL, TC and TG. The significance level was set at $P = 0.05$.

Results

The study recruited thirty male subjects (age: 20.77 ± 1.73 years, height = 174.00 ± 4.90 cm,

Table 2: Comparison of Lipid Profile Parameters at Baseline pre-evaluation the Twelve-Week Training Cycle Using Independent t-Test

Lipid Profiles Parameter (Measuring unit)	Group	Pre-training Evaluations		t- Value	P- Value
		MI	SD		
HDL (mg/dl)	E	45.53	4.20	3.05	0.672
	C	44.07	3.55		
LDL (mg/dl)	E	96.87	4.85	0.845	0.974
	C	96.20	5.69		
TC (mg/dl)	E	174.27	11.43	1.06	0.888
	C	173.47	10.86		
TG (mg/dl)	E	109.80	11.59	0.415	0.261
	C	108.67	12.67		

The data are presented as mean values along with their corresponding standard deviations. *P < 0.05 indicates a significant difference between pre-training evaluations within the same group. HDL (high-density lipoprotein), LDL (low-density lipoprotein), TC (total cholesterol), TG (triglyceride), E (Experimental group), C (Control group).

Table 3: Paired t-tests conducted to analyse individual lipid profile parameters pre- and post the twelve-week training cycle

Lipid Profiles Parameter (Measuring unit)	Group	Pre-training Evaluations		Post-training Evaluations		t-Student test for dependent group	
		M_I	SD	M_{II}	SD	t- Value	P
HDL (mg/dl)	E	45.53	4.20	49.13	3.64	8.12	.000
	C	44.07	3.55	45.20	3.40	.14	.005
LDL (mg/dl)	E	96.87	4.85	93.40	5.18	4.02	.001
	C	96.20	5.69	95.00	5.19	4.14	.000
TC (mg/dl)	E	174.27	11.43	168.20	9.59	6.68	.000
	C	173.47	10.86	172.13	10.58	2.55	.023
TG (mg/dl)	E	109.80	11.59	105.47	10.75	7.89	.000
	C	108.67	12.67	107.27	12.90	5.13	.000

The data are presented as mean values along with their corresponding standard deviations. *P < 0.05 indicates a significant difference between pre- and post-training evaluations within the same group. HDL (high-density lipoprotein), LDL (low-density lipoprotein), TC (total cholesterol), TG (triglyceride), E (Experimental group), C (Control group).

weight = 72.29±6.06 kg, BMI = 23.87±1.74 kg/m^2) who underwent the pre- and post-tests before and after a twelve-week training. The lipid profile of all the participants was assessed. The players from both BBCT and CLT groups, had similar demographic characteristics. Table 2 shows independent t-Test baseline parameters between trained and control group before training. There

were no significant differences with respect to lipid profile parameters such as HDL, LDL, TC and TG. Average HDL level of BBCT group and CLT group is 45.53 mg/dl and 44.07 mg/dl, average LDL level of BBCT group and CLT group is 96.87 mg/dl and 96.20 mg/dl, average TC level of BBCT group and CLT group is 174.27 mg/dl and 173.47 mg/dl, and the TG level of BBCT group and CLT group is 109.80 mg/dl and 108.67 mg/dl, respectively. All the p value is greater than 0.05 (p=1.03, 0.345, 0.196 and 0.256> 0.05). The output of independent t test result showed that there is no significant difference between these two groups. The lipid profile of BBCT group (n=15) and CLT group (n=15) were similar before training.

Table 3 illustrates output of paired sample t-test, the mean of pre- and post-training values for the HDL, LDL, TC and TG of BBCT and CLT groups. There were statistically significant differences in pre- and post-training values in the CLT group (p=0.005, 0.0001, 0.023, 0.0001 > 0.05). There were statistically significant differences between pre- and post-training values of all lipid profiles parameters in the training group (p= < 0.05). In CLT group LDL (before intervention = 96.20, after intervention = 95) decreased, TG (before intervention = 108.67, after intervention = 107.27) decreased and TC (before intervention = 173.47, after intervention = 172.13) decreased and HDL (before intervention = 44.07, after intervention = 45.20) increased. In the BBCT group, all of the Blood Lipid Profile's investigated components indicated statistically significant changes in the players who used Bulgarian Bag Circuit Training. LDL (before intervention = 96.87, after intervention = 93.40), decreased, TG (before intervention = 109.80, after intervention = 105.47) decreased, and TC (before intervention = 174.27, after intervention = 168.20) decreased and HDL (before intervention = 45.53, after intervention = 49.13), increased with BBCT training. The experimental group demonstrated significant improvements in their lipid profiles after training compared to the CLT group. Specifically, the BBCT group showed a 7.10% increase in HDL levels, 3.76% decrease in LDL levels, 3.81% decrease in total cholesterol levels, and 3.81% decrease in triglyceride levels.

Discussion

The findings of this study indicate the influence of kabaddi specific training utilizing BBCT on selected components of players blood lipid profiles. Before the commencement of the twelve-week training cycle, there were no significant differences observed between the BBCT and CLT groups regarding lipid profile parameters such as LDL, HDL, TC, and TG. This suggests that both groups had similar baseline lipid profiles, ensuring a balanced comparison of the intervention's effects.

Studies have indicated that players require a significant exercise stimulus and energy expenditure to improve their lipid profile (Braith and Stewart, 2006). In our study, we used a Bulgarian bag circuit training protocol, upon completion of the training program, significant improvements were observed in both the BBCT and CLT groups' lipid profiles. In the control group pre- and post-test statistically,significant reductions were noted in LDL, TC, and TG levels, accompanied by a significant increase in HDL levels. LDL levels decreased by approximately 1.24%, TC levels decreased by approximately 0.77%, and TG levels decreased by approximately 1.29%. Moreover, HDL levels increased by approximately 2.57%.These changes indicate favourable alterations in lipid metabolism and cardiovascular health, possibly attributed to the regular physical activity inherent in kabaddi training.

Notably, players participating in BBCT exhibited even more pronounced improvements in their pre- and post-test lipid profiles. In the BBCT group, significant improvements were observed in LDL, TC, and TG levels, coupled with a substantial increase in HDL levels. Specifically, LDL levels decreased by approximately 3.59%, TC levels decreased by approximately 3.47%, and TG

levels decreased by approximately 3.94%. Additionally, HDL levels increased by approximately 7.92%. Specifically, BBCT resulted in significant decreases in LDL, TC, and TG levels, coupled with a substantial increase in HDL levels. These findings suggest that the incorporation of external resistance training with the Bulgarian Bag induced greater metabolic adaptations, leading to enhanced lipid metabolism and cardiovascular health among kabaddi players.

The experimental group demonstrated a rise in HDL levels, along with a reduction in LDL, total cholesterol and triglyceride levels. Our findings are consistent with prior research on strength training, which has indicated an elevation in HDL levels without significant effects on other blood lipid parameters such as total cholesterol, LDL and triglycerides (Bidi *et al*., 2019). However, studies by Demirel *et al*. (2018) in high-intensity intermittent training revealed a decrease in TC and LDL levels by approximately 2%, along with increased HDL cholesterol levels in the training groups. Similarly, Süel (2013), Koh and Miller (2013), and Afşin *et al*. (2021) found that exercise interventions led to reductions in TC, TG, and LDL levels, while concurrently elevating HDL values among participants. The results from these studies support findings of the present study.

Facey *et al.* (2016) evaluated the fasting serum lipid concentrations among male Jamaican track and field athletes. Their findings indicated that non-athletic individuals exhibited notably higher levels of TC and LDL compared to the athletes. However, there were no significant disparities observed in HDL and TG levels between the two groups. These results imply a potential association between physical activity, lipid profiles, and muscle thickness in young adult males. The observed improvements in lipid profiles following BBCT can be attributed to several factors. First, the dynamic nature of Bulgarian Bag exercises engages multiple muscle groups simultaneously, eliciting a greater metabolic demand and promoting lipid oxidation. Second, the circuit training format of BBCT allows for high-intensity, interval-based workouts, known to enhance cardiovascular fitness and metabolic efficiency. Finally, the progressive overload inherent in the twelve-week training program likely contributed to physiological adaptations, including improved lipid profile parameters. Lipid profiles are intricately linked to Kabaddi performance through their influence on energy metabolism, cardiovascular health, training adaptations, body composition, and recovery processes. Implementing training strategies like BBCT that target metabolic pathways and enhance lipid metabolism can contribute to improved athletic performance and overall health outcomes in Kabaddi players.

Conclusion

In conclusion, the findings of this study demonstrated the beneficial effects of kabaddi specific circuit training with external resistance in the form of Bulgarian Bag on selected components of players blood lipid profiles. Athletes who participated in BBCT exhibited significant improvements in LDL, TC, TG, and HDL levels, indicative of enhanced lipid metabolism and cardiovascular health. These outcomes underscore the potential of BBCT as an effective training modality for optimizing lipid profiles and promoting cardiovascular health among kabaddi players. Incorporating BBCT into training regimens may serve as a valuable strategy for improving metabolic health and reducing the risk of cardiovascular diseases in athletic populations.

Future research should focus on elucidating the underlying mechanisms driving the observed improvements in lipid profiles following BBCT, as well as exploring the long-term effects of this training modality on overall health and performance outcomes in kabaddi athletes. Additionally, comparative studies investigating the efficacy of BBCT versus other resistance training modalities would provide valuable insights into the optimal training strategies for enhancing lipid metabolism and cardiovascular health in players populations.

References

Afşin A, Bozyllan E, Asoğlu R, Yavuz F and Dündar A. (2021) Effects of eight weeks exercise training on serum levels of adropin in male volleyball players. Hormone Molec Biol Clin Invest. 42(3): 297-302.

Bidi BZ, Ahnoun ZOS, Akim HH and Abka ZOT. (2019) Antioxidant status and oxidative stress. J Strength Conditioning Res. 33(6); 2400-2409.

Braith RW and Stewart KJ. (2006) Resistance exercise training: Its role in the prevention of cardiovascular disease. Circulation 113(22): 2642-2650.

Demirel N, Özbay S and Kaya F. (2018) the effects of aerobic and anaerobic training programs applied to elite wrestlers on Body Mass Index (BMI) and blood lipids. J Education Training Stud. 6(4): 58.

Duca M, Trecroci A, Perri E, Formenti D and Alberti G. (2020) Kinematics and kinetics of Bulgarian-bag-overloaded sprints in young athletes. Life 10(11): 1-11.

Facey A, Dilworth L and Irving R. (2016) The impact of serum lipid profile on muscle size in male Jamaican track and field athletes. 4(1): 20-25.

Koh Y and Miller J. (2013) Power-based resistance training reduced serum oxidized low-density lipoprotein in athletes. Int J Sports Sci. 2(5): 61-67.

Singh S and Gehlot S. (2019) Effect of circuit training and yogasanas on cardiovascular endurance, inspiratory capacity and forced vital capacity among sports person with special reference to prakriti. J Natural Remedies 19(3): 139-145.

Suel E. (2013) A comparison of blood lipid levels in athletes in various branches and sedentary university students. World Appl Sci J. 26(2): 262-266.

Sung YC, Liao YH, Chen CY, Chen YL and Chou CC. (2017) Acute changes in blood lipid profiles and metabolic risk factors in collegiate elite taekwondo athletes after short-term de-training: A prospective insight for athletic health management. Lipids Health Disease 16(1): 1-10.