Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2018/117

Original Article

Acute Effect of Extreme Sports on Serum Lipids

Ozturk Agirbas[1], Eser Aggon[2], Anthony C Hackney[3]

[1]Assistant Professor, Department of Coaching Education, College of Physical Education and Sports, Bayburt University, Bayburt, Turkey, [2]Assistant Professor, Department of Physical Education and Sports Teaching, College of Physical Education and Sports, Erzincan University, Erzincan, Turkey, [3]Professor, Department of Exercise and Sport Science, University of North Carolina, Chapel Hill, North Carolina, USA

Abstract

Purpose: The aim of this study is to determine the effect of rafting and paragliding exercises by sedentary males on serum lipids.

Material and Methods: 17 male rafters and 10 male paragliders volunteers (non-smoker, no known history of cardiovascular disease, body mass index <25 kg/m^2, and no intake of prescription medications) participated in the study. Participants had blood samples taken a day before and after rafting and paragliding practices. Data were analyzed by Wilcoxon and Mann–Whitney U tests.

Results: Significant decreases occurred for the low-density lipoprotein (LDL)/very low-density lipoprotein (VLDL) ratio in the rafting group after the exercise; though, there was no significant difference in serum lipids parameters of the paraglide group after the exercise.

Conclusion: While acute rafting and paragliding exercises have similar effects on TG and HDL, effect on LDL / VLDL ratio is different.

Key words: Exercise, Lipid, Paragliding, Rafting

INTRODUCTION

Rafting and paragliding are extreme sports that people participate in both for competition and entertainment purposes. According to Willig, rafting and paragliding can be among some of the most extreme sports activities.[1] While Williams and Soutar and Buckley referred that rafting is a challenging activity of adventure tourism, on the other hand,[2,3] Hinch and Higham and Roberts defined it as an extreme activity for sporting adventure.[4,5] Rafting is a group activity, in which four to eight people participate and single-winged paddles and inflatable boats are used.[6] As the level of challenge increases in rafting activities, more mental and physical concentration is required.[7]

Paragliding is the flight of pilots with a special made seat. The basic equipment can be listed as a parachute, a seat, and a spare parachute.[8] According to Mekinc and Mušič, paragliding is a kind of sport that is both exciting and competitive.[9]

Lipids have different derivatives according to their structures and functions. Tryglicerides are esters formed by the molecular fatty acid with glycerol.[10] These are neutral fats synthesized from carbohydrates and stored in the fat tissue. Lipids in foods state in the form of TG. In the small intestine epidermis and fat cells, fatty acids bind glycerol and combine to form TGs. Cholesterol is sterol, which is either a free or an esterified form. Free cholesterol is a component of the cell membrane; esterified cholesterol is usually locates in the serum and states in atheromatous plaques.[11,12]

Cholesterol is an organic substance placed in human and animal tissues and cells, also used in the synthesis of Vitamin D synthesis, calcium and phosphorus, building blocks of cell membranes, bile acids, and sex hormones.[13] High-density lipoprotein (HDL), which is synthesized by both the liver and small intestine and is responsible for cholesterol transport from tissues to the liver, contains 50% protein, 20% cholesterol, 5% TG, and 25% phospholipid.[10] Low-density lipoprotein (LDL) contains 20% protein, 50% cholesterol, 5% TG, and 25% phospholipid.[14] The

Access this article online

www.ijss-sn.com

Month of Submission : 02-2018
Month of Peer Review : 03-2018
Month of Acceptance : 04-2018
Month of Publishing : 05-2018

Corresponding Author: Dr. Ozturk Agirbas, Bayburt University, College of Physical Education and Sports, Bayburt, Turkey. Phone: +90 458 211 1153. E-mail: ozturkagirbas@bayburt.edu.tr

task of LDL is to carry cholesterol from the liver to the peripheral tissues and regulates cholesterol synthesis again in this region.[10] The lipoprotein with very LDL (VLDL) contains 5% protein, 30% cholesterol, 55% TG, and 10% phospholipid. They are synthesized from the liver and contain TGs that are synthesized from circulating fatty acids or carbohydrates. VLDL also contains significant amounts of cholesterol and cholesterol esters. Once the VLDL is combined in the liver, it becomes LDL in fat tissue and muscles.[10,15]

Intensity and duration of exercises effective on reducing body weight since it will be crucial to promote lipid activity and usage of active muscles. Thus, it is important to address the effects on lipid oxidation and lipolysis in relation to its intensity and duration of acute exercise.[16] It showed an increase in lipolysis and it oxidation by the active muscles during an acute aerobic exercise.[17] In addition, fatty acids are essential energy substrates during endurance exercise. Acute endurance exercise is associated with skeletal muscle lipid remodeling and neutral lipid storage during recovery.[18] This study aimed to determine the acute effects of rafting and paragliding on serum lipids and to compare the effects of these two sport activities.

MATERIALS AND METHODS

Subject

A total of 17 rafting and 10 paragliding participants ($n = 27$) were physically active men volunteered to participate in the study. They were not experienced in rafting and parachuting practice before the study. The rafting group demographics were: Age = 22.24 ± 3.07; height = 179.65 ± 6.61; weight = 73.59 ± 7.77; and body mass index (BMI) = 22.8 ± 1.99 and paragliding groups, age = 28.2 ± 10.28; height = 176.0 ± 8.19; weight = 76.8 ± 16.12; and BMI = 24.66 ± 3.93. The inclusion criteria were: Non-smoker, no known history of cardiovascular disease, BMI <30 kg/m^2, and no intake of prescription medication or antioxidant supplements. All participants completed written inform consent.

Exercise Protocols

The participants were given basic rafting and paragliding technical and safety trainings before the study (2 weeks - 5 days per week). The paragliding took placed and occurred by flying from a slope at an altitude of 1500 m. The rafting took place in the river with a rapid difficulty rating of 2+1 at an altitude of 1150 meters. Both rafting and paragliding exercises were standardized at a duration of 20 min.

Blood Samples Analyze

Participant blood samples were taken for each rafting and paragliding practices' a day before at 09:00 AM (pre) and immediately 15 min after practices' at (post) at 09:00 AM. All blood samples were drawn in ethylenediaminetetraacetic acid-treated tubes and placed on ice until processing. Whole blood aliquot samples were analyzed for hematocrit and hemoglobin. Remaining sample aliquots were centrifuged at 4°C for 15 min at 3000 rpm (Centra-8R IEC, MA). Subsequently, the samples were analyzed by COBAS 600 (Roche) brand autoanalyzer for lipid profiles.

Statistical Analysis

Statistically, analysis was performed with SPSS 22.0. The data set was found to not be normally distributed; therefore, we used the Wilcoxon test to compare intragroup values and Mann–Whitney U test to compare intergroup values.

RESULTS

There was a significant increase in the LDL/VLDL ratio, but no significant difference in TG and HDL after rafting exercises and there was no difference in TG, HDL, or the LDL/VLDL ratio after paragliding exercises [Table 1].

DISCUSSION

Exercise is a factor that brings about different physiological effects in acute and chronic periods, especially according to severity of activity. Lipid is an energy source, at the same time, as it has many structural functions in the body. Specifically, during the long period exercises, there may be differences in the relative lipid concentrations in the blood due to the production of energy from the TGs. Our study was conducted to determine the acute effect of rafting and paragliding exercises, which are among the extreme sports, on blood lipid profiles.

We found out that there were no statistically significant changes in TG values, even though decreases were observed after both the rafting and paragliding exercises ($P > 0.05$; Table 1). These findings agree with the literature as similar studies report that some exercise practices do not result in any changes in the TG levels.[19-23] Contrastingly, there are some studies detecting that the acute exercises decreased the TG levels. Magkos *et al*. reported that TG levels decreased significantly after the acute endurance exercises.[24] Turgut *et al*. reported that TG values decreased significantly after acute swimming exercise among females.[25]

There were no significant changes in HDL after either rafting or paragliding [Table 1]. Some researchers reported no significant difference in HDL values after acute endurance and resistance exercises.[23] McClean *et al*. reported in their study, in which they formed the control and exercise groups including healthy males loaded with

Table 1: The results of Wilcoxon test for TG, HDL, and LDL/VLDL before and after rafting and paragliding exercises

Serum lipids	Measurement	*n*	Mean rank	Median	Z	*P*	*n*	Mean rank	Median	Z	*P*
TG (mmol/L)	Before exercise	17	8.92	17.64	−0.750	0.453	10	5.00	20.22	−0.674	−0.500
	After exercise	17	8.25	17.39			10	2.50	20.48		
HDL (mmol/L)	Before exercise	17	9.40	0.36	−0.828	0.407	10	2.00	0.34	−1.483	−0.138
	After exercise	17	8.43	0.34			10	3.25	0.34		
LDL/VLDL (ratio)	Before exercise	17	10.81	1.44	−3.031	0.002*	10	4.25	1.47	−0.271	−0.786
	After exercise	17	3.13	1.37			10	2.17	1.45		

*P<0.05; a: Statistically significant different from baseline. TGs: Triglycerides, HDL: High-density lipoprotein, LDL: Low-density lipoprotein, VLDL: Very low-density lipoprotein

high fatty food, that there were no meaningful differences between the groups in their HDL levels after the moderate acute exercises after 2 h from feeding time, according to the repeated measurement times as 2 and 4 h; however, in the measurements carried after the 3rd h, the HDL values of those who did exercises were meaningfully higher.[26] Turgut *et al*. reported that HDL values increased significantly after acute swimming exercise among females.[25] Valimaki *et al*. in athletes, who do intermittent and continuous running exercise, found that oxidation of HDL concentrations increased acutely in both types of exercise, claimed that these results enhanced the transport of lipid oxidation products by HDL in acute exercises, but the sporting history or the genetic makeup of the athletes could change these acute responses.[27]

Meaningful decreases in the LDL/VLDL ratio occurred after rafting only [Table 1]. This finding may occurred because rafting exercise may have required more muscular use than paragliding. To bring out the acute effects of exercise on the lipid profile, it can be thought that either the duration or the intensity of the exercise needs to be increased.[28,29]

Regular exercise affects lipid metabolism, changes plasma lipid and lipoprotein levels - in a positive fashion and reduces the risk of atherosclerosis. However, these effects on the lipoproteins from exercise depend on the sex, body weight, body fat distribution, sports activity, duration, and intensity of exercise, and whether the exercise has effect on weight loss or not.[29] It reported that there was no difference in VLDL-TG concentrations after acute endurance exercises in some research.[23,24] Findings of McClean *et al*. revealed no significant difference in LDL levels between the groups after moderate acute exercise 2 h after feeding.[26] Medlow *et al*. referred that the acute exercise might increase the sensitivity of LDL.[30] Lira *et al*. claimed that the acute resistance exercise might cause changes in lipid profile at specific density and lipid profile might indicate that low- and medium-intensity exercises may have been more useful than high-intensity exercises rafting and paragliding are high intensity exercises as they are extreme sports.[31] Due to the high-intensity nature of these sports, the results of Lira *et al*. supported our present research findings.

CONCLUSION

- The paragliding does not have any significant effect on the blood lipid profiles,
- Rafting exercises are only effective at LDL/VLDL ratio.

ACKNOWLEDGMENTS AND GRANT SUPPORT

The study was financed by Erzincan University Scientific Research Projects Coordination Unit (Project No: 2014/4501) and approved by Erzincan University Ethics Committee (2015-03/02). This study was published as Oral Presentation in 4. The International Balkan Conference in Sport Sciences, 21–23 May 2017, Bursa, TURKEY.

We would like to thank to Gurcan Ekinci (Rafting Instructor) and Ali Zaimoglu (Paragliding Instructor), all the participants and staff of laboratory who supported the research.

REFERENCES

1. Willig CA. Phenomenological ınvestigation of the experience of taking part in extreme sports'. J Health Psychol 2008;13:690-702.
2. Williams P, Soutar GN. Close to the "edge": Critical issues of adventure tourism operators. Asia Pac J Tour Res 2005;10:247-61.
3. Buckley R. Adventure Tourism. Wallingford: CABI; 2006.
4. Hinch TD, Higham JE. Sport tourism: A framework for research. Int J Tour Res 2001;3:45-58.
5. Roberts C. Sport and adventure tourism. In: Robinson P, Heitmann S, Dieke PU. editors. Research Themes for Tourism. United Kingdom: CABI; 2011. p. 146-59.
6. Wilson I, McDermott H, Munir F, Hogervorst E. Injuries, ill-health and fatalities in white water rafting and white water paddling. Sports Med 2013;43:65-75.
7. Wu CH, Liang RD. The relationship between white-water rafting experience formation and customer reaction: A flow theory perspective. Tour Manage 2011;32:317-25.
8. Kaniamos P. Paragliding: Priročnik in Vodič za letenje z Jadralnim Padalom. Jastrebarsko: Pintardesign; 2008.
9. Mekinc J, Mušič K. Elements of safety in paragliding. Ann Kinesiol 2016;7:67-80.
10. Peker İ, Ciloglu F, Buruk S, Bulca Z. Exercise Biochemistry and Obesity.

1st ed. Istanbul: Nobel Medicine Bookstore, Tayf Offset; 2000. p. 99-118.
11. Erden IM. Biochemistry. Anadolu University, Open Teaching Publications. Eskisehir, Turkey 1996;218:42.
12. Laker MF. Clinical Biochemistry for Medical Students. London: W.B. Sounders Company; 1996.
13. Sieber R. Cholesterol removal from animal food can ıt be justified? Food Sci Tech 1993;26:375-87.
14. Duman C, Erden BF. Short comment of biochemical laboratory data for primary health care. STED 2004;13:256-60.
15. Miles S. Weight control and exercise. Clin Sport Med 1991;10:157-69.
16. Jabbour G, Iancu HD. Acute and chronic exercises: Effect on lipid metabolisms in obese individuals. Sci Sports 2017;32:321-6.
17. de Glisezinski I, Moro C, Pillard F, Marion-Latard F, Harant I, Meste M, *et al*. Aerobic training improves exercise-induced lipolysis in SCAT and lipid utilization in overweight men. Am J Physiol Endocrinol Metab 2003;285:E984-90.
18. Bosma M. Lipid homeostasis in exercise. Drug Discov Today 2014;19:1019- 23.
19. Colakoglu F, Senel O. The effects of 8 weeks aerobic exercise program on body composition and blood lipids of middle aged sedentary females. Spormetre 2003;1:57-61.
20. Ugras A, Savas S. Effects of aerobıc exercıses on some physiologıcal characteristics and blood lipids. Kastamonu Educ J 2004;12:293-302.
21. Lakka HM, Tremblay A, Després JP, Bouchard C. Effects of long-term negative energy balance with exercise on plasma lipid and lipoprotein levels in identical twins. Atherosclerosis 2004;172:127-33.
22. Buyukyazi G, Ulman C, Taneli F, Aksoy D, Tikiz H. Effects of Walking on Serum Lipids, MMP-9 and TIMP-1 in Post-Menopausal Women. 10th International Sport Congress. Bolu, Turkey; 2008.
23. Magkos F, Tsekouras YE, Prentzas KI, Basioukas KN, Matsama SG, Yanni AE, *et al*. Acute exercise-induced changes in basal VLDL-triglyceride kinetics leading to hypotriglyceridemia manifest more readily after resistance than endurance exercise. J Appl Physiol (1985) 2008;105:1228- 36.
24. Magkos F, Wright DC, Patterson BW, Mohammed BS, Mittendorfer B. Lipid metabolism response to a single, prolonged bout of endurance exercise in healthy young men. Am J Physiol Endocrinol Metab 2006;290:E355-62.
25. Turgut M, Cinar V, Akbulut T, Kilic Y. Effect of acute exercıse on lıpıd levels of woman. Euro J Phys Educ Sport Sci 2017;3:412-18.
26. McClean CC, Mc Laughlin MJ, Burke G, Murphy MH, Trinick T, Duly E, *et al*. The effect of acute aerobic exercise on pulse wave velocity and oxidative stress following postprandial hypertriglyceridemia in healthy men. Eur J Appl Physiol 2007;100:225-34.
27. Valimaki IA, Vuorimaa T, Ahotupa M, Vasankari T. Effect of continuous and ıntermittent exercises on oxidised HDL and LDL lipids in runners. Int J Sports Med 2016;37:1103-9.
28. Crouse SF, O'Brien BC, Rohack JJ, Lowe RC, Green JS, Tolson H, Reed JL. Changes in serum lipids and apoproteins after exercise in men with high cholesterol: İnfuence of intensity. J Appl Physiol 1995;79:279-86.
29. Kim JR, Oberman A, Setcher GF, Lee JY. Effect of exercise intensity and frequency on lipid levels in man with coronary heart disease: Training level comparison Trial. Am J Cardiol 2001;87:942-6.
30. Medlow P, McEneny J, Murphy MH, Trinick T, Duly E, Davison GW, *et al*. Lipoprotein subfraction oxidation in acute exercise and ageing. Free Radic Res 2016;50:345-53.
31. Lira FS, Yamashita AS, Uchida MC, Zanchi NE, Gualano B, Martins E Jr, *et al*. Low and moderate, rather than high intensity strength exercise induces benefit regarding plasma lipid profile. Diabetol Metab Syndr 2010;2:31.

How to cite this article: Agirbas O, Aggon E, Hackney AC. Acute Effect of Extreme Sports on Serum Lipids. Int J Sci Stud 2018;6(1):78-81.

Source of Support: Nil, **Conflict of Interest:** None declared.