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Original article

COMPARISON OF CARDIOVASCULAR RESPONSES DURING THE ULTIMATE GAME IN SEDENTARY YOUNG PEOPLE

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Abstract

Aim. The aim of the present study is to comparatively examine the cardiovascular response in sedentary young people of both genders during a 20-minute recreational game of Ultimate Frisbee.

Methods. The research methods used in this paper were: scientific documentation, direct observation, mathematical statistics (non-parametric Mann-Whitney statistical test), and graphical method.

Results. Application of the Mann-Whitney test highlights that there are no significant differences between the results achieved by the young people of both genders at the significance level $p > 0.05$ for each analyzed parameter (maximum heart rate, average heart rate, time zone 1, etc.).

Conclusions. Cardiovascular response monitoring during physical activity is essential in detecting overexertion; although played for leisure, the data recorded with the help of Polar H10 chest straps revealed intense activity for both genders, also highlighting that the Ultimate Frisbee game is suitable young people with good physical fitness.

Keywords: Ultimate Frisbee game, cardiovascular response, heart rate monitor.

Introduction

Systematic physical activity is the key to overall well-being and a basic factor in the prevention and management of mental health problems, but also in the prevention of non-communicable diseases (NCDs) such as cardiovascular disease, type 2 diabetes and various cancers.

The recommendation of the World Health Organization (WHO, 2020) for adults aged 18-65 years is a minimum of 150-300 minutes of moderate-intensity aerobic physical activity per week or at least 75-150 minutes of vigorous-intensity aerobic physical activity or an equivalent combination of the two; for additional health benefits, at least two muscle-strengthening workouts per week are recommended, which involve all major muscle groups.

Cardiovascular response during physical activity is an important indicator of physical fitness status and therefore quality of life, knowing that a good fitness level involves a high energy level, which can support a balanced private and professional life, as well as better physical and emotional health.

The variability of cardiovascular response, blood pressure and peripheral vascular resistance is regulated by the autonomic nervous system (ANS), and the balance between its two component nervous systems is responsible for appropriate cardiovascular responses both at rest and during exercise (Silverman & Deuster, 2014). These cardiovascular responses are also modulated by the status of the individual fitness level (Dos Santos et al., 2019).

Heart rate (HR) monitoring is imperative because it provides information based on which exercise parameters can be adjusted, thus preventing health damage in untrained people or those aged over 40. For field HR monitoring, chest straps are the most commonly used due to their accuracy, which is comparable to that of the electrocardiogram (ECG). (Ge et al., 2016)

Ultimate Frisbee is a team game originating in the United States, in 1896; it is currently played in over 100 countries and is governed by the "Spirit of the Game" (Braneț et al., 2022), which places the responsibility of fair play on every player and guides all of them in this self-refereed sport (Madueno et al., 2017).

Direction changes, jumps and sprints are present in both the offensive and defensive phases to prevent the loss of points, the effort being comparable to other team sports such as football and rugby (Bangsbo, 1994; King et al., 2009). Ultimate Frisbee is a sport requiring high-intensity training that stimulates the glycolytic pathway (Kajiki et al., 2021).

During game play, athletes achieved average HR and maximum HR values of 82 ± 2% and 99 ± 1%, respectively, of maximum heart rate, given that Ultimate Frisbee is an intense intermittent team sport with a high cardiovascular load and clear signs of fatigue towards the end of each half (Krustrup & Mohr, 2015).

Objectives

1. Identification of the four 4 sedentary volunteers who participated in the Ultimate Frisbee teaching workshops held as part of the "United Through European Traditional Sports" project during 2021-2022, in order to carry out the research.

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2. Monitoring the effort made during a 20-minute game of Ultimate Frisbee with the help of Polar H10 chest straps.

Methods

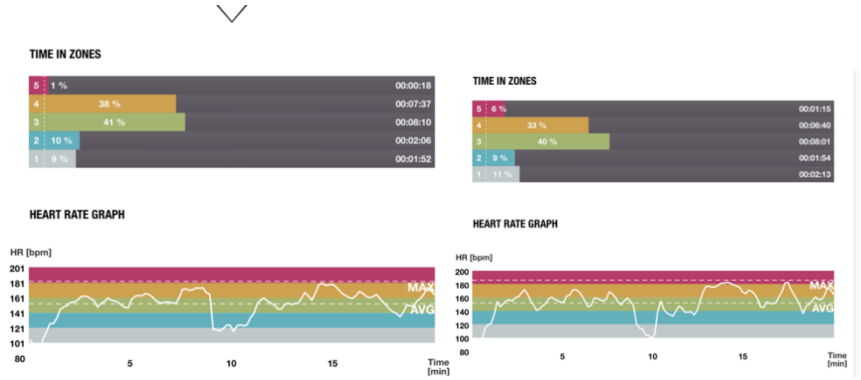
The research methods used in this paper were: scientific documentation, direct observation, mathematical statistics (non-parametric Mann-Whitney statistical test), and graphical method.

Participants

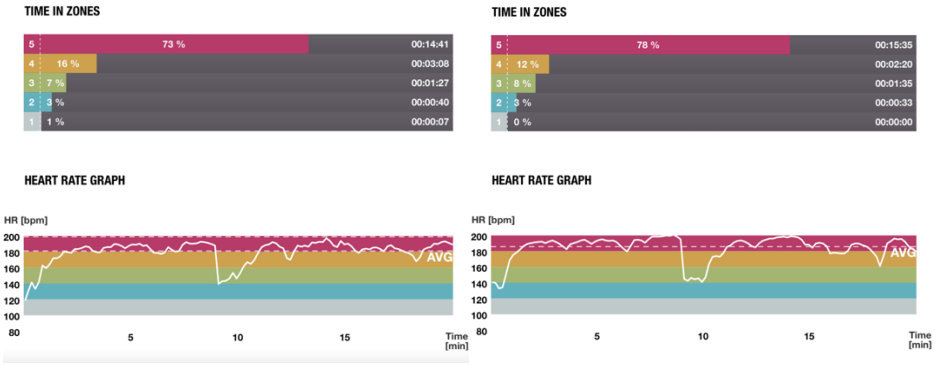
The present research was conducted at the end of May 2022, and the participants were monitored during a 20-minute game of Ultimate Frisbee played on the synthetic field of the POLITEHNICA Bucharest National University of Science and Technology. The 4 volunteers (2 girls and 2 boys) were young people who did not meet the WHO recommendation regarding weekly physical activity and who were divided into two groups according to gender in order to make a comparison of their cardiovascular responses during the recreational Ultimate Frisbee game play.

All participants were healthy at the time of the research; they were informed about the conduct and specifics of the investigation, and the measurements complied with the ethical standards of the Declaration of Helsinki.

Results



Graph 1. Cardiovascular response in the 2 sedentary young women (Group B)



Graph 2. Cardiovascular response in the 2 sedentary young men (Group A)

Table 1. Data recorded for the 4 subjects using Polar H10 chest straps

					GROUP B									
♂ Subjects	ZONE 1		ZONE 2		ZONE 3		ZONE 4		ZONE 5		HR AVG		HR MAX	
	Time	%	Time	%	Time	%	Time	%	Time	%	Time	%	bpm	%
D.G.	01:52	9	02:06	10	08:10	41	07:37	38	00:18	1	152	76	182	91
G.I.	02:13	11	01:54	9	08:01	40	06:40	33	01:15	6	152	76	186	93
					GROUP A									
♀ Subjects	ZONE 1		ZONE 2		ZONE 3		ZONE 4		ZONE 5		HR AVG		HR MAX	
	Time	%	Time	%	Time	%	Time	%	Time	%	Time	%	bpm	%
O.C.	00:07	1	00:40	3	01:27	7	03:08	16	14:41	73	181	91	199	100
S.C.	00:00	0	00:33	3	01:35	8	02:20	12	15:35	78	186	93	203	102

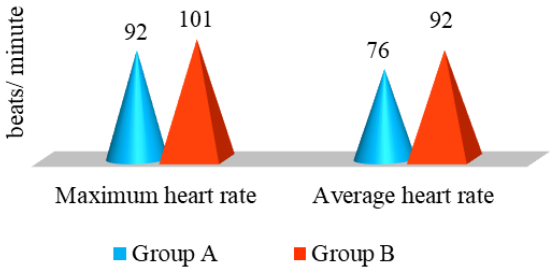
Note: **HR MAX**=maximum heart rate; **Hr AVG =** average heart rate, ZONE 1-5 = five heart rate zones

Table 2. Statistical indicators recorded for the 2 groups with the help of Polar H10 chest straps

ANALYZED PARAMETERS	Statistical indicators		Mann-Whitney test		
	Mean ± std. dev.	Coefficient of variation	Average ranks	Z	P
Maximum heart rate (beats/min)					
Group A	92.0 ± 1.4	1.5%	1.50	-1.549	0.121
Group B	101.0 ± 1.4	1.4%	3.50		
Average heart rate (beats/min)					
Group A	76.0 ± 0.0	0.0%	1.50	-1.633	0.102
Group B	92.0 ± 1.4	1.5%	3.50		
Time zone 1 (%)					
Group A	10.0 ± 1.4	14.1%	3.50	-1.549	0.121
Group B	0.5 ± 0.0	141.4%	1.50		
Time zone 2 (%)					
Group A	9.5 ± 0.7	7.4%	3.50	-1.633	0.102
Group B	3.0 ± 0.0	0.0%	1.50		
Time zone 3 (%)					
Group A	40.5 ± 0.7	1.7%	3.50	-1.549	0.121
Group B	7.5 ± 0.7	9.4%	1.50		
Time zone 4 (%)					
Group A	35.5 ± 3.5	10.0%	3.50	-1.549	0.121
Group B	14.0 ± 2.8	20.2%	1.50		
Time zone 5 (%)					
Group A	3.5 ± 3.5	101.0%	1.50		
Group B	75.5 ± 3.5	4.7%	3.50	-1.549	0.121
Group B	229.0 ± 5.7	2.5%	1.50		

Table 2 shows the main component indicators of descriptive statistics, namely mean, standard deviation and coefficient of variation. These statistical indicators were calculated for each parameter (maximum heart rate, average heart rate, time zone 1, etc.) according to the data recorded for each of the two groups, Group A and Group B.

Table 2 also shows the results of the non-parametric Mann-Whitney statistical test as a component of inferential statistics, which was used to compare the results achieved by the young people included in the 2 groups for each analyzed parameter. The results of the non-parametric Mann-Whitney statistical test reveal the mean rank, *Z* value and *p* value significance threshold. It is noted that that the mean values of maximum heart rates and the mean values of average heart rates are higher in Group B than in Group A, as can be seen in Graph 3.

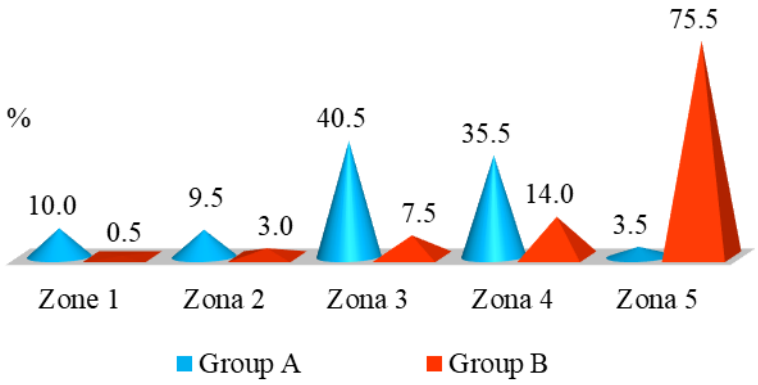


Graph 3. Average heart rates by group

The data are homogeneously dispersed for both Group A and Group B. Exceptions are the data specific to Group A for the Time zone 5 parameter and those specific to Group B for the Time zone 1 parameter, whose dispersion is inhomogeneous. The only relatively homogeneous dispersion is found in Group B for the Time zone 4 parameter.

Graph 4 shows the average times by group and zone as a percentage.

Application of the Mann-Whitney test highlights that there are no significant differences between the results obtained by the young people of both genders at the significance level $p > 0.05$ for each analyzed parameter.



Graph 4. Average times by group and zone

Conclusions

Although played for leisure, the results obtained from heart rate monitoring indicate vigorous intensities during the Ultimate Frisbee game, as also demonstrated by other studies (Scalan et al., 2015).

Statistical processing has shown that there are no significant differences between the results achieved by the two groups of young people at the significance level $p > 0.05$ for each analyzed parameter.

Cardiovascular response monitoring during physical activity is essential in detecting overexertion; although played for leisure, the data recorded with the help of Polar H10 chest straps revealed intense activity for both genders, also highlighting that the Ultimate Frisbee game is suitable young people with good physical fitness.

Authors' Contributions

All authors have contributed equally to the work.

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