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The Effect of Sports Massage on Hematological Parameters in Semi-Professional Male Runners

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Abstract

Introduction: Disorders of blood rheology have been reported as factors affecting the incidence of cardiovascular events and sudden death after exercise, and it seems that the recovery during or after exercise can improve cardiovascular risk factors, so the purpose of this study was to investigate the recovery effect of sports massage on hematological parameters in semi-professional male runners.

Methods: In this quasi-experimental and applied study, from among the male semi-professional athletes of track and field (runners) in Fars province, Iran, 20 individuals were randomly selected and divided into two groups of 10 participants: control group and sports massage group. First, to investigate the study variables in the pre-test, the subjectsب blood samples were taken in 12 hours of fasting, and then in the match day, the two groups participated in a 1500 m run, and after finishing the match, the massage group did Swedish sport for 30 min and the control group ended their activity without recovery. After one hour, the post-test blood sampling was taken of subjects. In order to analyze the study findings, Paired sample t- test and independent samples t-test were used and the significance level was considered at less than 0.05.

Results: The results of this study showed that the white blood cell levels in the sports massage group were lower compared to the control group (p=0.03), however there was no significant difference in the levels of red blood cells (p=0.93), hemoglobin (p=0.89), and hematocrit (p=0.88) of the control and massage groups.

Conclusion: The results of the study showed that there is a significant difference between the two types of recovery (active and sports massage) in the variations of white blood cell, hemoglobin, and hematocrit.

Keywords: Running, Hematologic Tests, Massage

Introduction

Blood is a fluid mediator, the main action of which is maintaining the condition of homeostasis in the body, which plays an important role in immunity. In recent years, hematological changes due to physical activity have been considered by many researchers. Physical activity can have specific changes in the number and distribution of subgroups, and the proliferation of white blood cells (1). Based on the results of various studies, one of the most important causes of circulatory damage is the disruption of rheological factors in the blood. Disorders of blood rheology have been reported as factors affecting the incidence of cardiovascular events and sudden death after exercise (2, 3). In many cases, high intensity exercise may result in significant changes in the function and distribution of leukocytes and cause temporary impairment in the function of the immune system and inflammation during the recovery period (4). Although most of the immune cells increase during exercise, in the course of recovery after intense exercise, a stage of immunosuppression or an "open window" occurs, which results in an increase in the readiness of the infection (5). In addition to the intensity of exercise, its repetition after several hours by producing stress-hormonal-neurological responses may cause changes in the immune system and increase the likelihood

of an open window in the recovery period (6). The ability of a person to perform daily exercises depends on how fast his muscles return to the initial state after exercise. This causes the body to return to its original state by replacing body fluids, storing energy and repairing damaged muscle tissue (7). In addition, with enough rest and more attention to nutrition, it can improve the immune system that has been hit by intense workouts. Active recovery refers to the return of the body to the initial state after one bout of exercise or match with performing active movements (stretching movements and running with an intensity of 35 to 40% $Vo_{2\ max}$) (8). Active recovery is one of the common ways to reduce lactate, eliminate fatigue, and return to the initial state compared to inactive recovery. The active recovery generally includes a pattern of low size and intensity sports activity, in proportion to the current athletic training load capacity. Inactive recovery refers to the courses that do not engage the individual in any activity, the duration of which can be very short for a few days after a lengthy workout or a rigorous match. Given the importance of returning to the initial state, selecting the best way to quickly return to this state in athletes plays an important role in the recovery after a long-term or mid-term activity of high intensity (5). Because recovery during or after exercise can improve blood flow in the muscles and ultimately eliminate metabolic residual, reduce overall body temperature, regenerate myoglobin oxygen, and so on (9). Today, the use of a variety of recoveries, including active, inactive, electrical stimulation and a combination of these are considered. But the results of the studies are contradictory about their effectiveness (5, 9). Therefore, recognizing periods of recovery and rapid return of the body to the normal state is of particular importance. Meanwhile, utilization of various types of recovery, such as active recovery, inactive recovery, and massage, has been considered. Since the recovery period is of particular importance in returning the homeostasis, including the immune system, to the initial state, the aim of the present study was to compare the effects of two methods of active recovery and exercise massage on the hematological indices of semi-professional male runners.

Methods

The present research was an applied research method; and in this research a semi-experimental method was used, being implemented cross-sectionally. The researcher compared the changes resulting from the application of independent variables on dependent variables in the post-test phase among three groups of active recovery, inactive recovery and massage. Before performing the program, the anthropometric and demographic characteristics of the subjects were measured and recorded using the instrumentation. The statistical population of this study was semi-professional male athletes of field and track (runners) in Fars province in 2016. Sampling was done via simple randomization, so that after informing and inviting interested individuals and completing the preliminary stages, 20 semi-professional runners were selected as the sample of the study and were then randomly assigned to two groups of ten people: sports massage and control group. Individuals had to meet the criteria for inclusion in the research based on age range, gender (only male), dietary control (no specific dietary intake), health assessment (no specific diseases), and assessment of physical activity (being athlete or non-athlete). When individuals were approved of all the preliminary stages of the study, the pre-test measurements (10 to 12 hours of fasting, 48 hours before the competition) were first taken and the samples were sent to the lab for measuring the indices. Afterwards, on the day of the match, blood sampling was taken of the sports massage group after the match was over. The research protocol comprised a 1500 meter run. In this research, after performing a 1500 meter run, the recovery was immediately carried out using sports massage and inactive methods. In the first group of sports massage,

recovery included massage in quadriceps, hamstrings, hips and shins for 15 minutes; in the second group of active recovery, it included soft and slow running for 15 minutes, and in the second group of study, inactive recovery or rest (sitting) was performed for 15 minutes. 48 hours before the match at 8:00 a.m., blood sampling was carried out at the Hafez Hospital Lab in Shiraz. Runners attended the sports complex of Shiraz University of Medical Sciences at 9:00 a.m. To analyze the data, descriptive statistics (mean, standard deviation) and inferential statistics including the Shapiro-Wilk test to check the normality of the data were used. Also, in order to analyze the inferential findings, Paired sample t- test and independent samples t-test were used and the significance level was considered at less than 0.05, using SPSS software (version 22).

Results

First, the mean and standard deviation of the demographic characteristics of the subjects in the research are presented in Table 1. The results of paired sample t- test in Table 2 showed that the post-test levels of white blood cell ($t = -4.47$, $p= 0.002$), red blood cells ($t=-2.92$, $p = 0.01$), hemoglobin ($t=-3.13$, $p= 0.01$) and hematocrit ($t=-3.18$, $p = 0.01$) compared to their pre-test levels increased significantly in the control group. Also, there was no significant difference between the post-test and pre-test levels of white blood cells ($t = 0.93$, $p = 0.37$) in the massage group. However, post-test levels of red blood cells ($t = -2.55$, $p=0.03$), hemoglobin ($t=-3.15$, $p = 0.01$) and hematocrit ($t=-3.24$, $p = 0.01$) was higher in the massage group compared to its pre-test levels. The results of independent samples t-test in Table 2 showed that the levels of white blood cells ($t = 2.23$, $p = 0.03$) in the sports massage group were lower than the control group, however, there was no significant difference in the levels of red blood cells ($t=0.08$, $p= 0.93$), hemoglobin ($t = -0.13$, $p=0.89$) and hematocrit ($t=-0.14$, $p = 0.88$) in the control and massage groups (Table 2).

Discussion

The results showed that the levels of white blood cells in the sports massage group were lower than the control group, but there was no significant difference in the levels of red blood cells, hemoglobin and hematocrit in the massage and control groups. It seems that the community's interest in the promotion of health through exercise is an issue that has attracted researchers' attention to the mechanisms that improve or damage the functioning of the immune system during exercise. Research has shown that exercise is beneficial to a certain point, and after that, increasing the duration or severity may expose a person to the infection. Studies have also shown that intense sports activities increase leukocytes and move them to the active and damaged muscle tissue to make their defense mechanism there, which increases the likelihood of muscular bruising, and in many cases, high intensity exercise may be associated with significant changes in the function and distribution of leukocytes and cause temporary impairment in the function of the immune system during the recovery period (10). In this way, muscle fibrils, connective tissue around the fibers, adjacent layers of plasma membranes, plasma membranes of muscle fibrils, sarcomers, and sarcoplasmic networks are damaged (11). The results of the study of the effects of weight training on hematological factors showed that myoglobin and white blood cells and inflammatory factors increased significantly after exercise (11-13); however, active recovery in the form of massage can affect the metabolic status of the various systems of the athlete's body and change the conditions for continuing training or competition in subsequent sessions, and these changes can have a positive or negative role in the next sessions of the competition or exercise (14). Piraki *et al.* in a study showed that performing a session of an exhaustive exercise activity increased the number of peripheral blood white blood cells in athletes, except for eosinophils.

Table 1. Mean and standard deviation of demographic characteristics of the subjects in the control and massage groups

Group	Age (Year)	Height (cm)	Weight (Kg)
Control	32.21±3.6	178.67±5.48	50.71±3.75
Massage	10.20±4.90	175.45±4.90	20.73±2.30

Table 2. Results of dependent t-test to examine the differences between the pre-test and post-test variables in semi-professional runners

Variable	Group	Time	Mean ± SD	Paired sample t- test	Independent sample t- test
WBC (Cu/mm)	Massage	Pre- test	6530.0±1173.0	t=0.37, p=0.37	t=2.23, p=0.03*
		Post- test	6190.0±1525.0		
	Control	Pre- test	6890.0±1312.0	t=-4.47, p=0.002	
		Post- test	7400.0±1400.0		
RBC (Mil/ul)	Massage	Pre- test	5.73±0.61	t=-2.55, p=0.03	t=0.08, p=0.93
		Post- test	6.19±0.63		
	Control	Pre- test	5.19±0.82	t=-2.93, p=0.01	
		Post- test	5.67±0.90		
Hemoglobin (g/dl)	Massage	Pre- test	15.21±2.0	t=-2.15, p=0.01	t=-0.13, p=0.89
		Post- test	16.70±2.49		
	Control	Pre- test	13.85±2.22	t=-3.13, p=0.01	
		Post- test	15.25±2.47		
Hematocrit (%)	Massage	Pre- test	46.23±5.49	t=-3.24, p=0.01	t=-0.14, p=0.88
		Post- test	53.22±6.25		
	Control	Pre- test	41.63±6.68	t=-3.18, p=0.01	
		Post- test	49.31±8.86		

There was no significant difference in the amount of eosinophils before and after exercise in the two groups of return to the initial state by active and inactive method (15). However, active recovery reduced the number of white blood cells and modulated hematological factors (16, 17). Evidence has shown that the use of massage increases the temperature of the skin and muscle, and its mechanical pressure, by increasing arterial pressure, helps to increase blood flow (18). Also, a massage hour reduces the inflammatory and lactate dehydrogenase in men (19). It seems that sports massage after intense exercise can increase the anti-inflammatory agents such as nuclear peroxisome proliferator-activated receptor γ coactivator 1α (PGC-1α) and focal adhesion kinase (FAK) with the mechanism of increasing blood flow and antioxidants, which, in turn, decreases the tumor necrosis factor-α (TNF-α) and interleukin-6 (IL-6), thereby improving hematological levels (20). Many of the immunological changes caused by short-term sports activities are due to responses to stress hormones such as catecholamines, which themselves are affected by factors such as individual fitness, intensity, and duration of exercise. Both duration and intensity of exercise contribute to the metabolic pressure of the training session and, as a result, affect the reduction of metabolism (21). Regarding the fact that in conducting research on hematologic effects of massage techniques in athletes, especially after moderate and severe sports activities, one of the limitations of the

present research is the lack of information in this regard, therefore, further studies in this field are suggested to perform to gain further information.

Conclusion

It seems that returning to the initial state via massage has a significant effect on the reduction of white blood cell levels in semi-professional runners. However, there was no significant effect on red blood cells, hemoglobin and hematocrit.

Ethical issues

Not applicable.

Authors' contribution

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

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