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Effect of interval training and drinking vital water on anaerobic capacity, functional indicators and some skills in volleyball

Samah Nooruldeen Issa *

Faculty of Physical Education and Sports Sciences, University of Baghdad, Iraq.

* Correspondence: Samah Nooruldeen Issa; Samah.eissa@cope.uobaghdad.edu.iq

ABSTRACT

The primary objective of this study was to identify the effect of interval training and drinking vital water on anaerobic capacity, functional indicators and some skills in volleyball. The present study had an experimental design of parallel groups, in which participants were divided in two groups: experimental group and control group. The students of the College of Physical Education and Sports Science of the University of Baghdad represented the research community. The participants were selected in a deliberate way. A total of 230 students were present in the research community, of which 20 participants were randomly selected as the sample of the study. All the participants were equally allocated into the two groups, with n=10 in each group. The findings showed that the combination of interval training and drinking vital water had a positive effect on anaerobic capacity, functional indicators and some skills in volleyball.

KEYWORDS

Interval training; Vital water; Anaerobic capacity; Functional indicators; Volleyball skills

1. INTRODUCTION

Among the pool of sports, volleyball is one of the games that need a quick reaction movement, high agility, and speed in performance, requiring high physiological abilities, especially anaerobic ability and the ability of the heart to work. The most common method for training volleyball players used by the training coaches is the high-intensity interval method of training. This training method helps the players to develop playing efficiency throughout the match period, which may last for long times, as well as playing quickly and with high accuracy throughout this period along with the ability of athletes to bear fatigue and resistance despite the intensity of the performance and the player bears fatigue with a maximum or semi-maximum load by producing

anaerobic energy when performing rapid and explosive movements and following up with this load for a length of time.

Development of the functional abilities of the body organs of the players especially the circulatory system and breathing, help the players to give playing performance with maximum efficiency. The anaerobic phosphagen ability is a basic ability for the volleyball player in most of the technical skills of the game. The heart functioning has also a key role in making the player perform with efficiency. The more will be blood pumped by the heart per minute; more energy will be supplied to the working muscles. The amount of blood pushed by the heart during a specific time from the ventricle, and the volume of blood paid per minute according to (liters/minute), which under normal conditions is 5 liters/min that may reach 36-40 liters/min when training sports. Cardiac output and stroke size is directly associated with each other which clearly explains the difference in the performance of the heart of an athlete and a non-athletic individual.

Various researchers in the field of volleyball have unanimously agreed on the importance of achieving the functional and physiological capabilities of the athlete, especially the functioning of the heart. The amount of blood and the number of red blood cells present in the blood has a direct impact on providing the muscles with the necessary oxygen and energy represented by ATP.

In various studies, authors have stated that vital water has a direct impact on the viscosity of the blood. Vital water is different from ordinary water. Vital water is magnetized water. Once an athlete drinks this magnetized water, the magnetic impulses get transmitted from the blood to the central nervous system in the brain. This leads to the establishment of a biological equilibrium in which vital functions of the body improve to a great extent. Vital water is magnetic water. When water passes through the magnetic field, it becomes more vital and biologically active, and helps in improving the movement of blood and its delivery to the body's tissues and cells (Mahjoub, 2000). Vital water is used for treatment in multiple conditions, which include treatment of pressure problems and treatment of gout and other diseases, as there are more than 14 properties that change in water after passing through the magnetic field (Kadhim, 2012).

Many researchers have agreed to a point that volleyball is one of the games that depend on its performance on anaerobic capacity at a rate of (80-85%) during the match period. In the present study, the researcher has used the high-intensity interval training method. This method is interspersed with rest periods, as it is characterized by the presence of rest periods between each exercise and another, as well as between one group and another. From a physiological point of view, the high-intensity interval training method contributes to improve the energy production efficiency of the anaerobic system (under hypoxic conditions) (Hammad, 2001).

The research problem came through asking several questions from the researcher, which included: if high-intensity interval training have an effect on anaerobic capacity; if drinking vital water during the training period positively affected the anaerobic capacity and functional indicators; if use of high-intensity interval training with drinking vital water have a positive effect on some basic volleyball skills.

The primary objective of this study was to identify the effect of interval training and drinking vital water on anaerobic capacity, functional indicators and some skills in volleyball. In the present study, the researcher hypothesized that there would be statistically significant differences between the results of the pre and post-tests and between the experimental and control groups, in favor of the experimental group.

2. METHODS

2.1. Design and participants

The present study had an experimental design of parallel groups, in which participants were divided in two groups: experimental group and control group. The students of the College of Physical Education and Sports Science of the University of Baghdad represented the research community. The participants were selected in a deliberate way. A total of 230 students were present in the research community, of which 20 participants were randomly selected as the sample of the study. All the participants were equally allocated into the two groups, with n=10 in each group. Four students were recruited as the participants for the exploratory experiment.

2.2. Instruments and procedures

In the present study, many tools and devices were used for data collection to achieve the objectives of the research. The various tools used in the present study included a stopwatch, tables, dumbbells, medicine balls, cotton, syringes, sterilizer, blood saver, tubes, centrifuge, calculator, and volleyballs.

The researchers conducted the pre-tests over a period of two days in October 2021. The functional tests and the skill tests were conducted with the help of the assistant work team. The homogeneity and equivalence of the research sample in the pre-tests is shown in the table 1 and in table 2.

Table 1 shows that the sample was homogeneous in the variables of age, height and weight, where the value of the coefficient of skewness is less than ±3, and this indicates the homogeneity of the individuals in the sample.

Table 1. Homogeneity of the research sample

Variables	Unit	Mean	SD	Median	Skewness
Age	Year	22.62	0.69	3.94	0.43
Height	Cm	169.8	3.98	2.34	0.15
Weight	Kg	65.18	7.39	11.33	0.60

Table 2 shows that the two groups were equivalent in all research variables in the pre-tests. They are on the same starting line, as the table showed no significant differences in all functional and skill tests. The skill tests carried out were serve test, spiking test from position 4 and spiking test from position 2 (Abdel Majeed, 2001). The functional tests conducted were hemoglobin blood test, phosphagen anaerobic capacity test of Sargent, and blood viscosity (PH) test (Abdel-Majeed, 2001).

Table 2. Equivalence of the two samples in the research variables

Tests	Unit	Control		Experimental		T	p
		Mean	SD	Mean	SD		
Serve test	Degree	6.90	.994	9.60	.843	-6.548	0.391
Spiking test from position 4	Degree	5.90	.738	6.20	.789	-0.87	0.465
Spiking test from position 2	Degree	6.20	.632	.6	.667	-0.688	0.500
Hemoglobin blood test	g/dL HB	12360	150.5	12330	156.7	0.437	0.668
Phosphagen anaerobic capacity test	Jump cm	12802.5	401.2	12894	512.5	-0.446	0.661
Blood viscosity (PH) test	kg/m/Ph	7391.1	6.3	7376	17.3	2.516	0.986

In the present study, the training program was developed with two training units for each week in agreement with the rest of the teachers for a period of two months. After an extensive review of previous literature and conducting personal interviews with experts specialized in the field of volleyball, the training modules were developed and implemented by the research team. High-intensity interval training method (80-90%) of the player's strong limit was used. In the current study, the sample participants were prevented to drink normal water during the study period. They were provided with vital water. The participants were provided with bio water in ready-made packages of 12 water bottles per day, especially during training the unit. They also carried extra packs along with them. Special exercises were used to develop speed and strength characteristics of speed, and explosive power of the arms and legs, using a high-intensity interval training method. These units were applied in a gradual manner, increasing the intensity, and then culminating in the training load

in the main section before skill exercises for a period of 20-30 minutes. All units were aimed at developing the anaerobic phosphagen ability, some functional abilities, and some skills in volleyball. The researcher took into account the application of the training units accurately, follow-up and provided everything that guaranteed the success of the application of these units to give positive results.

The post-tests were conducted after the completion of the training program and the application of all units, on two consecutive days in December 2021. The post-tests were conducted for the control and experimental groups under the same conditions in which the pre-tests were conducted.

2.3. Statistical analyses

In the present study, the statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 23. The researcher calculated arithmetic means, standard deviations, and t tests. The significance level was $p<0.05$.

3. RESULTS AND DISCUSSION

Table 3 presents the results of the pre and post-tests in the experimental group. Statistical analysis revealed a significant difference in all functional tests and skill tests. A significant difference was found between the pre and post-tests and in favor of the post-tests that confirmed the extent of the effect. In the present study, the researcher implemented the high-intensity interval training along with drinking vital water during the training units to the participants of the experimental group. In a previous study, Fox (1981) stated that after performing strenuous sports exercises, 70% of ATP-CP is restored within the first 30 seconds of the recovery period (Fox, 1981).

The researcher attributed these significant findings to the functional adaptation that took place in the body organs, especially the circulatory system, which directly gets affected by the high intensity and varied exercises in the training units (Khouribet, 1995). The researcher also attributed these significant findings to the ability of vital water to develop adaptive processes for functional organs and the ability of blood to transport oxygen and release the necessary energy. Grana (1988) stated that an athlete's heart, blood, and muscles have the ability to adapt under training conditions. Sports training makes the blood more liquid and less capable of clotting, and this adaptation for the trainee or the athlete helps to transport oxygen and reduce the risk of clotting. These factors

positively affected the performance of the athlete (Grana, 1988). The researcher also attributed this development to a significant increase in the percentage levels of oxygen in the blood that performs many functions, including transporting nutrients and oxygen, maintaining body temperature, and transferring metabolic wastes and carbon dioxide to the devices capable of expelling it to the outside the body. The results were justified in accordance with a study conducted by Al-Lami (2004).

Table 3. Results of the pre and post-tests in the experimental group.

Variables	Experimental group					
	Pre-test		Post-test		T	p
	Mean	SD	Mean	SD		
Serve test	9.60	.843	6.70	.949	10.474	Sig
Spiking test from position 4	6.20	.789	8.70	.675	-9.303	Sig
Spiking test from position 2	6.00	.667	8.60	.699	-7.005	Sig
Hemoglobin blood test	12330	156.7	13600	421.6	-9.0968	Sig
Phosphagen anaerobic capacity test	12894	512.5	14068.6	379.3	-7.077	Sig
Blood viscosity (PH) test	7376	17.3	7257.4	40.1	10.601	Sig

The statistical analysis revealed a significant difference in all the skill tests research variables. A significant difference was found between the pre and post-tests and in favor of the post-tests that confirmed the extent of the effect. The researcher attributed these significant findings to the method of high-intensity interval training along with drinking vital water (magnetized) that created a positive effect in developing the performance of these skills, especially the spiking and serve. These skills are offensive skills that require speed, accuracy, and strength all together in the performance. The developments of all these qualities require high-intensity training. The periodic training method is based on raising the level of the explosive power of an athlete, which is the most important ability needed by a volleyball player in offensive skills and serving.

Table 4 presents the results of the pre and post-tests in the control group. The control group did not participate in the training program and did not drink bio-water, participating only in the curriculum-specific training units of the college. The results showed that there were no significant differences between the pre and post-tests in the control group. The researcher attributes the absence of significant differences to the lack of use of exercises of high intensity and the lack of use of different training methods during the training units. The researcher also attributes the absence of significant differences to the non-drinking of vital or (magnetized) water.

Table 4. Results of the pre and post-tests in the control group.

Variables	control group				T	p
	Pre-test		Post-test			
	Mean	SD	Mean	SD		
Serve test	6.90	.994	7.70	.823	3.207	Non sig
Spiking test from position 4	5.90	.738	6.30	.949	-1.000	Non sig
Spiking test from position 2	6.20	.632	6.20	.789	.000	Non sig
Hemoglobin blood test	12360	150.5	12425	158.5	4.333	Non sig
Phosphagen anaerobic capacity test	12802.5	101.2	12884.5	434.6	-1.715	Non sig
Blood viscosity (PH) test	7391.1	6.3	7385.6	6.72	7.492	Non sig

Table 5 presents the results of the post-tests in the control and experimental groups. In all the tests the results obtained by the experimental group were significantly better than the results obtained by the control group. The researcher attributes these results to the efficacy of the interval training and drinking vital water.

Table 5. Results of the post-tests in the control and experimental groups.

Variables	Groups	Post-test		T	p
		Mean	SD		
Serve test	Control	7.70	.823	5.518	0.022
	Experimental	6.70	.949		
Spiking test from position 4	Control	6.30	.949	-6.519	0.00
	Experimental	8.70	.675		
Hemoglobin blood test	Control	12425	158.5	-8.249	0.00
	Experimental	13600	421.6		
Phosphagen anaerobic capacity test	Control	12884.5	434.6	-6.491	0.00
	Experimental	14068.6	379.3		
Blood viscosity (PH) test	Control	7385.6	6.72	9.953	0.00
	Experimental	7257.4	40.1		

The statistical analysis revealed a significant difference in all functional indicators. A significant difference was found between post-tests of the experimental and control groups and in favor of the experimental group that confirmed the extent of the effect. The researcher attributed these significant findings to the adaptation and development of the functional capabilities of the

participants of the experimental group. In the present study, the researcher implemented the high-intensity interval training along with drinking vital water during the training units to the participants of the experimental group. The application of exercises led to the adaptation of the functional organs of the body and the ability of blood to transport oxygen and release the necessary energy. Another justification could be recreating and changing the physical properties of water by introducing water to the magnetic field. The most important change that happens is a significant increase in the percentage of water. Since oxygen is transported by the blood, which contains water, hence changing the properties of water may have a significant effect on the biomechanical indicators. This justification was confirmed by Mahjoub (2000) in a study. The authors of the study stated that "when water passes through the magnetic field, it becomes more vital and active from a biological point of view, and helps in improving the movement of blood and its delivery to the body's tissues and cells" (Mahjoub, 2000).

The geographical conditions in Iraq are hot and dry in most of the months of the year. Hence, players were prone to sweat heavily under such training conditions in hot and dry weather. A player loses a huge amount of water with sweating. It becomes necessary to compensate for this huge loss of water, which may have a direct impact on the functioning of body cells and other systems in the form of loss of blood plasma, increased viscosity of blood, rise in body temperature. Similar reasoning was supported by Khouribet (1997) in a study, in which authors stated that "the failure to compensate for this lost amount of water can lead to a serious breach in the water balance in general, and salt in particular, with a decrease in the efficiency of performance, so the athlete should take large quantities of fluids on training days or after, to compensate, above all, for the lost water" (Khouribet, 1997).

Statistical analysis also revealed a significant difference between the two groups in the serve test and spiking tests. The researcher attributed this significant difference to the high-intensity interval training method, which included rest periods between training sessions and also to the dedication and consistency of the players in performing these training sessions with precision and adherence to the times specified for each exercise. Hence, all of these factors led to the emergence of this significant difference between the experimental group and the control group in favor of the experimental group. In the present study, the exercises implemented and performed by the players of the participants of the experimental group were characterized by speed, strength, rapid performance, and a high intensity ranging between 80 – 90 %, and the researcher introduced exercises of intensity up to 80 – 95 % and with faster periods to develop the phosphagen ability and to develop explosive power in the players. This high-intensity power is required by the volleyball players in playing offensive skills like spiking and serving. The justification was supported by a study in which the

authors stated that spiking and serving needs strength and speed because touching the ball takes place in a very short period of time, and this is what is required by the law of the game, which must be performed quickly, with high accuracy and with high strength to avoid the blocking wall and to hit the ball in a place where it is difficult to defend by the other team (Abdel-Majeed, 2001).

To perform the skills of spiking and serving, a player requires explosive power for the arms and legs, speed and accuracy in performance, as well as strength. Explosive ability can only be developed with high-intensity interval training, which is one of the best teaching methods for developing phosphagen capacity, and one of the most important changes that occurs is the improvement of the efficiency of the individual's vital organs, such as the nervous, muscular, circulatory and respiratory systems to produce energy, exchange gases, and the ability to restore healing (Hussain Al-Ali, 2000).

4. CONCLUSIONS

The findings showed that the combination of interval training and drinking vital water had a positive effect on anaerobic capacity, functional indicators and some skills in volleyball. Considering these findings, the researcher recommends the use of interval training and drinking vital water to improve the anaerobic capacity, functional indicators and skills in volleyball.

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AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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