SPORT TK-EuroAmerican Journal of Sport Sciences

https://revistas.um.es/sportk Online ISSN: 2340-8812

Received: **25/06/2023.** Accepted: **29/09/2023.** Published: **01/11/2023**

Comparative study of functional indicators in swimming and volleyball

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ABSTRACT

This study aimed to identify various functional indicators relevant to swimming clubs and volleyball players, and also to compare selected functional indicators between athletes engaged in swimming and volleyball. The researchers employed the descriptive method within the framework of comparative studies. The study sample comprised applicants from clubs in Baghdad, deliberately chosen to represent the pinnacle of swimming proficiency and volleyball efficiency. Each category, swimming and volleyball, consisted of 22 subjects, divided evenly into two groups, with 11 subjects in each. Functional tests utilized in this study included the heart rate test and the physical fitness test known as PWC170. There exists a notable disparity in resting heart rate between swimmers and volleyball players. While some alignment is observed in individual heart rates between the two sports, significant differences persist. Furthermore, substantial disparities in physical fitness test results, particularly the PWC170 test, are evident, with volleyball players demonstrating a six-level advantage over swimmers. Additionally, there are instances of exceptionally high PWC170 levels among swimmers, albeit in a minority of cases. There is a discernible discrepancy of eight degrees in maximum oxygen consumption (Vo2max) rates favoring volleyball players. Lastly, the Hb test results for swimmers are significantly influenced by their performance in physical fitness tests and maximum oxygen consumption, leading to a clear advantage for volleyball players in this assessment.

KEYWORDS

Functional Indicators; Athletes; Swimming; Volleyball

1. INTRODUCTION

The impact of various sciences on raising the level in all areas of life, including the sports field, results from scientific development across different research fields. The scientific method serves as the most important and appropriate means to achieve desired goals. We are aware that the

development of various sciences, such as physiology, anatomy, sports medicine, psychology, biomechanics, biochemistry, science of tests, and others, greatly influences the advancement of training science and applied field theories (Shaalan et al, 2022; Taha Idrees et al, 2022; Badwi Shbeeb et al, 2023).

Heart rate is an important indicator that is medically dependent and is one of the most important measures that can be easily observed as an indicator of the functional variables that occur to the athlete during the physical effort and the size of the heart pump of blood is affected by. The functional organs (physiological) in the human body are greatly affected by the size and intensity of training. These are indicators that reflect the level of adaptation in functional devices during the long-term training phase. This functional development can be detected through functional tests (Hassanein, 1995). It is the scientific method that is guaranteed to provide the human potentials that have the appropriate preparations to reach excellence, if the tests used are predictive power (Hassanein, 1995).

Swimming is among the sports that have benefited from this development by adhering to correct scientific principles in sports training. Researchers have delved into various sources related to swimming, revealing the necessity for high physical abilities to overcome variables and resistances inherent in the sport. This includes managing the body's weight, intensifying efforts to outperform competitors in races, and maintaining consistent muscle coordination during competition. Such events demand meticulous control over all body joints. Achieving proficiency in swimming necessitates rigorous training over many years, facilitating adaptation of the body's functional organs to the intensity and volume of training (Yadolahzadeh, 2020; Youssef Khalil et al., 2023).

Volleyball players demonstrate proficiency in utilizing functional devices, with a primary focus on rotary and breathing apparatus. Therefore, the significance of this study lies in its ability to utilize tests that accurately reflect the functional indicators of the athletes being assessed. This provides valuable insights for trainers and contributes to the enhancement of information and indicators beneficial to the sports domain.

Both volleyball and swimming demand a foundation of high-level physical and functional requirements. This foundation is essential for practitioners due to the sports' high-intensity and high-volume performance demands. Reflecting on the aforementioned components, athletes in these activities exhibit exceptional physical abilities and fitness levels (Abdulhadi et al, 2022; Alawadi et al, 2022; Issa, 2022; Maki et al, 2022).

In this context, numerous scientific studies have explored the relationship between physical abilities and fitness elements in sports (Asfour et al, 2022; Hameed & Abdalkarem, 2022; Saleh Al-

Thubaini, 2022). This study aimed to identify various functional indicators relevant to swimming clubs and volleyball players, and also to compare selected functional indicators between athletes engaged in swimming and volleyball. The research hypothesis was that there would be significant differences in some functional indicators between swimmers and volleyball players.

2. METHODS

2.1. Study design and participants

To accomplish the research objectives, the researchers employed the descriptive method within the framework of comparative studies. The study sample comprised applicants from clubs in Baghdad, deliberately chosen to represent the pinnacle of swimming proficiency and volleyball efficiency. Each category, swimming and volleyball, consisted of 22 players, divided evenly into two groups, with 11 players in each. To assess the homogeneity between the two samples, the researchers conducted separate analyses for age, weight and height (Table 1).

Table 1. Sample homogeneity

	Swimming		**Volleyball**		**T value**
	Mean	**Standard deviation**	**Mean**	**Standard deviation**	
Age	23.09	2.86	24.5	2.46	1.11
Weight	73.4	3.72	76.2	3.39	1.64
Height	174.9	4.48	175.6	4.30	0.85

2.2. Procedures

The materials used in this study were: Fixed chair, a tube for blood, a syringe to extract blood, questionnaire for the opinions of experts in determining the functional variables, stationery, pencil, dry pen, ruler, medical cotton, sterilization alcohol, medical bed in a special room to perform the test, stopwatch, heart rate monitor, blood pressure monitor, and hand calculator.

The researchers surveyed and analyzed the functional variables through a questionnaire, especially to determine the functional variables of volleyball and swimming, taking into account the clarity of the presentation and validity and availability of scientific conditions. The researchers adopted the variables that obtained 80% or more of the nomination of the experts (Table 2).

The researchers conducted an exploratory experiment on 6/7/2022 to identify the obstacles and problems that may face the researchers and the auxiliary team during the experiment, through which to identify the validity of the devices and tools used. This experiment also allowed to know the time taken for the tests, as well as the validity of the tests and the efficiency of the team assistant.

Table 2. The functional tests in the nomination form for experts

	Functional Tests	Number of Nominations	Percentage
1	Pulse rate	7	83*
2	Blood pressure	4	55
3	Speed of hospitalization	5	65
4	Percentage of Hb	6	80*
5	VO2max test	8	90*
6	PWC170 test	8	90*
7	Respiratory rate 5 minutes	5	60
8	Pulmonary capacity air volume within the lung	--	--
9	Pulmonary recommendation	--	--
10	Aerobic testing	4	55
11	Anaerobic capacity test	5	60
12	Parach Test Power Index Manual E1	5	60
13	Pulse Rate Test	7	75
14	Test fatigue Carlosin	6	70

To extract the scientific conditions for the tests, the researchers found the scientific weight of these tests by finding the truth of the content, by presenting them to a group of experts and specialists in this field to extract honesty, consistency and objectivity. The researchers used the sincerity of the content by means of the experts and specialists mentioned above, where all of them agreed on these tests to be honest in measuring these variables. For the purpose of extracting the stability of the tests, the researchers conducted the tests on all swimmers and volleyball players on 26/2/2021. After seven days and on 2/11/2022, the same tests were performed on the same sample and in the same conditions. The stability coefficient was extracted by using the simple correlation coefficient (Pearson), where the results showed that the tests have high stability (Table 3). For the purpose of determining the objectivity of the tests, the researchers extracted them using two arbitrators who recorded the results separately and by using the simple correlation coefficient (Pearson). The researchers processed the results of the tests between the first arbitrator's grades and the second arbitrator grades (Table 3).

Table 3. Statistical relevance of the tests

Tests	Persistence	Objectivity
Pulse rate	0.912	0.921
Test PWC170	0.883	0.901
VO2max test	0.931	0.937
Hb	0.844	0.869

The pulse rate test consisted of measuring the heart rate per minute before performing any effort (at rest). For this, the subject sits on a chair in a state of complete rest without any physical

effort. Then, a special clock is placed in the hand to measure the pulse. The physical fitness test PWC170, VO2max test and Hb test measured physical adequacy and were implemented according to Watson (1986).

2.3. Statistical analyses

The statistical package SPSS, version 23.0, was utilized for processing the statistical data. This research employed the following statistical methods: arithmetic mean, standard deviation, percentage, simple correlation coefficient (Pearson) and t test. For the present study, statistical significance was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

The results are presented in Table 4. This table shows a comparison of functional indicators in swimming and volleyball.

Table 4. Comparison of functional indicators in swimming and volleyball

	Swimming		Volleyball		T value
	Mean	**Standard deviation**	**Mean**	**Standard deviation**	
Heart rate	66.545	7.646	52	2.309	7.510
PWC170	19.754	6.122	25.828	1.729	2.535
VO2max	57.746	14.001	65.171	2.892	1.369
Hb	14.900	0.760	16.057	0.415	3.666

Heart rate at rest was significantly lower in volleyball (52) than in swimming (66.545). The results of PWC170, VO2max and Hb were significantly higher in volleyball than in swimming. The researchers attribute these differences to variations in the volume and intensity of training in swimming and volleyball.

The study highlights several key findings. Firstly, there exists a notable disparity in resting heart rate between swimmers and volleyball players. Secondly, while some alignment is observed in individual heart rates between the two sports, significant differences persist. Thirdly, substantial disparities in physical fitness test results, particularly the PWC170 test, are evident, with volleyball players demonstrating a six-level advantage over swimmers. Additionally, there are instances of exceptionally high PWC170 levels among swimmers, albeit in a minority of cases. Furthermore, there is a discernible discrepancy of eight degrees in maximum oxygen consumption (VO2max) rates favouring volleyball players. Lastly, the Hb test results for swimmers are significantly influenced by their performance in physical fitness tests and maximum oxygen consumption, leading to a clear advantage for volleyball players in this assessment.

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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.

FUNDING

This research received no external funding.

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