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SHORT COMMUNICATION

The Effect of an Athletic Nutritional Program on Performance and Physiological Variables of Volleyball Players in Iraq

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ABSTRACT

Background: Nutrition represents the only and main source of energy for the athlete, which helps him to move. This study designed a nutritional program for volleyball players and examined its effect on their performance and physiological variables.

Methods: In an experimental design with pre- and post-testing in 2024, 32 volleyball players were randomly enrolled in this study. Pre-tests assessed physical abilities, including muscular strength, speed, coordination, agility, flexibility, balance, and general physical indicators, in addition to relevant physiological variables. Following the implementation of the proposed nutritional program, post-tests by using the same measurement tools and procedures determined the changes from the interventions.

Results: Significant improvement in physical abilities and selected physiological variables of the post-tests was noticed when compared to the pre-tests indicating that the proposed nutritional program had a significantly positive effect on volleyball players' performances.

Conclusion: Significant differences were seen between the pre-test and post-test mean scores for the experimental group, revealing improvement in physical tests of muscular strength, speed, coordination, agility, flexibility, balance and body indicators in addition to physiological variables such as resting heart rate, post-exercise heart rate, vital capacity, resting systolic and diastolic blood pressures and respiratory rate per minute.

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Introduction

Nutrition represents the only and main source of energy for the athletes, which helps them to move, as the athlete's body cannot continue to play without a proper nutrition. If the athlete's nutrition is disturbed, there would be a weak performance and the athletes would have difficulties to continue their exercises. Nutrition can have an important role in training and performance of the athletes (1-4). Nutrition has a pivotal role in overall preparation of athletes, and this role is not less important than other factors related to training. Nutrition can directly control the continuous development of health and skill levels, and any imbalance or deficiency in this system; while it can directly lead to disturbances in the health status of athletes too (5).

Nutrition is a topic that attracts the attention of researchers and specialists, and its impact in cellular level on individuals can affect large segments of the society due to its direct connection to general health status and physical fitness (6, 7). Additionally advertisements of certain types of food can have a negative impact on public health, as these foods can be high in calories and lead to weight gain and obesity (8, 9). Fatigue has a link to an athlete's lifestyle and health status, while a balanced nutrition provides the biofuel necessary for energy renewal and survival of the athlete and an appropriate nutrition plays a crucial role in boosting immunity and supporting mental health and daily activity (10, 11).

It was shown that a positive attitude toward healthy nutrition and regular physical activity habits is associated with an improved work performance among physical education teachers, highlighting the importance of nutritional awareness and physical activity in enhancing overall performance in sports contexts (12). The surge in fatty foods and steroids has influenced athletic nutrition as an essential bio fuel. Nutrition and training are integrated parts in an athlete that can disrupt health and impair the performance (13, 14); so a proper nutrition can meet all the body needs and the diet ingredients are considered essential elements of energy and any error in the nutrition of athletes can lead to a loss of energy and decrease muscle capacity (15, 16).

It seems that the nutritional status of athletes requires interventions by specialists and their extensive knowledge on the nature of the foods they consume, not only during competitions, but also during training seasons, whether it is in a transitional, preparatory, or competitive period (17). As one of the most important factors in a player's performance is nutrition; therefore, it is essential to follow the principles of a proper nutrition to meet all the body requirements as a source of energy. Any mistake in planning of a player's nutrition would lead to a loss of energy and the muscle capacity (18).

Daily fat requirements vary based on individual factors like age and activity level. However current guidelines recommend a daily intake of 20-35% of total calories, with a general advisory not to exceed 30% to maintain an optimal health (19). Achieving an ideal weight and athletic physique requires implementation of regular trainings, adequate sleep, and scheduled meal times. Resistance exercises like weightlifting and aerobic activities like swimming combined with increased protein intake are essential for muscle growth, strength and physical fitness (20).

The WHO defined food as the biological basis for growth, tissue building and maintenance. A proper nutrition can ensure the nutritional balance and contribute to physical, psychological, and social well-being. Furthermore, the nutritional status of individuals can directly impact societal productivity and the overall development (21). Designing effective training programs is not limited to choosing the right exercises, but also requires attention to nutritional aspects that contribute to maximizing the benefits of physical activity (22, 23). Integrated healthy nutrition is the primary energy source. Therefore, developing scientific nutritional programs is essential to enhance players' physical and physiological variables. By raising body efficiency and energy levels, these programs align with modern sports advancements to optimize both health and athletic performance across various disciplines (24). The aim of this study was to design and implement an integrated nutritional program specifically to be tailored for volleyball players, with the objective of evaluating its impact on physical, performance and physiological variables.

Materials and Methods

One-group experimental design using pre- and post-measurements was adopted to determine the effect of the proposed nutritional program. The study was randomly conducted on a sample of 32 volleyball players from Iraqi clubs in Aphrodishe, Basra, Darbandikhan, Amanat Baghdad, and Sirwan Halabja, Iraq during 2024. The sample was divided into two groups of 16 players participating in the exploratory study to establish the validity and reliability of the tests, while the remaining 16 players formed the experimental group that underwent the proposed nutritional program**.** These variables were designed to offer a comprehensive evaluation of both the physical and physiological capabilities of volleyball players. These contributing valuable data would guide the development of an effective training and nutrition program.

The physical variables selected for the study were muscular strength, which was measured by the right and left hand grip strength and the pull-up test, speed measured through a 30-meter sprint from a flying start and running in place for 15 seconds, coordination assessed through a numbered circle test and a jump rope test. The agility was evaluated by a zig-zag running test (Barrow method) and an inclined push-up from a standing position. The balance was measured by a jump and balance on markers test. The body indicators such as body fat percentage and body mass index (BMI) were determined too. Physiological variables including vital capacity, resting diastolic and systolic blood pressure, resting heart rate, post-exercise heart rate, and respiratory rate per minute were examined.

The researcher applied the nutritional program regularly to the members of the research sample on a daily basis. The daily meals included 3 meals (breakfast, lunch, and dinner), with the program lasting for 6 weeks per week, and the daily duration of the program was 45 minutes. The main study was conducted during the period from 3/6/2024 to 22/7/2024. The pre-measurements were conducted from 3/6/2024 to 4/6/2024 for the variables under study on the members of the research sample (16 players), and the tests were carried out in sports clubs over two days; one day was dedicated to measuring physical tests, and the other to measuring physiological tests. The proposed training program was implemented over a period of 6 weeks from 5/6/2024 to 20/7/2024. Post measurements of the variables under study were conducted from 21/7/2024 to 22/7/2024. The tests were carried out in sports clubs after 6 weeks of implementing the nutritional program, and the post-measurements lasted for two days as one day for measuring physical tests and one day for measuring physiological tests.

Results

The basic variables of the participants (age, height, weight, training age) were presented in Table 1. It is clear from Table 1 that the data for the total research sample is with normal distribution, as the values of the skewness coefficient ranged between 0.63 and 1.39 and this value is close to zero. The kurtosis coefficient reached between 1.02 and 1.51 which means that the oscillation of the normal curve was acceptable and on average and not oscillating up or down confirming the similarity of research group members in the initial variables before the experiment. Table 2 shows statistically significant differences between the mean scores of the pre- and post-measurements for the experimental group, favoring the post-measurement in physical tests such as muscular strength, speed, coordination, agility, flexibility, balance, and physical indicators, where the calculated "t" value ranged between 3.974 and 18.632. There were statistically significant differences between the pre-and post-measurements of the research sample for physiological variables of the experimental group in favor of the post-measurement.

Table 3 presents pre- and post-measurements for physiological variables in experimental group. There were statistically significant differences

Table 1: Basic variables of participants before the experiments.

Variable	Unit	Mean	Median	Standard deviation	Skewness coefficient	Kurtosis coefficient
Age	Year	23.95	24.00	2.12	1.21	-0 1.02
Length	Cm.	188.47	187.00	3.69	0.63	0.28
Weight	Kg.	82.36	81.00	1.55	0.85	1.51
Training age	Year	9.41	8.50	2.31	1.39	1.12

Table 2 : The comparison between the pre- and post-measurements for physical abilities of the experimental group.

Variable		Unit	Pre measurement		Post measurement		T value	*P* value
			-C	±A	-C	±A		
Muscular strength	Right grip strength	Kg	22.36	3.17	29.54	3.13	8.069	0.001
	Left Grip Strength	Kg	18.48	2.94	27.52	3.05	12.301	0.00
	Pull-up test (hitch	Number	13.47	2.07	19.14	1.86	6.355	0.001
Speed	30-meter run test from a flying start	Second	6.02	0.69	5.09	0.83	4.185	0.001
	Fifteen-second run test	Number	16.18	0.84	25.92	0.79	13.669	0.001
Compatibility	Numbered Circles test	Second	5.92	0.91	4.87	1.10	3.974	0.001
	Skipping Rope test	Number	16.05	4.82	30.71	3.69	18.632	0.001
Agility	Barrow's Zig Zag Run test	Second	14.09	1.45	11.47	1.52	8.471	0.001
	Standing oblique prone test	Number	15.47	2.02	23.74	1.82	9.332	0.001
Flexibility	Forward torso flexion from standing	Cm.	3.69	0.94	6.97	1.01	10.154	0.001
Balance	Jump and balance test over the markers	Degree	49.78	2.69	67.31	2.33	14.528	0.001
Body indicators	Fat percentage	Kg	29.91	1.33	22.17	1.39	7.314	0.001
	Body Mass Index (BMI)	Kg/m^2	28.04	1.54	22.08	1.68	5.947	0.001

The value of (t) at the significance level (0.05)=2.131.

Table 3: Pre- and post-measurements for physiological variables in experimental group.

Variable	Unit	Pre-measurement		Post-measurement		T value	*P* value
		-C	±A	-C	±A		
Resting pulse rate	Pulse/Minute	73.85	2.14	66.28	1.93	7.149	0.001
Pulse rate after exertion	Pulse/Minute	184.31	1.36	170.01	1.52	11.394	0.001
Vital capacity	mL/L	37648.14	5.94	4247.54	4.82	22.471	0.001
Resting systolic blood pressure	mm Hg	123.47	1.77	115.27	1.27	6.632	0.001
Resting diastolic blood pressure	mm Hg	82.27	2.10	76.58	2.34	5.281	0.001
Respiratory rate per minute	Number/Minute	21.39	0.86	15.08	1.02	7.361	0.001

The value of (t) at the significance level (0.05)=2.131.

between the mean scores of the pre- and post-measurements of the experimental group, favoring the post measurement for physiological variables such as resting heart rate, heart rate after exertion, vital capacity, resting systolic blood pressure, resting diastolic blood pressure, and respiratory rate per minute. The calculated "t" value ranged from 5.281 to 22.471.

Discussion

In order to establish a solid theoretical foundation for the physical and physiological variables of volleyball players, the researcher conducted a comprehensive review of relevant research, scientific studies, and previous literature presented by Imam (25), Shams El Din (26), Ibrahim (27), Kamash (28), and Salah El Din (29). All these studies collectively emphasized the importance of structured nutritional and training programs in optimizing athletic performance to enhance the physiological efficiency. We showed statistically significant differences between the pre-and post-measurements of the research sample in the physical abilities under research for the experimental group in favor of the post-measurement.

We demonstrated statistically significant differences between the mean scores of the pre- and post-measurements for the experimental group, favoring the post-measurement in physical tests such as muscular strength, speed, coordination, agility, flexibility, balance, and physical indicators as described before (26, 30, 31). In this context, it was shown that the proposed nutritional program could contribute to a health fitness improvement from 24.39% to 31.97% for muscular strength, 20.86% to 21.53% for muscular endurance, 29.66% for respiratory endurance, 20.64% for flexibility, and 7.75% for body fat percentage, all in favor of the post measurement (27, 32).

Additionally, it was found that the nutritional guidance program combined with daily exercise could positively affect the development of physical abilities in the research sample (30). Furthermore, the nutritional program was illustrated to lead to an increase in body muscle weight for swimmers and improve the body fat mass in swimmers. The importance of focusing on the quality of food consumed by swimmers, rather than the quantity, to maintain physical and physiological variables have been emphasized (26, 31, 33). There were statistically significant differences between the mean scores of the pre- and post-measurements of the experimental group, favoring the post measurement for physiological variables such as resting heart rate, heart rate after exertion, vital capacity, resting systolic blood pressure, resting diastolic blood pressure, and respiratory rate per minute. These findings are consistent with previous studies confirming that the nutritional guidance program accompanying daily exercise had a positive impact on the development of the physiological abilities of the research sample (34). Similarly, it was shown that the proposed nutritional supplement (ginseng, wheat germ, honey) had a positive effect on physiological variables such as heart rate, systolic blood pressure, diastolic blood pressure, and vital capacity (35).

Moreover, the impact of a nutritional program on swimmers was examined revealing improvements in physiological variables and an increase in muscle mass and body weight identical to our findings (26). Additionally, the effect of a nutritional program on schoolchildren was investigated showing statistically significant differences between pre- and post-measurements in favor of the post measurement (36). An improvement in oxygen consumption, red blood cell count, hemoglobin level, white blood cell count, and physical fitness level have been exhibited too (37). All the mentioned studies identical to our findings, in addition to the many other researched (38, 39), highlight the important role of nutrition in improving various physiological variables.

Conclusion

In light of our research findings, statistically significant differences were noticed between the mean scores of the pre- and post-test for the experimental group, in favor of the post-test for physical activities such as muscular strength, speed,

coordination, agility, flexibility, balance, and body indicators. Additionally, statistically significant differences were observed between the mean scores of the pre- and post-test for the experimental group, in favor of the post-test for physiological variables such as resting heart rate, post exercise heart rate, vital capacity resting systolic blood pressure, resting diastolic blood pressure and respiratory rate per minute.

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Authors' Contribution

All authors contributed equally to the conception, design, data collection, analysis, and writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

None declared.

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