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# Comparative Analysis of Health Related Fitness Among Female Vegetarian Athletes of Football, Basketball and Volleyball

**Anindita Das, Ravi Sharma**

Lakshmbai National Institute of Physical Education, Gwalior, Madhya Pradesh, India

**Email address:**

[anindita416@gmail.com](mailto:anindita416@gmail.com) (A. Das)

**To cite this article:**

Anindita Das, Ravi Sharma. Comparative Analysis of Health Related Fitness Among Female Vegetarian Athletes of Football, Basketball and Volleyball. *American Journal of Sports Science*. Special Issue: Kinanthropometry. Vol. 4, No. 1-1, 2016, pp. 27-30.

doi: 10.11648/j.ajss.s.2016040101.15

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**Abstract:** The study was conducted to compare the health related physical fitness of vegetarian athletes of different team games like Football, Basketball and Volleyball. Sixty female athletes ( $21.2 \pm 2.4$  year) were studied out of which twenty were from Football, twenty were from Basketball players and rest were from Volleyball. Significant differences were observed only in endurance whereas no significant differences were observed in flexibility, body composition, muscle strength and muscular endurance.

**Keywords:** Health Related Fitness, Vegetarian, Football, Volleyball, Basketball

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## 1. Introduction

Athletes require an adequate food intake to meet the high level of energy expenditure, to maintain the homeostasis, to prevent exercise – related stress disorders, to achieve an appropriate body composition, and to sustain athletic performance [1]. When activity is to be done, fuel is required. This fuel must be supplied by food which is burnt chiefly in the active muscles [2]. Female athletes are expected to be fit, lean and competitive in their sport. They also have the pressures of today's society, which places a high emphasis on body image and thinness. A person who does not eat or does not believe in eating meat, fish, fowl, or, in some cases, any food derived from animals, as eggs or cheese, but subsists on vegetables, fruits, nuts, grain etc are known as vegetarians. Many first class athletes have been vegetarian provided the protein intakes is adequate, vegetarian diets are suitable for hard training. There is no evidence that extra protein is beneficial: nor does it do any harm [3]. Physical fitness is typically defined with focus on two goals: performance and health. Health related physical fitness can be defined as the ability of a person to perform daily activities with vigor, and by traits and capacities that are associated with a low risk for the development of chronic diseases and prevention of premature death. Health related components are very essential for the athlete's performance. The components of fitness each

work together to contribute to the ability of the body to handle physical demands. The more efficient the body functions, the higher the level of fitness. Optimal fitness is a combination of lifestyle, nutrition, habits, but it cannot be reached without an appropriate level of physical activity. Optimum physical performance is a combination of all the components of fitness; depending on the specific demands of the sport or activity. Some components will require more attention than others, but each should be present as a part of an integrated training program [4]. Health-related fitness relates to those components of fitness that are affected by habitual physical activity and relate to health status. As mentioned above, they include aerobic functioning, body composition, and musculoskeletal functioning [5]. Thus the study was conducted to reveal the significant role of diet in health related physical fitness and components of different team games.

## 2. Method

### 2.1. Subjects

A total of 60 female vegetarian athletes were selected from football, basketball and volleyball by using purposive sampling. The age of the subjects were ranged from 18 to 24 years. Players were with regular game practice with good level of skill and playing for the last 4 years in regular basis.

Out of sixty players, 20 were from Football, 20 from Basketball and 20 from Volleyball. All the players had similar life styles including physical activities, diet, daily routine exercise program, sleeping time as they were all in sports hostel under controlled supervision. All the tests were administered on each player individually with the help of standard scientific instruments.

## 2.2. Ethical Issue

Consent was taken from each subject and the study was approved by the ethical committee of the Institute.

## 2.3. Criterion Measures

Health related fitness variable	Criterion measure
Endurance	12 min run/walk test
Flexibility	Sit and Reach test
Lean Body Mass (LBM)	Skinfold method
Muscular strength	Push ups
Muscular endurance	Sit ups

## 2.4. Administration of Tests

### 2.4.1. Endurance

12 min run- walk test was conducted on 200 m track. The length of track was divided into 8 equal posts of 25 m each. All the subjects were assembled at starting line. They were instructed to run continuously for 12 min and if they felt tired they could walk instead. A score was assigned to each of the runners to keep record of the number of laps completed and the part of a lap run within stipulated period. The subject started running at the sound of the clapper by starter by a time keeper. After 12 min a long whistle was blown and all the subjects stopped running.

### 2.4.2. Flexibility

Flexibility was measured with the help of sit and reach box. The tester with the help of flexomeasure case was faced down. The subject sat down near the edge of the flexomeasure box behind the zero mark while knees were in locked position. As subject prepare to stretch, with the heel apart not more than 5 inches, subject slowly stretched forward while pushing flexomeasure by both hands. The reading was taken near the edge of flexomeasure case.

### 2.4.3. Lean Body Mass (LBM)

Lean body mass (LBM) obtained from subtracting the observed fat amount from the body weight. Durnin and Womersley [6] technique was followed for body density. Body fat% was derived from the equation of Brozek et al [7].

### 2.4.4. Muscle Strength

Muscle strength was estimated from Push Ups by a standard method [8].

### 2.4.5. Muscular Endurance

Muscular endurance was estimated from Sit-Ups by a standard method [8]. The performer performed maximum number of sit – ups in 1 minute was recorded.

## 2.4.6. Statistical Analysis

Data were analyzed with Statistical Package SPSS (IBM) version 20.

## 3. Results

Finding pertaining to the descriptive Statistics of the players from selected groups on the health related fitness variables has been presented in Table 1. The values of mean, standard deviation and standard error of mean for Football, Basketball and Volleyball were shown in Table 1.

**Table 1.** Descriptive Statistics of the players from selected groups on the health related fitness variables.

		N	Mean	Std. Deviation	Std. Error
Flexibility	Football	20	40.93	4.12	0.92
	Basketball	20	37.88	4.54	1.02
	Volleyball	20	39.33	5.66	1.27
	Total	60	39.38	4.90	0.63
Endurance (m)	Football	20	2481.70	97.75	21.86
	Basketball	20	2396.20	153.43	34.31
	Volleyball	20	2239.60	221.80	49.60
	Total	60	2372.50	191.63	24.74
Lean Body Mass (kg)	Football	20	24.21	2.76	0.62
	Basketball	20	25.48	2.51	0.56
	Volleyball	20	26.18	2.27	0.51
	Total	60	25.29	2.61	0.34
Muscular Strength	Football	20	37.90	7.11	1.59
	Basketball	20	39.25	6.80	1.52
	Volleyball	20	38.95	10.72	2.40
	Total	60	38.70	8.28	1.07
Muscular Endurance	Football	20	40.95	10.60	2.37
	Basketball	20	37.40	6.08	1.36
	Volleyball	20	39.30	8.23	1.84
	Total	60	39.22	8.49	1.10

**Table 2.** Test of Homogeneity of Variances.

	Levene Statistic	df1	df2	Significant value
Flexibility	0.315	2	57	0.731
Endurance	1.058	2	57	0.645
Lean Body Mass (kg)	0.070	2	57	0.932
Muscular Strength	0.567	2	57	0.570
Muscular Endurance	2.822	2	57	0.068

To test the equality of variances, Levene's test was used. The F-value was insignificant as the p-value was more than 0.05. Thus the null hypothesis of equality of variances might be accepted, and it was concluded that the variances of the two groups were equal. The results were presented in Table 2.

None of the health related fitness variable showed significant differences except endurance which was shown in Table 3. In the case of flexibility, body composition, muscular strength and muscular endurance, the p-values were greater than 0.05. There were no significant differences among these variables in Football, Basketball and Volleyball. But in case of endurance, p-value was less than 0.05. Thus, there were significant differences in endurance of Football, Basketball and Volleyball players. Since f-value was significant in endurance, post hoc test was needed for comparing the means of groups.

**Table 3.** ANOVA of the present study.

		Sum of Squares	df	Mean Square	F	Sig.
Flexibility	Between Groups	93.1	2	46.55	2.003	0.144
	Within Groups	1324.713	57	23.241		
	Total	1417.813	59			
Endurance	Between Groups	602974.8	2	301487.4	10.991	0.000
	Within Groups	1563524	57	27430.25		
	Total	2166499	59			
Lean Body Mass	Between Groups	39.669	2	19.834	3.118	0.052
	Within Groups	362.629	57	6.362		
	Total	402.297	59			
Muscular Strength	Between Groups	20.1	2	10.05	0.142	0.868
	Within Groups	4020.5	57	70.535		
	Total	4040.6	59			
Muscular Endurance	Between Groups	126.233	2	63.117	0.873	0.423
	Within Groups	4121.95	57	72.315		
	Total	4248.183	59			

**Table 4.** Tukey Post Hoc Test for endurance.

Dependent Variable	(I) types of sports	(J) types of sports	Mean Difference (I-J)	Std. Error	Significance value.
Endurance	Football	Basketball	85.50	52.37	0.24
		Volleyball	242.10*	52.37	0.000
	Basketball	Football	-85.50	52.37	0.24
		Volleyball	156.60*	52.37	0.011
	Volleyball	Football	-242.10*	52.37	0.000
		Basketball	156.60*	52.37	0.011

Difference between Football and Volleyball was significant as the p-value for the mean difference was less than 0.05. Similarly, the mean difference between Basketball and Volleyball was also significant as the p-value was less than 0.05. However there was no difference between the means of Football and Basketball.

## 4. Discussion

The purpose of the present study was to compare the health related physical fitness among female vegetarian athletes from Football, Basketball and Volleyball. No significant difference were observed in case of flexibility, body composition, muscular strength and muscular endurance of all athletes (Table 3). But in case of endurance there was significant difference among female athletes of Football, Basketball and Volleyball.

Football is a game which requires more endurance The game Basketball also requires endurance but less than Football whereas Volleyball need less endurance than the other two games. Hence, a significant differences were observed among the three different games (Table 3). In case of other health related physical fitness variables, more or less they were required in all the three games due to which these variables had shown insignificant difference among the athletes.

Previous Studies revealed that vegetarian diet did not have neither a beneficial nor a detrimental effect on physical performance, especially when carbohydrate intake was

concerned [9, 10, 11, 12]. An emphasis on plant foods was needed to enhance carbohydrate intake and optimize body glycogen stores, which might lead to increase in dietary fiber intake to reduce the bioavailability of several nutrients, including zinc, iron, and some other trace minerals. However, there was no convincing evidence, that vegetarian athletes suffered impaired nutrient status from the interactive effect of their heavy exertion and plant-food based dietary practices to the extent that performance, health, or both were impaired. Although there had been some concern about protein intake for vegetarian athletes, data indicated that all essential and nonessential amino acids could be supplied by plant food sources alone as long as a variety of food was consumed and the energy intake is adequate. There had been some concern that vegetarian female athletes were at increased risk for oligoamenorrhea, but evidence suggested that low energy intake, not dietary quality, was the major cause. In conclusion, a vegetarian diet person was not associated with improved aerobic endurance performance.

Different studies had shown that vegetarian athletes could meet their protein needs from predominantly or exclusively plant-based sources when a variety of these foods were consumed daily and energy intake was adequate. Studies revealed that muscle creatine stores were lower in vegetarians than non-vegetarians. Though creatine supplementation provided ergogenic responses in both vegetarian and non-vegetarian athletes, most of the studies supported greater ergogenic effects on lean body mass accretion and work performance for vegetarians [13, 14, 15, 16].

## 5. Conclusion

Only endurance of health related fitness has shown significant difference in female vegetarian Football, Basketball and volleyball players. No significant differences were observed for flexibility, Lean Body Mass, Muscular strength and Muscular endurance. It could be inferred that in the game of Football high level of endurance was required as compared to Basketball and Volleyball.

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