

A Comparison of Selected Physical Fitness Parameters and Physiological Parameters between Individual Sports Athletes and Team Sports Athletes

Monika Ruhil

Coordinator of Sports, Ashoka University Plot No. 2, Rajiv Gandhi Education City, Kundli, Haryana- 131028 India

Abstract

The study was conducted to compare the selected physical fitness and physiological parameters namely muscular strength, muscular endurance, speed, flexibility, anaerobic power, vital capacity, basal metabolic rate, body mass index and waist hip ratio between the individual sports athletes and team sports athletes. For the purpose of the study 46 subjects who were studying in IGIPSS, University of Delhi were randomly selected (23 each from individual sports and team sports). The mean age, weight and height of the selected subjects were 18.13 ± 0.98 years, 57.43 ± 8.91 kgs and 1.67 ± 0.74 mtrs respectively. The criterion measure used were push up test for muscular strength, curl up test muscular endurance, 50 yards dash for speed, sit and reach test for flexibility, sarjent jump for anaerobic power, dry spirometer for vital capacity and metric BMR equation for basal metabolic rate. The independent 't' test was employed to compare the selected parameters between the individual sports athletes and team sports athletes with level of significance set at 0.05. The findings of the study revealed that the mean values of muscular strength (35.087 ± 10.3744), basal metabolic rate (1610.9478 ± 146.33830) and body mass index (21.1048 ± 2.32220) of individual sports athletes were found significantly higher than the mean values of muscular strength (28.826 ± 10.2365), basal metabolic rate (1473.9217 ± 159.01930) and body mass index (19.7378 ± 1.95883) of the team sports athletes as the 't' value obtained were 2.060, 3.041 and 2.158 respectively at $p \leq 0.05$. Similarly the mean values of muscular endurance (Value), speed (Value sec), anaerobic power (Value) and waist hip ratio (Value) of the individual sports athletes were found insignificantly higher than the muscular endurance (Value), speed (Value sec), anaerobic power (Value), and waist hip ratio (Value) of the team game athletes as the 't' value obtained were 0.148, 0.452, 1.686 and 0.592 respectively at $p > 0.05$. While the mean values of flexibility (Value) and vital capacity (Value cc) of team sports athletes were found insignificantly higher than the mean values of flexibility (Value) and vital capacity (Value cc) of the individual sports athletes as the 't' value obtained were 1.393 and 0.757 respectively at $p > 0.05$. It may be concluded that the individual sports athletes had significantly higher muscular strength, basal metabolic rate and body mass index; and higher but not significant muscular endurance, speed, aerobic power and waist hip ratio than the team sports athletes. While team sports athletes had higher but not significant flexibility and vital capacity than individual sports athletes.

KEYWORDS: Physical Fitness, Body Mass Index, Basal Metabolic Rate, Vital Capacity, Anaerobic Power, Speed, Muscular Strength, Muscular Endurance, Waist Hip Ratio, Flexibility.

Introduction

Fitness is a condition in which an individual has sufficient energy to avoid fatigue and enjoy life. Physical fitness is a state of well-being that comprises skill and health-related components. Skill-related physical fitness refers to an individual's athletic ability in sports and encompasses skill-related attributes like dynamic balance, power, speed and agility; the

health-related aspect is a measure of cardiovascular endurance, muscle strength, muscular endurance and flexibility and body composition (Hopkins & Walker, 1988).

Team sports are those in which individuals are organized into opposing teams which compete to win. Ex- hockey, cricket, football etc. Individual sports are those where only one person participate and compete with others. Ex- Athletics, badminton, boxing, judo etc. The variables on which this study based are physiological parameters and physical fitness components. The different variables are- BMI (Body mass index) is a measure of body fat based on your weight in relation to your height. BMR (basal metabolic rate) is the minimal amount of energy needed to keep your body functioning. Flexibility refers to range of motion around joint (uppal 2001). Speed refers to the ability to execute motor actions, under given conditions, in minimum possible time (uppal 2001). Muscular strength refers to the ability to act against resistance. Muscular endurance refers to the ability to exert force against resistance for longer duration. Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation. Anaerobic power reflects the ability of the ATP-PC energy pathways to produce energy for muscular contraction. Waist hip ratio is the ratio of the circumference of the waist to that of the hips, it estimates the fat distribution in body. These different variables used to find out the difference between those who participates in team sports or in individual sports because nature of every sport and requirement is different , the athlete posses those qualities which are required in that particular sport or event in which he/she participates. In every sport or event one requires all the motor abilities but according to the need and nature of the sport or event the ratio differ for example those who participate in jumps event need more explosive strength while comparing to a gymnast who need flexibility more , this is because the requirement for performance is different in both sports. Individual sport or team sport are different in nature, there need and requirement are different from each other which also creates difference in different variables among those who participates in it.

It is always a concern of the sports scientists and scholars are the individual sports athletes and team sports athletes differs in different parameters. This concern has motivated the scholar to compare the selected physical fitness and physiological parameters namely muscular strength, muscular endurance, speed, flexibility, anaerobic power, vital capacity, basal metabolic rate, body mass index and waist hip ratio between the individual sports athletes and team sports athletes.

Problem Statement

The purpose of the present investigation was to compare selected physical fitness parameters and physiological parameters between the individual sports and team sport and hence the study was entitled as “**A Comparison of Selected Physical Fitness Parameters and Physiological Parameters between Individual Sports Athletes and Team Sports Athletes**”.

Methodology

For the purpose of the study 46 subjects who were studying in IGIPSS, University of Delhi were randomly selected (23 each from individual sports and team sports). The mean age, weight and height of the selected subjects were 18.13 ± 0.98 years, 57.43 ± 8.91 kgs and 1.67 ± 0.74 mtrs respectively. The criterion measure used were weighing Scale for weight, measuring tape for height, push up test for muscular strength, curl up test muscular endurance, 50 yards dash for speed, sit and reach test for flexibility, sarjent jump for anaerobic power, dry spirometer for vital capacity and metric BMR equation for basal metabolic rate. The selected subjects underwent the above mentioned tests and the data

obtained were recorded in nearest kilogram for weight, speed in nearest one tenth of the second, height in meters, flexibility in centimeter, vital capacity in cubic centimeter (cc) while the following equations were used to calculate the body mass index, aerobic power and basal metabolic rate:

$$\text{Body Mass Index} = \frac{\text{Weight (Kgs)}}{(\text{Height (m)})^2}$$

$$\text{Aerobic Power} = 2.21 \times \text{Weight (kgs)} \times \sqrt{d}$$

where d= Jumping Reach – standing height

Basal Metabolic Rate:

$$\begin{aligned} \text{Women} &= 655 + (9.6 \times \text{Weight (kg)}) + (1.8 \times \text{Height (cms)}) - (4.7 \times \text{Age (Yrs)}) \\ \text{Men} &= 66 + (13.7 \times \text{Weight (kg)}) + (5 \times \text{Height (cms)}) - (6.8 \times \text{Age (Yrs)}) \end{aligned}$$

The independent 't' test was employed to compare the selected parameters between the individual sports athletes and team sports athletes with level of significance set at 0.05.

Findings

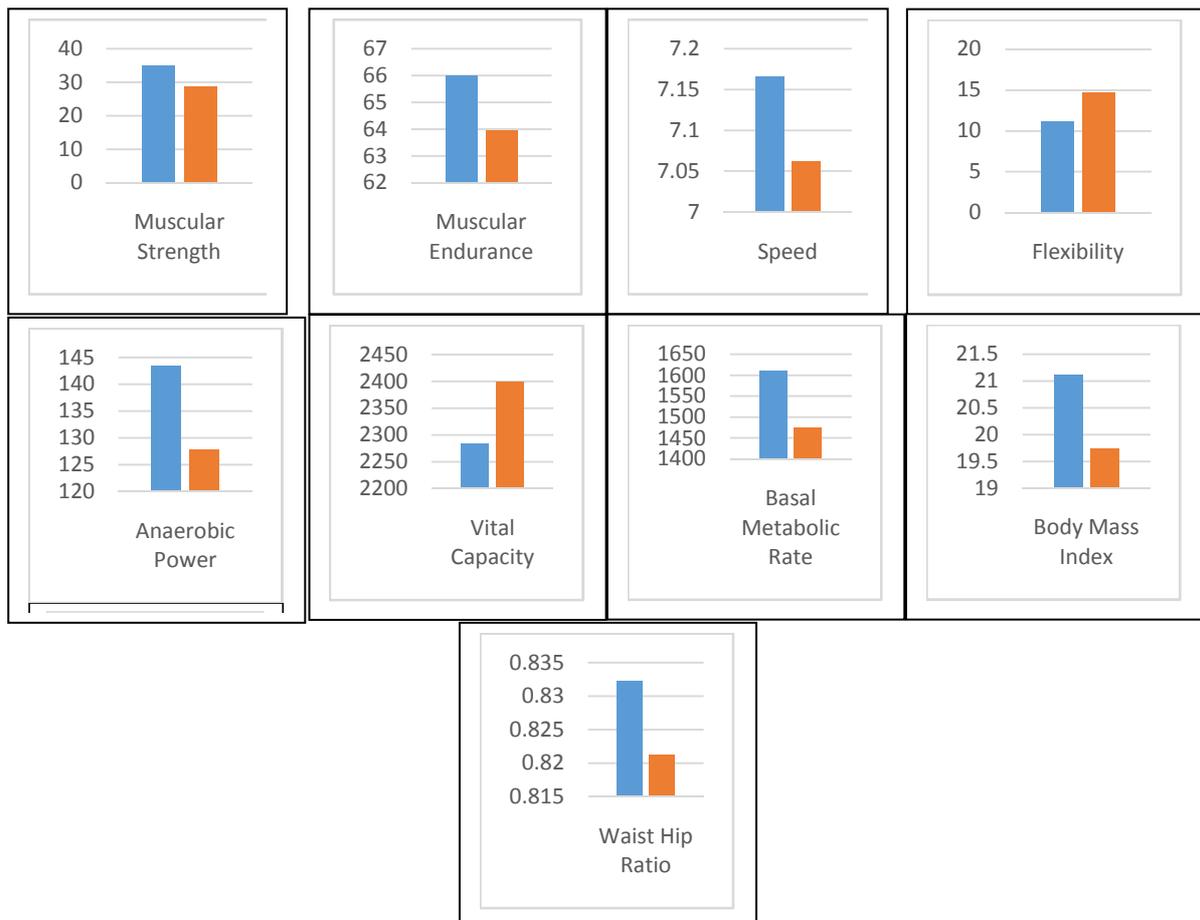
Table-1: Comparison of Selected Variables between Individual Sports and Team Sports

Variables	Game	N	Mean	Std. Deviation	Mean Difference	't'	Df	Sig. (2-tailed)																																																																																																			
Muscular Strength	Individual Game	23	35.087	10.3744	6.2609	2.060*	44	0.045																																																																																																			
	Team Game	23	28.826	10.2365					Muscular Endurance	Individual Game	23	66.000	59.8946	2.0435	0.148	44	0.883	Team Game	23	63.957	28.7441	Speed	Individual Game	23	7.1661	0.65292	0.10391	0.452	44	0.654	Team Game	23	7.0622	0.88912	Flexibility	Individual Game	23	11.1626	8.33144	-3.63913	-1.393	44	0.171	Team Game	23	14.8017	9.36118	Anaerobic Power	Individual Game	23	143.53	34.10	15.64433	1.686	44	0.099	Team Game	23	127.89	28.560	Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453	Team Game	23	2400.000	580.5562	Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44
Muscular Endurance	Individual Game	23	66.000	59.8946	2.0435	0.148	44	0.883																																																																																																			
	Team Game	23	63.957	28.7441					Speed	Individual Game	23	7.1661	0.65292	0.10391	0.452	44	0.654	Team Game	23	7.0622	0.88912	Flexibility	Individual Game	23	11.1626	8.33144	-3.63913	-1.393	44	0.171	Team Game	23	14.8017	9.36118	Anaerobic Power	Individual Game	23	143.53	34.10	15.64433	1.686	44	0.099	Team Game	23	127.89	28.560	Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453	Team Game	23	2400.000	580.5562	Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485								
Speed	Individual Game	23	7.1661	0.65292	0.10391	0.452	44	0.654																																																																																																			
	Team Game	23	7.0622	0.88912					Flexibility	Individual Game	23	11.1626	8.33144	-3.63913	-1.393	44	0.171	Team Game	23	14.8017	9.36118	Anaerobic Power	Individual Game	23	143.53	34.10	15.64433	1.686	44	0.099	Team Game	23	127.89	28.560	Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453	Team Game	23	2400.000	580.5562	Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																					
Flexibility	Individual Game	23	11.1626	8.33144	-3.63913	-1.393	44	0.171																																																																																																			
	Team Game	23	14.8017	9.36118					Anaerobic Power	Individual Game	23	143.53	34.10	15.64433	1.686	44	0.099	Team Game	23	127.89	28.560	Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453	Team Game	23	2400.000	580.5562	Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																																		
Anaerobic Power	Individual Game	23	143.53	34.10	15.64433	1.686	44	0.099																																																																																																			
	Team Game	23	127.89	28.560					Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453	Team Game	23	2400.000	580.5562	Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																																															
Vital Capacity	Individual Game	23	2284.783	442.2142	-115.2174	-0.757	44	0.453																																																																																																			
	Team Game	23	2400.000	580.5562					Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004	Team Game	23	1473.9217	159.01930	Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																																																												
Basal Metabolic Rate	Individual Game	23	1610.9478	146.33830	137.02609	3.041*	44	0.004																																																																																																			
	Team Game	23	1473.9217	159.01930					Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036	Team Game	23	19.7378	1.95883	Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																																																																									
Body Mass Index	Individual Game	23	21.1048	2.32220	1.36704	2.158*	44	0.036																																																																																																			
	Team Game	23	19.7378	1.95883					Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557	Team Game	23	0.8213	0.07485																																																																																						
Waist Hip Ratio	Individual Game	23	0.8323	0.04808	0.0109	0.592	44	0.557																																																																																																			
	Team Game	23	0.8213	0.07485																																																																																																							

*Significant at 0.05 level of Significance

Table-1 clearly reveals that the mean muscular strength (35.087 ± 10.3744), mean basal metabolic rate (1610.9478 ± 146.33830) and mean body mass index (21.1048 ± 2.32220) of individual game athletes were found to be significantly higher than the mean muscular strength (28.826 ± 10.2365), mean basal metabolic rate (1473.9217 ± 159.01930) and mean body mass index (19.7378 ± 1.95883) as the 't' value obtained were 2.060, 3.041 and 2.158 respectively at $p \leq 0.05$. While the mean muscular endurance (Value), mean speed (Value sec), mean anaerobic power (Value), and mean waist hip ratio (Value) of the individual game athletes were found to be insignificantly higher than the mean muscular endurance (Value), mean speed (Value sec), mean anaerobic power (Value), and mean waist hip ratio (Value) of the team game athletes as the 't' value obtained were 0.148, 0.452, 1.686 and 0.592 respectively at $p > 0.05$.

Similarly the mean flexibility (Value) and mean vital capacity (Value cc) of team game athletes were found to be insignificantly higher than the mean flexibility (Value) and mean vital capacity (Value cc) of the individual game athletes as the 't' value obtained were 1.393 and 0.757 respectively at $p > 0.05$. The comparison of the selected physical fitness and physiological parameters are graphically represent below



Discussions on the findings

1. **Analysis of the data revealed** that the mean muscular strength (35.087 ± 10.3744), mean basal metabolic rate (1610.9478 ± 146.33830) and mean body mass index (21.1048 ± 2.32220) of individual game athletes were found to be significantly higher than the mean muscular strength (28.826 ± 10.2365), mean

basal metabolic rate (1473.9217 ± 159.01930) and mean body mass index (19.7378 ± 1.95883) as the 't' value obtained were 2.060, 3.041 and 2.158 respectively at $p \leq 0.05$. While the mean muscular endurance (Value), mean speed (Value sec), mean anaerobic power (Value), and mean waist hip ratio (Value) of the individual game. So the result shows that those who participates in the individual sports athletes had significantly higher muscular strength, basal metabolic rate and body mass index than the team sports. The individual sports athletes had higher muscular endurance, speed, anaerobic power and waist hip ratio than the team sports athletes. The team sports athletes had higher flexibility and vital capacity than the individual sports athletes.

Conclusions

As per the statistical implementation and the findings of the study the following conclusions were drawn:

- 1-The individual sports athletes had significantly higher muscular strength, basal metabolic rate and body mass index than the team sports athletes.
- 2-The individual sports athletes had higher muscular endurance, speed, anaerobic power and waist hip ratio than the team sports athletes.
- 3-The team sports athletes had higher flexibility and vital capacity than the individual sports athletes.

Reference

- AAPHER (1965) AAPHER youth fitness test manual. Washington, DC. American Alliance for Physical Education and Recreation.
- Chia M (2007) Fit to play: enabling play and physical activity in children. In: The power of movement enhancing children's cognitive, social & emotional and physical development through movement. Nonis K & Daswani S (eds) Pearson Education Asia, Singapore. pp:112-128.
- Das P, Debnath P, Chatterjee P(2007) Compative Study of Physical Fitness Components of junior footballers and sprinters of Kolkata. J. Sports & Sports Sci. 30(4), 35-42.
- Hopkins WG and Walker NP (1988) The meanings of physical fitness. Preventive Med. 17,764-773.
- Jan Percival, Llyod Percival and Joe Taylor (1982) The complete guide to total fitness. A & C Black Publ. Ltd. pp:224.
- Jan Percival, Llyod Percival and Joe Taylor (1982) The complete guide to total fitness. A & C Black Publ. Ltd. pp: 224.
- Jenson CR and Hirst CC (1980) Measurement in physical education and athletic. Macmillan Publ. Inco. NY.
- Johnson BL and Nelson JK (1988) Practical measurements for evaluation in physical education (3rd ed.). Surjeet Publ. pp:245-246.
- Mal B (1982) Scoring ability in football. SNIPES J. p:22.
- Saini R (1996) Comparative study of psychomotor components between the athletes of individual and team sports. Unpublished Master Thesis. P.U. Chandigarh.

- Sidhu LS and Grewal R (1984) Effect of hard training on cardio-vascular system of Indian women hockey players. *J. Sports Med. Phy. Fitness.* 24(1), 34-40.
- Singh A (1986) Normative study of physical fitness of Punjab University men students. Unpublished Doctoral Thesis, Punjab University, Chandigarh.
- Sodhi HS and Sidhu LS (1984) Physique and selection of sportsmen – a Kinanthropometric study. Patiala Publ. House, Patiala.
- Tanaka K, Nakamura Y and Sakai T (2004) Role of exercise science in maintaining overall quality of life in humans. *Japan J. Phys. Educ. Hlth. Sport Sci.* 49, 209-229.
- Uppal AK (1980) Effect of 10-weeks participation in physical education programme on selected strength variables in women. *SNIPES.* 3(3), 31-34.