

Comparative study of some physiological variables and physical fitness of swimmers, athletes and sedentary people

■ ANWAR AZIZ DAR, YUWRAJ SHRIVASTAVA AND B. JOHN

Received : 22.02.2013; Revised : 15.08.2013; Accepted : 08.09.2013

■ ABSTRACT

Physical fitness is the quality of the whole body in terms of its state of adaptation to physical activity. Physical fitness implies more than one task and is usually meant to include not only the activities of everyday life but also emergencies in which a person is un-expectedly called up to perform activities demanding unusual, un-expenditure of strength energy and adoptive ability under extremely unfavourable situations. The main purpose of the study was to find out some physiological variables and physical fitness components of swimmers, athletes and sedentary people. 20 swimmers, 20 athletes and 20 sedentary people from Amravati district were selected as subjects. Only male subjects were selected. The age groups of the subjects were above 40 years. Some physiological variables (exhale capacity, haemoglobin percentage and pulse rate) were measured in this study. For measuring motor fitness Indiana motor fitness test was used. For the present study 20 subjects from each group were selected as subjects.

■ **Key Words** : Physiological variables, Physical fitness, Sedentary people

■ **How to cite this paper** : Dar, Anwar Aziz, Shrivastava, Yuwraj and John, B. (2013). Comparative study of some physiological variables and physical fitness of swimmers, athletes and sedentary people. *Internat. J. Phy. Edu.*, 6 (2) : 70-77.

See end of the article for
authors' affiliation

YUWRAJ SHRIVASTAVA
Dr. C.V. Raman University,
BILASPUR (C.G.) INDIA
Email: yuwrajs56@gmail.com

In most educational systems, physical education, also called as physical training in many countries, through each with a very different connotation, is a course-both at academic and at teacher training level in the curriculum which utilizes learning in the cognitive (perceptual-conceptual development and information-processing ability), affective (experience of feeling or emotion) and psychomotor (neuromuscular experience of activity) domains in a play or movement exploration setting. Both participation and study are vital to physical education. The primary aims of physical education vary historically, based on the needs of the time and place. Often, many different types of physical education occur simultaneously, some intentionally and others not. Most modern schools' goal is to equip students with the knowledge, skills, capacities and values along with the enthusiasm to maintain a healthy lifestyle into adulthood. Some schools also require physical education as a way to

promote weight loss in students. Activities included in the programmes are designed to promote physical fitness, to develop motor skills, to instill knowledge and understanding of rules, concepts, and strategies and to teach students to work as part of a team, or as individuals, in a wide variety of competitive activities (Ardie, 1991).

Aim of physical education :

To a large extent general education was physical education in early societies for the environment made great demands on physical condition of man. Youth who lacked in physical courage stamina and skill were a danger to the community. In the chances of group survival, the tribe encouraged both to develop the strength, endurance, agility and skills needed to withstand the rigors of outdoor life, to obtain the necessities of life and to engage in aggressive and defensive actions.

Physical fitness :

Human life is based upon the body he keeps. All the activities of life are done with the help of body. Nature has created humans to perform various activities efficiently. Today modernization has made human life more easy, as most of the work is performed by the machines. The sedentary life style of man has reduced the efficiency of humans. fitness not only to improve our abilities but also to improve our health and wellness. This will also help to develop healthy environment around us along with community health, thus, nation will be benefited. By organizing physical fitness programmes, we can improve our fitness, wellness and health (Berger, 1982).

Origin and development of swimming :

Swimming has been known since prehistoric times. The earliest records of people swimming are drawings founds near Wadi Sora (or soru) in the southwestern part of Egypt which date back about 6000 years ago. The Bible, the Iliad and the Odyssey all contain written references to swimming. Many ancient civilizations swam, including the Egyptians, Phoenicians, Persians, Romans and Greeks.

Sedentary people :

Sedentary life style is a medical term used to denote a type of life with no or irregular physical activity. A person who lives a sedentary life style may colloquially be known as a couch potato. It is commonly found in both the developed and developing world. Sedentary activities include sitting, reading, watching television, playing certain activities video games and computer use for much of the day with little or no vigorous physical exercise. A sedentary life style can contribute too many preventable causes of death.

A sedentary lifestyle and lack of physical activity can contribute to or be risk factor for anxiety, cardio vascular diseases, high blood pressure, diabetes, kidney stones, obesity and depression.

Physiology :

Physiology is the science which deals with the study of human body functions.

Sports physiology :

Sports physiology is derived from exercise physiology. It applies the concept of exercise physiology to training the athlete and enhancing the athlete's sports performance.

As physiology mainly focuses on the functions of structures, we cannot discuss physiology without knowing anatomy. Similarly, we cannot understand the anatomy and physiology until and unless we know the composition of human body.

Statement of problem :

Physical fitness is backbone of the human life. Physical fitness has a great role in life, but to maintain physical fitness and functions of internal organs daily exercise is must. Different people do different exercises according to their interest, for example—swimming, running, walking, calisthenics and yoga exercises etc. But which exercise has high and low influence on physical fitness and health status, so present research work was undertaken.

Purpose of the study :

The main purpose of the present study was to find out some physiological variables and physical fitness components of swimmers, athletes and sedentary people.

Some allied objectives of the study were :

- To find out the exhale capacity of swimmers, athletes and sedentary people.
- To find out the haemoglobin percentage of swimmers, athletes and sedentary people.
- To find out the pulse rate of swimmers, athletes and sedentary people.
- To find out the physical fitness of swimmers, athletes and sedentary people.
- To compare the exhale capacity of swimmers, athletes and sedentary people.
- To compare haemoglobin percentage of swimmer, athletes and sedentary people.
- To compare the pulse rate of swimmers, athletes and sedentary people.
- To compare the physical fitness of swimmers, athletes and sedentary people.
- To find out the high and low of some physiological variables of swimmers, athletes and sedentary people.
- To find out the high and low physical fitness of swimmers, athletes and sedentary people.

Significance of the study :

The significance of the study was follows :

- The study would be helpful to know exhale capacity of swimmers, athletes and sedentary people.
- The study would be helpful to know the haemoglobin percentage of swimmers, athletes and sedentary people.
- The study would be helpful to know the pulse rate of swimmers, athletes and sedentary people.
- The study would be helpful to know the physical fitness of swimmers, athletes and sedentary people.
- The study would be helpful in comparing the exhale capacity of swimmers, athletes and sedentary people.
- The study would be helpful in comparing haemoglobin percentage of swimmers, athletes and sedentary people.



- The study would be helpful in comparing the pulse rate of swimmers, athletes and sedentary people.
- The study would be helpful in comparing the motor fitness of swimmers, athletes and sedentary people.
- The study would be helpful in comparing the high and low of some physiological variables swimmers, athletes and sedentary people.
- The study would be helpful to know high and low physical fitness of swimmers, athletes and sedentary people.

Hypothesis :

It is hypothesized that there will be significant difference in some physiological variables and physical fitness of swimmers, athletes and sedentary people.

Delimitations :

The study was delimited to the following areas :

- Subjects were selected from Amravati district.
- Only male subjects were selected.
- The age groups of the subjects were above 40 years.
- Some physiological variables (exhale capacity, haemoglobin percentage and pulse rate) were measured in this study.
- For measuring motor fitness, Indiana motor fitness test was used.
- For the present study, 20 subjects from each group were selected as subjects.

Limitations :

In this study following are the limitations which were not being taken into consideration.

- Socio-economical status of the subjects was not being considered.
- In this study caste, religion of the subjects was not considered.
- Personality traits and habits were not being considered.
- Diet and daily routine of the subjects were not being considered.
- There was no control over the cost of the equipment used by the subjects.
- No specific motivational technique was not being used while collecting data.
- Family backgrounds of the subjects were not being considered.

Physical fitness :

The ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure-time activities and meeting emergency demands (Balwal, 1996).

Exhale capacity :

Maximal volume force fully expired after maximal

inspiration is called exhale capacity (Best, 1983).

Haemoglobin :

Haemoglobin is O₂ carrying pigment of blood, the principle protein in the erythrocyte. Haemoglobin content is defined as gram percentage of haemoglobin for each 100 ml of blood (Bhomil, 1987).

Pulse rate :

Pulse rate is actually the frequency of pressure waves (waves per minute) propagated along the arteries such as carotid as radial arteries.

■ METHODOLOGY

The information regarding the selection of subjects, sources of data sampling procedure, selection of the variables, selection of the test, description of the test and collection of the data have been described in this chapter.

Source of data :

The present research has been taken on the male subjects for the study. The sources from swimmers, athletes and sedentary people of Amravati district were taken as sources of data.

Selection of subject :

As subjects, 20 swimmers, 20 athletes and 20 sedentary people from Amravati were selected.

Sampling method :

The purposive sampling method was applied to select the subjects for this study.

Criterion measures :

The following criterion measures were chosen for testing the hypothesis.

Exhale capacity :

Peak flow meter was used to measure the exhale capacity.

Pulse rate :

Stop watch was used to measure the pulse rate.

Haemoglobin :

HB percentage of the subjects was measured by HB apparatus (Sahil's Haemometer).

Purpose:

To measure exhale capacity.

Equipment :

Peak flow meter / Exhale Barometer.

Procedure :

The subject was asked to stand erect. Then he /she was asked to inspire to the highest of his/her capacity. Then put the mouthpiece of pick flow meter in his/her mouth in such a way that the position of peak flow meter should be parallel to the ground surface. Then ask the individual to expire forcefully avoiding the leakage of the expired air. That is the entire air should pass only through the apparatus. Three chances were given to each subject and the best of three will be granted as the test score. Scoring was done in ml being the norms for male 400-450 ml. and 300-350 ml. for female.

Purpose :

To estimate haemoglobin percentage.

Sahli haemometer :

Non-fading standard brown tinted glass pieces are provided in either side of the slot for cod matching. An opaque white glass is fitted at the back to provide uniform illumination.

Haemoglobin pipetter :

It has only one mark indicating 20 cm (0.02 ml) blood.

Stirrer :

It is a thin glass rod for mixing the blood in HCl.

Needle :

For pricking the finger.

Cotton :

For cleaning the finger.

N/10 HCl :

To convert haemoglobin in to acid hemain.

Distilled water :

For estimation of haemoglobin of blood.

■ OBSERVATIONS AND DISCUSSION

The statistical analysis of the data was done for the

comparison of some physiological variables of swimmers, athletes and sedentary peoples and Physical fitness in this chapter.

The research scholar conducted Physiological Variables and Physical fitness variables on 60 subjects 20 from each group to compare physiological Variables and motor fitness variables of Swimmers, Athlete and sedentary people.

The following physiological variable and Physical fitness variable were conducted for this study *i.e.*

Physiological variables :

- Haemoglobin
- Pulse rate
- Exhale capacity

Physical fitness variables :

- Arm and shoulder strength
- Abdominal strength
- Explosive strength
- Agility
- Endurance
- Speed

Table 1 shows the mean value of the various groups in the haemoglobin percentage. The mean value of swimmer subjects was 13.95. The mean value of athlete subjects was 13.55 and mean value of sedentary subjects was 13.6.

Table 1 : Mean value of hemoglobin percentage of swimmers, athletes and sedentary subjects

Name of group	Mean
Swimmers	13.95
Athletes	13.55
Sedentary	13.6

To find the mean difference F test was applied. Table 2 shows the mean difference obtained by applying F test.

Table 2 reveals that there was significant difference between the means of swimmers, athletes and sedentary subjects of haemoglobin percentage. The F 0.4720 was as tabulated value. Calculated F was less than the Tabulated F, which shows the not significant in swimmers, athletes

Table 2: Anova table showing mean difference of swimmers, athletes and sedentary subjects

Source of variance	df	Sum of squares	Mean variance	F Calculated	F Tabulated
Between groups	K-1 (3-1=2)	1.8994	0.9497		
Within groups	N-K (60-3=57)	114.7002	2.0123	0.4720	3.15

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

Table 3: Post hoc table showing mean difference of hemoglobin percentage of swimmers, athlete and sedentary subjects

Group	Mean	Group	Mean	Mean diff.	Cri. diff.
Swimmers	13.9500	Athletes	13.5500	0.4000	1.1259
Swimmers	13.9500	Sedentary	13.6000	0.3500	1.1259
Athletes	13.5500	Sedentary	13.6000	0.0500	1.1259



subjects of haemoglobin percentage. Therefore, there is no need of post hoc test.

Table 3 shows the mean difference between swimmers, athletes and sedentary subjects. The mean value of swimmers was 13.9500 and the mean value of athletes was 13.55. The mean difference between swimmers and athlete subjects was 0.4000 which was less than critical difference, where critical difference was 1.1259. This shows non-significant difference.

The mean value of swimmers was 13.95 and the mean value of sedentary was 13.60. The mean difference between swimmers and sedentary was 0.3500 which is less than critical difference. Where as critical difference was 1.1259. This shows non-significant difference.

The mean value of athletes was 13.5500 and the mean value of sedentary was 13.6000. The mean difference between athletes and sedentary was 0.0500 which is less than critical difference. Where as critical difference was 1.1259 this shows the non-significant difference.

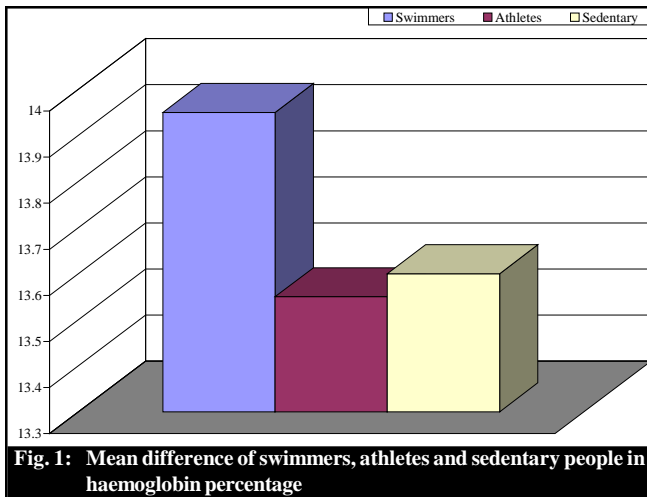


Fig. 1: Mean difference of swimmers, athletes and sedentary people in haemoglobin percentage

Table 4 shows the mean value of the various groups in the Pulse rate. The mean value of swimmer subjects was 73.4. The mean value of athlete subjects was 74.95 and mean value of sedentary subjects was 78.4.

Table 4: Mean value of pulse rate of swimmers, athletes and sedentary subjects

Name of group	Mean
Swimmers	73.4
Athletes	74.95
Sedentary	78.4

To find the mean difference, F test was applied. Table 5 shows the mean difference obtained by applying F test.

Table 5 reveals that there was significant difference between the means of swimmers, athletes and sedentary subjects of pulse rate. The calculated F was 5.3093 where as tabulated F was 3.15. Calculated F greater than the Tabulated F, which shows the significance in swimmers, athletes subjects of Pulse rate. Therefore, there is need of post hoc test.

Table 6 shows the mean difference between swimmers, athletes and sedentary subjects. The mean value of swimmers was 73.40 and the mean value of athletes was 74.950. The mean difference between swimmers and athlete subjects was 1.55 which is less than the critical difference, where critical difference was 3.94. This shows non-significant difference.

The mean value of swimmers was 73.400 and the mean value sedentary was 78.40. The mean difference between swimmers and sedentary was 5.00 which is more than critical difference. Where as critical difference was 3.94. This show the significant difference.

The mean value of athletes was 74.950 and the mean value sedentary was 78.40. The mean difference between athletes and sedentary was 5.00 which is more than critical difference. Where as critical difference was 3.450 and this shows the not significant difference (Fig. 2).

Table 7 shows the mean value of the various groups in the exhale capacity. The mean value of swimmer subjects was 419.50, mean value of athlete subjects was 364.50 and mean value of sedentary subjects was 346.00.

To find the mean difference F test was applied. Table 8 shows the mean difference obtained by applying F test.

Table 8 reveals that there was significant difference

Table 5: Anova table showing mean difference of swimmers, athletes and sedentary subject

Source of variance	df	Sum of squares	Mean variance	F Calculated	F Tabulated
Between the groups	K-1 (3-1=2)	262.0313	131.0156		
Within the groups	N-K (60-3=57)	1406.5630	24.6765	5.3093	3.15

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

Table 6: Post hoc table showing mean difference of exhale capacity of swimmers, athlete and sedentary subjects

Group	Mean	Group	Mean	Mean diff.	Cri. diff.
Swimmers	73.4000	Athletes	74.9500	1.5500	3.9429
Swimmers	73.4000	Sedentary	78.4000	5.0000	3.9429
Athletes	74.9500	Sedentary	78.4000	3.4500	3.9429

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

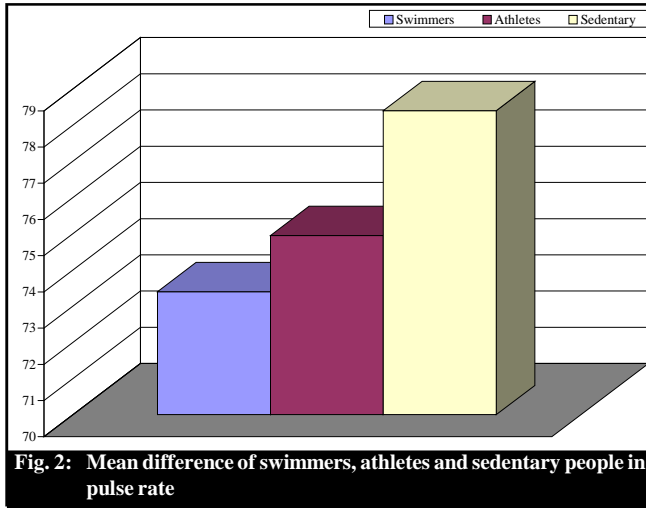


Table 7: Mean value of exhale capacity of swimmers, athletes and sedentary subjects

Name of group	Mean
Swimmer	419.50
Athletes	364.50
Sedentary	346.00

between the means of swimmers, athletes and sedentary subjects of exhale capacity. The calculated F was 18.6230 where as tabulated F was 3.15. Calculated F was greater than the Tabulated F, which shows the significant difference in swimmers, athletes subjects of exhale capacity. Therefore, there is need of post hoc test.

Table 9 shows the mean difference between swimmers, athletes and sedentary subjects. The mean value of swimmers was 419.50 and the mean value of athletes was 364.00. The mean difference between swimmers and athlete subjects was 55.00 which was greater than critical difference. Where as critical difference was 31.44. This shows significant difference.

The mean value of swimmers was 419.500 and the mean value sedentary was 346.00. The mean difference between swimmers and sedentary was 73.50 which was more than

critical difference. Where as critical difference was 31.44 which shows the significant difference.

The mean value of athletes was 346.00 and the mean value sedentary was 346.00. The mean difference between swimmers and sedentary was 18.50 which was more than critical difference. Where as critical difference was 31.44 this shows the not significant difference (Fig. 3).

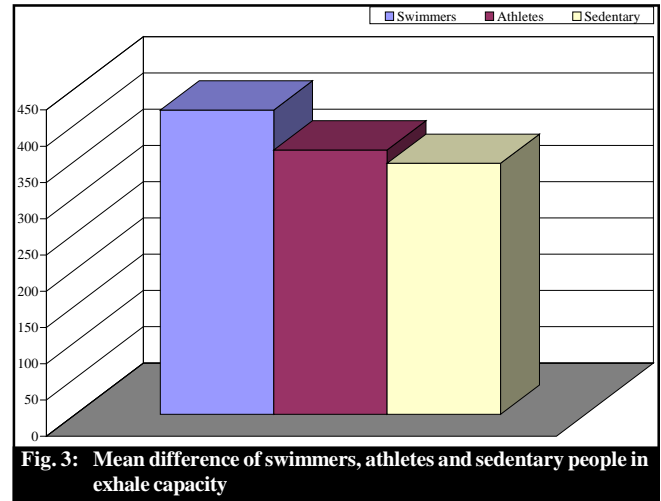


Table 10 shows the mean value of the various groups in the physical fitness. The mean value of swimmer subjects was 37.500. The mean value of athlete subjects was 30.5000 and mean value of sedentary subjects was 18.2500.

To find the mean difference, F test was applied. Table 11 shows the mean difference obtained by applying F test.

Table 11 reveals that there was significant difference between the means of swimmers, athletes and sedentary subjects of physical fitness. The calculated F was 23.1073 where as tabulated F was 3.15. Calculated F was greater than the tabulated F, Which shows the significant difference in swimmers, athletes and sedentary subjects of physical fitness. Therefore, there is need of post hoc test.

Table 12 shows the mean difference between swimmers, athletes and sedentary subjects. The mean value of swimmers

Table 8: Anova table showing mean difference of swimmers, athletes and sedentary subjects

Source of variance	df	Sum of squares	Mean variance	F Calculated	F Tabulated
Between the groups	K-1 (3-1=2)	58463.0000	29231.5000		
Within the groups	N-K (60-3=57)	89470.0000	1569.6490	18.6230	3.15

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

Table 9: Post hoc table showing mean difference of exhale capacity of swimmers, athlete and sedentary subjects

Group	Mean	Group	Mean	Mean diff.	Cri. diff.
Swimmers	419.5000	Athletes	364.0000	55.0000	31.4465
Swimmers	419.5000	Sedentary	346.0000	73.5000	31.4465
Athletes	364.0000	Sedentary	346.0000	18.5000	31.4465

F at 2&52 degree of freedom at 0.05 level of significance is 3.15



Table 10: Mean value of physical fitness of swimmers, athletes and sedentary subjects

Name of group	Mean
Swimmers	37.5000
Athletes	30.5000
Sedentary	18.2500

was 37.500 and the mean value of athletes was 30.50. The mean difference between swimmers and athlete subjects was 7.000 which was less than critical difference. Where as critical difference was 7.1950. This shows non-significant difference in swimmers and athletes in physical fitness.

The mean value of swimmers is 37.500 and the mean value sedentary was 18.25. The mean difference between swimmers and sedentary was 19.25 which was more than critical difference. Where as critical difference was 71.950 this show the significant difference in physical fitness of swimmers and sedentary subjects.

The mean value of athletes was 30.500 and the mean value sedentary was 18.25. The mean difference between swimmers and sedentary was 12.25 which was more than critical difference. Where as critical difference was 71.950 this show the significant difference in athletes and sedentary subjects (Fig. 4).

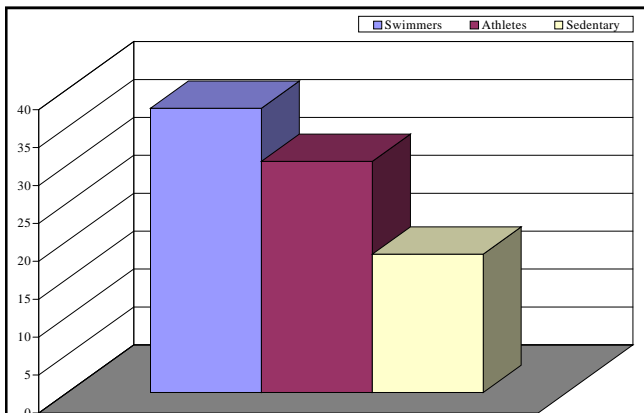


Fig. 4: Mean difference of swimmers, athletes and sedentary people in physical fitness

Justification of hypothesis :

In the beginning it was hypothesized that there will be significant difference between some physiological variables and physical fitness of swimmers, athletes and sedentary people. But after analysis and interpretation of data by applying F test it showed significant difference in some physiological variables and physical fitness of swimmers, athletes and sedentary peoples. Hence, the hypothesis was accepted.

Every nation is in increasing concerned about health, fitness of its citizen realizing that health and fitness are basic fundamentals of every citizen. The strength of the nation rests upon the health of its people and future of the health of the people depends to a large extent, on what in done to promote, improve and preserve the health as health is a fundamental human right to be a good man in the first requisite to success in life and to be nation of healthy citizens in the first condition to national prosperity.

Physical fitness is the quality of the whole body in terms of its state of adaptation to physical activity. Physical fitness implies more than one task and is usually meant to include not only the activities of everyday life but also emergencies in which a person is un-expectedly called up to perform activities demanding unusual, un-expenditure of strength energy and adoptive ability under extremely unfavourable situations.

The dominance of different fitness factors vary from game to game and with players to players but it does not include all the essentials of many things are required for higher performance in addition to physical and motor fitness, no doubt the high degree of motor fitness is necessary for success in all the games and sports.

The important parameters are physiological parameters which seems to play a very important role in the modern competitive sports in production of more excellent performance, because competitions are organized more frequently than ever before in the different sports of the world.

Conclusion :

On the basis of finding and within the limitation of

Table 11: Anova table showing mean difference of swimmers, athletes and sedentary subjects

Source of variance	df	Sum of squares	Mean variance	F Calculated	F Tabulated
Between groups	K-1 (3-1=2)	3797.500	1898.7500		
Within groups	N-K (60-3=57)	4683.7500	82.1711	23.1073	3.15

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

Table 12: Post hoc table showing mean difference of physical fitness of swimmers, athlete and sedentary subjects

Group	Mean	Group	Mean	Mean diff.	Cri. diff.
Swimmers	37.500	Athletes	30.500	7.000	7.1950
Swimmers	37.500	Sedentary	18.25	19.250	7.1950
Athletes	30.500	Sedentary	18.25	12.250	7.1950

F at 2 and 52 degree of freedom at 0.05 level of significance is 3.15

present study, the following conclusion has been drawn :

There was no significant difference in haemoglobin percentage of swimmers athlete and sedentary subjects.

There was significant difference in pulse rate of swimmers athlete and sedentary subjects.

There was a significant difference in exhale capacity of swimmers athlete and sedentary subjects.

There was significant difference in physical fitness of swimmers athlete and sedentary subjects because obtained F was more than Table F.

Recommendation :

The following recommendations were made on the basis of the results from the study which may be useful for the future research work.

- The study may be repeated to other physiological and physical fitness variables on the same subjects.
- The similar study may be repeated on the female subjects.
- The same study may be repeated on the other class of the society for different age groups.
- In this study nine variables were taken, but this can be done on more or less variables.
- The similar study can be carried out on the total physical fitness.
- The study can be carried on the basis of different regions.
- The study may be conducted on the basis of different types of profession.
- The study may be conducted to find out the relationship between physiological and physical fitness variables.

Authors' affiliations:

ANWAR AZIZ DAR AND B. JOHN, Dr. C.V. Raman University, BILASPUR (C.G.) INDIA

■ REFERENCES

- Ardie, Mc. (1991).** *Exercise Physiology* Philadelphia, Lea and Fenger.
- Berger, R.A., (1982).** *Applied exercise physiology*, Philadelphia, Lea & Ferber.
- Balwal, Lakshmi Kant (1996).** Comparative study of certain selected physiological components of cricket players and sprinters.

Master Thesis, Amravati University, Amravati, M.S. (INDIA) .

Best, J.W. (1983). Research in education : Prentice – Hall of india Pvt. Ltd., NEW DELHI (INDIA).

Bhomik, Amit Kumar (1987). Comparison of selected physiological parameters between soccer and Kabaddi players. Master's Thesis, Amravati University, M.S. (INDIA) .

Bodhankar, U.D. (1993). The relationship of haemoglobin level to physical fitness among the girls collage of yeoman city. Ph.D. Thesis, YEOMAN.

Bucher, C.A. (1960). Foundation of physical education, (st. fouis : the C.V. Mosby Co.

Chowbhary, Shea (1980). comparison of selected physiology variables of kho–kho and kabaddi girls team of Tripura state, Ph.D. Thesis, Jiwaji University, Gwalior, M.P. (INDIA).

Deb, Biplab K. (1984). Comparison of selected circulatory respiratory and anthropometric variables of student participating in different team sports, Master,s Thesis Jiwaji University, Gwalior, M.P. (INDIA).

Debnath, Kalapna (1981). Comparative study of physiological and physical activities of gymnastics and football players Master's Thesis, Jiwaji University, Gwalior, M.P. (INDIA).

Dogra, S.R. (2007). Hemoglobin percentahe amongst the national level girl handball players of central schools Master dissertation, Amravati University, Amravati, M.S. (INDIA).

Gill, Manmeet, Deol, Nishann Singh and Kaur, Ramanjit (2010). Comparative study of physical fitness components of rural and urban female students of Punjabi University, Patiala, *Anthropologist*, **12**(1): 17-21.

Grievink, L., van der Velden, P.G, Stellato, R.K., Dusseldorp, A., Gersons, B.P., Kleber, R.J. and Lebret, E. (2007). A Longitudinal comparative study of the physical and mental health problems of affected residents of the firework disaster Enschede the Netherlands. *Public Health*, **121**(5) : 367-374.

Huff Nancy, Harbin (2000). A comparison of physical fitness levels of home school and public school students in south Alabama dissertation abstract international, **61**(2).

Moezy, Azar, Olyaei, Gholamreza, Hadian, Mohammadreza, Razi, Mohammad and Faghihzadeh, Soghrat (2008). A comparative study of whole body vibration training and conventional training on knee proprioception and postural stability after anterior cruciate ligament reconstruction. *British J. Sports Med.*, **42** (5) : 373-378.

6th
Year
★★★★★ of Excellence ★★★★★

