International Journal of Physical Education
Volume 6 | Issue 2 | October, 2013 | 95-97
Research Article

A comparative study of vital capacity among different groups of sportsman

■ **PRADEEP SINGH CHAHAR**

Received : 03.04.2013; **Revised :** 20.10.2013; **Accepted :** 30.10.2013

■ **ABSTRACT**

The purpose of the study was to compare the vital capacity among different groups of sportsmen. To accomplish this purpose a total of thirty inter-university level sportsmen of different sports (10-swimming, 10-basketball and 10-hockey) with 17-24 years of age from Lakshmibai National University of Physical Education, Gwalior, were selected as the subjects for the present study. The variables taken into account in this study were age, height, weight and vital capacity of the sportsmen. The vital capacity (VC) in L/min of the sportsman was measured with the help of Winspiro PRO computerized spirometer. One way analysis of variance results showed significant difference in vital capacity among different groups of sportsmen ($F=7.407$; $p<.01$). Further LSD post hoc test revealed that among the different sports group of players chosen for this study, the swimmers showed maximum vital capacity. This might be due to the fact as swimming exercises lead to functional improvement in respiratory muscles and also alterations in elasticity of lung and ventilatory muscles, leading to an improvement in vital capacity and other lung functions.

Author for correspondence :
PRADEEP SINGH CHAHAR
Lakshmibai National University of Physical Education, GWALIOR (M.P.) INDIA

■ **Key Words :** Spirometer, Vital Capacity, Different Sports, Sportsmen

■ **How to cite this paper :** Chahar, Pradeep Singh (2013). A comparative study of vital capacity among different groups of sportsman. *Internat. J. Phy. Edu.*, 6 (2) : 95-97.

Exercises in the form of sports, aerobics or workouts, if performed regularly have a beneficial effect on the various systems of the body (Ward, 1994). Breathing and exercise have always been closely linked in athletic training and keep-fit propaganda and any physical effort is quite obviously dependent on efficient pulmonary ventilation (Stanley Miles, 1969). Proper breathing techniques are essential to an athlete, because it can help him or her become more successful during athletic activity, and increases lung capacity. Increasing lung capacity can help an athlete become more energetic during sports, feel more refreshed after the sport, and it can also help him or her prevent respiratory distress (Jeanne Rose, 2012).

The lung function tests, like other physiological tests must be of the utmost importance for measuring the fitness of an individual from a physiological point of view (Astrand and Rodahl, 1970). Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation. It is equal to the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume (Biersteker and Biersteker, 1985). It is generally assumed that physically active persons, in sports or at work, have higher vital capacities than physically inactive persons of the same sex, age, height, and weight (Rong *et al.,* 2008). In a study where the lung function measurements were correlated with sport, age, gender, height, and weight in the various athletes. The lung capacity of swimmers was greater than that of other athletes (Mehrotra *et al.,* 1998). Hence, the present study was undertaken with a view to compare the vital capacity among different groups of sportsmen.

■ METHODOLOGY

A total thirty (n=30) inter-university level sportsmen of different sports (10-swimming, 10-basketball and 10-hockey) belonging to age group 17-24 years and height ranging from 154–187 cm from Lakshmibai national university of physical education, Gwalior, having no history

of smoking or respiratory complaint were selected as the subjects for the present study. The present study was conducted just prior to their interuniversity tournaments. Obviously, it was assumed that all the sportsmen were physically well-trained and were of university level. Before administering the vital capacity test, the age in completed years, height in cm and weight in kg of the sportsmen were measured and recorded. The vital capacity (VC) of the sportsman was measured with the help of Winspiro PRO computerized spirometer. The vital capacity has been expressed in L/min.

Administration of test :

The subject sat comfortably facing the spirometer and was asked to inspire as deeply as possible to fill the lungs, while keeping the nostrils closed with a nose clip and the mouthpiece held firmly between the lips after that the subject was instructed to exhale the air as much as possible with maximum effort into the spirometer. Three trials were taken of each subject at an interval of 5 min. and the highest among the three was taken as final (Miller *et al.*, 2005).

Statistical technique :

The comparison of mean vital capacity values among different groups of sportsmen were performed by descriptive statistics, one way analysis of variance (ANOVA). Further, LSD post hoc test was employed for means comparison in case of significant.

■ OBSERVATIONS AND DISCUSSION

The characteristics of the study subjects with the help of descriptive statistics are presented in Table 1. There were total thirty participants included in this study. The mean and standard deviation for age, height and weight of the subjects were 21.50 ± 1.9, 173.73 ± 5.9 and 67.03 ± 8.1, respectively.

Table 1: Descriptive statistics for subjects

Profile	N	Mean	Std. deviation
Age	30	21.50	1.9
Height	30	173.73	5.9
Weight	30	67.03	8.1

The descriptive statistics for the different sports in context to vital capacity used in the present study are presented in Table 2. The mean and standard deviation values of vital capacity for swimmers, hockey players and basketballers were 4.84 ± 0.53, 3.98 ± 0.72 and 4.71 ± 0.29, respectively.

Table 2: Descriptive statistics for vital capacity

Different sports group	N	Minimum	Maximum	Mean	Std. deviation
Swimmers	10	4.21	6.04	4.84	0.53
Hockey players	10	2.73	5.16	3.98	0.72
Basketballers	10	4.23	5.07	4.71	0.29

The mean values of vital capacity of different groups of sportsmen have been compared by means of analysis of variance (ANOVA) are depicted in Table 3.

Table 3 : One way analysis of variance of three different sports in relation to vital capacity

	Sum of squares	df	Mean square	F-ratio	Sig.
Between groups	4.456	2	2.228	7.407*	.003
Within groups	8.121	27	.301		
Total	12.576	29			

* Significant at 0.05 level; *p<.01, P=0.05; F_{05} (2, 27) = 3.35

Table 3 reveals that there was a significant difference between different sports in relation to vital capacity as calculated value of F (7.407) was greater than that of tabulated value (3.35) at .05 level of significance.

As the differences between the means of vital capacity among different sports *i.e.*, swimmers, hockey players and basketballers were found significant as shown in Table 3. Therefore, the LSD post-hoc test was employed to compare the groups with each other as shown in Table 4. Looking at the results (p-values), we can see the comparison between swimmers and hockey players was significant, as the p-value was lower than 0.05. Making the comparison of hockey players with basketballers, the p-value was again less than 0.05 and even 0.001, so the value was highly significant. The comparison of swimmers and basketballers showed no significant difference as the p-value was greater than 0.05. (Fig. 1).

Table 4 : LSD post hoc means comparison of different sports in relation to vital capacity

Swimmers	Hockey players	Basketballers	Mean difference	p-value
4.84	3.98		.87700*	.001
4.84		4.71	.13600	.584
	3.98	4.71	-.74100*	.001

* and ** Indicate significance of value at P=0.05 and 0.01, respectively

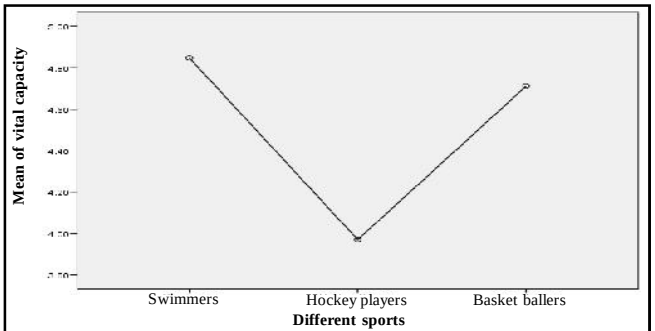

Fig. 1 : Graphical representation of means of different sports group in relation to vital capacity

Various researches have already worked on the vital capacity values in healthy peoples. In the present study, effort was made to compare the vital capacity of different sportsmen (swimmers, hockey players and basketballers) with each other. The results discussed above clearly indicated that all the players had higher values of vital capacity, by this means we can say that regular exercise has a upbeat effect on the lungs and there volumes. The statistical finding of the present study revealed that there was a significant difference in mean vital capacity of different sportsmen. Similar findings have been obtained by the studies done by Chatterjee *et al*. (2010); Mehrotra *et al.* (1998), Ghosh *et al.* (1985) and Stanley Miles (1969).

Among all the sportsmen chosen for this study, the swimmers showed the highest value of vital capacities. The reason for this better vital capacity could be manifold. Swimming exercise affects lung volume measurements as respiratory muscles including diaphragm of swimmers are required to develop greater pressure as a consequence of immersion in water during respiratory cycle, thus, may lead to functional improvement in respiratory muscles and also alterations in elasticity of lung and chest wall or of ventilatory muscles, leading to an improvement in vital capacity and other lung functions of swimmers (Sable *et al.*, 2012). The results of the present study resembles with the study done by Mehrotra *et al*. (1998) and Gupta *et al*. (2012) who observed that the vital capacity of the swimmers were higher than the other sportsmen. Therefore, it may be concluded that regular swimming exercises, can reduce risk of developing lungs disease and other related diseases and can also become a part of the remedy programme of patients recuperating from COPD and other lung disorders.

■ REFERENCES

Astrand, P.O. and Rodahl, K. (1970). *Textbook of work physiology*, McGraw-Hill, KOGAKUSA.

Biersteker, M.W. and Biersteker, P.A. (1985). Vital capacity in trained and untrained healthy young adults in the Netherlands, *Eur. J. Appl. Physiol.*, **54**(1):46-53.

Bouhuys, A. (1964). Lung volumes and breathing patterns in wind-instrument players. *J. Appl. Physiol.*, **19** (5) : 967-975.

Bouhuys, A. and Beck, G.J. (1979). Large lungs in divers? *J. Appl. Physiol. Respir. Environ. Exerc. Physiol.*, **47** (5) : 1136-1137.

Chatterjee, Pinaki, Das, Paulomi, Debnath, Parimal and Banerjee, Alok K. (2010). A comparative study of vital capacity of Indian and Nepalese young female, *J. Physical Edu. & Sports Mgmt.*, **1**(2): 25-27.

Cliff, Ian J., Evans, Angela H., Pantin, Charles F.A. and Baldwin, David R. (1999). Comparison of two new methods for the measurement of lung volumes with two standard, *Thorax*, **54** (4) : 329–333.

DuBois, D., DuBois, E.F. (1916). Clinical colorimetry. A formula to estimate approximate surface area if weight and height is known, *Arch. Internat. Med.*, **17**: 863-871.

Ghosh, A.K., Ahuja, A. and Khanna, G.L. (1985). Pulmonary capacities of different groups of sportsmen in India. *British. J. Sports Med.*, **19**(4): 232-234.

Gupta, Shilpa S. and Sawane,Manish V. (2012). A comparative study of the effects of Yoga and swimming on pulmonary functions in sedentary subjects, *Internat. J. Yoga.*, **5**(2): 128-133.

Heydarpour, F., Mousavinasab, S.N., Nahidi, A.R., Alipour, M., Stami, A. and Heydarpour, P. (2007). The effect of long-term exposure to particulate pollution on the lung function of teheranian and zanjanian students, *Pakistan J. Physiol.*, **3**(2): 4–8.

Mehrotra, Prateek Kumar, Varma, Narsingh, Tiwari, Sunita and Kumar, Prabhat (1998). Pulmonary functions in Indian sportsmen playing different sports, *Indian J. Physiol. Pharm.*, **42**(3): 412-416.

Memon, M.A., Sandila, M.P. and Ahmed S.T. (2006). Pulmonary function test in a cohort of older Pakistani population, *Pakistan J. Physiol.*, **2**(1): 34–37.

Miller, M.R., Hankinson, J., Brusasco, V., Burgos, F., Casaburi, R. and Coates, A. (2005). Standardisation of spirometry, *Eur. Respir. J.*, **26**(2): 319–338.

Munawar, Farida, Niazi, Rizwan Ahmed Khan, Mumtaz, Aniqa, Khan, Sundus, Ansar, Ammara, Ahmed, Sagheer and Nawaz, Rais (2011). Predicted and recorded vital capacity in students of shalamar medical and dental college, Lahore, *Pakistan J. Physiol.*, **7**(2): 50-52.

Rong, C., Bei, H., Yun, M., Yuzhu, W. and Mingwu, Z. (2008). Lung function and cytokine levels in professional athletes, *J. Asthma*, **45**(4) : 343-348.

Sable, M., Vaidya, S.M. and Sable, S.S. (2012). Comparative study of lung functions in swimmers and runners, *Indian J. Physiol. Pharmacol.*, **56**(1): 100-104.

Stanley, Miles (1969). The respiratory system and sport, *J. Roy. Coll. Gen. Pi. Acrrr.*, **18**: 180-185.

Surgeon Rear-Admiral Stanley Miles (1969). The respiratory system and sport, *J. Roy. Coll. Gen. Practtt.*, **18** (86) : 180-185.

Ward, J. (1994). Exercise and the older person, *Aust.Fam. Physician*, **23**(4): 642-645 and 648-649.

■ WEBLIOGRAPHY

Swimming as Exercise, Retrieved on January 2nd, 2014 from *http://www.livestrong.com/Article/378683-Swimming-As-Exercise/#Ixzz2h01ffykb*.

Jeanne, Rose (2012). Three breathing exercises for athletes that can increase lung capacity Retrieved on 25th December, 2012 from *http://rivals.yahoo.com/highschool/news?slug=ycn*-10876703.