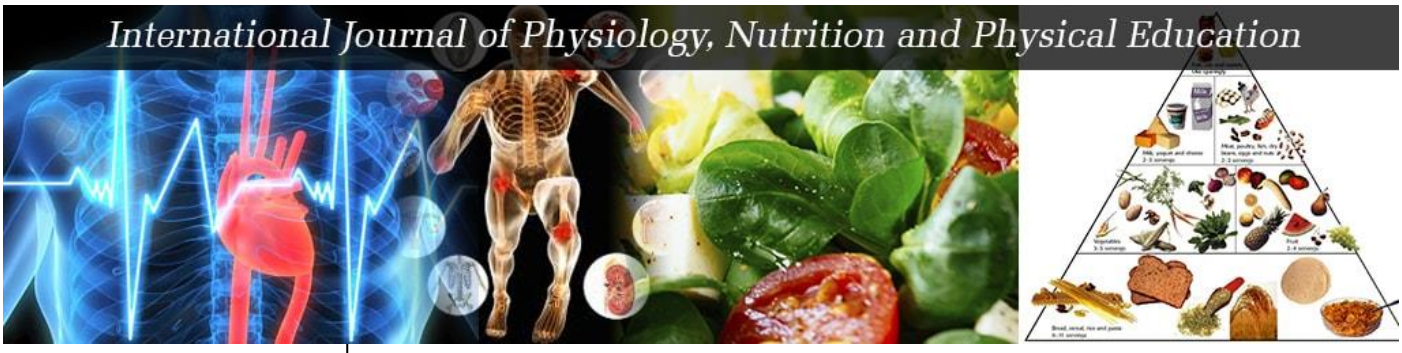
International Journal of Physiology, Nutrition and Physical Education 2019; 4(1): 2352-2354



ISSN: 2456-0057
IJPNPE 2019; 4(1): 2352-2354

www.journalofsports.com
Received: 19-11-2018
Accepted: 28-12-2018

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Comparative study of vital capacity between swimmers and long distance runners

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Abstract
For the purpose of study 20 Swimmers and 20 long distance runners were selected who had represented at National level. The subjects were females and the age group of subjects was ranging between 18-24 years. Data was collected on 20 swimmers and 20 long distance runners of Guru Nanak dev university Amritsar. All the subjects had represented their states at national level. The necessary data was collected through the administration of standardize instruments for the measurement of chosen variables. The data was collected at that time which was convenient to the subjects. The data was analyzed and compared with the help of statistical procedure in which mean, standard deviation, DF and 't' test were used to compare the data. The statistical analysis of data shows that the vital capacity of long distance runners and swimmers was found statistically significant with regard to FVC(L), FEV(1), FEV1/FVC%, PEF (L/S), FEF 25-75 (L/S) where the swimmers had performed better than the long distance runners. If we look into the physiological status of both the categories both have almost similar profile and requirement as per the requirement of their games.

Keywords: Vital capacity, swimmers, long distance runners

1. Introduction
Respiration is a physical process by which living organisms take in oxygen from the surrounding medium and emit carbon dioxide. The term respiration is also used to refer to the liberation of energy, within the cell, from fuel molecules such as carbohydrates and fats, carbon dioxide and water. The main aim of respiration is to provide oxygen to the tissues and to remove carbon dioxide from the tissues. In order to achieve this objective, there must be inflow and outflow of air from the atmosphere to the lungs alveoli and vice versa. The transport of oxygen from the atmosphere to the cells and the transport of carbon dioxide from the tissues to the atmosphere is referred to as 'external inspiration' while the reaction of oxygen within the cell and the resultant formation of carbon dioxide within the cell is known as internal inspiration. The gases must diffuse between alveoli and blood, oxygen and carbon dioxide must be transported in the blood and body fluids to and from the cells. There must be proper regulation of inspiration in order to maintain adequate ventilation. William and Terry (2002) [10]. They conducted a study to determine if pulmonary function or exercise performance could be changed by Power lung by specifically training the respiratory muscles using a power lung resistance device and the results showed positive changes in pulmonary function. Daniel *et al*. (2003). He has reported that young swimmers have longer lung volumes and a greater cardio respiratory functional capacity than other children

1.2 Selection of Subjects
For the purpose of study 20 Swimmers and 20 long distance runners were selected who had represented at university level. The subjects were females and the age group of subjects was ranging between 18-24 years.

1.3 Collection of DAta
Data was collected on 20 swimmers and 20 long distance runners of Guru Nanak Dev University. All the subjects had represented at university level. The necessary data was collected through the administration of standardize instruments for the measurement of chosen

variables. The data was collected at that time which was convenient to the subjects.

2. Methodology and Procedure

Each subject performed a deep inhalation followed by a forceful exhalation into the mouthpiece tube of Spirometer until all air was expelled. The subject then performed a normal inhalation to complete the maneuver. System automatically calculated the actual values and displayed the same on screen. If the investigator was satisfied with the test then save the data if not then test was repeated again. The system automatically retained the best test. Follow the above maneuver Real Time Flow/Volume & Volume/Time graphs were plotted and printed and then the above mentioned variables were recorded. Each subject came for two times after every trial their vital capacity was noted the subject was thanked for their co-operation.

3. Criterion Measures

FVC: Forced Vital Capacity was measured in liters, FEV1: Volume was exhaled after 1 sec. in liters, FEVI/FVC%: It was measured in liters, PEF(L/S): Peak expiratory flow rate was measured in liters per second and Forced Expiratory Flow 25–75% or 25–50%

4. Statistical Techniques

The data was analyzed and compared with the help of statistical procedure in which mean, standard deviation, df and 't' test were used to compare the data.

5. Findings of the study

Mean, S.D. of the selected dimensions of was swimmers and long distance runners computed. Its results have been depicted in table 1 and table 2.

Table 1: Mean and standard deviation of 5 dimensions of long distance runners

Sr. No.	Variable	Units	Long distance runners	
			Mean	S.D.
1	FVC	liters/second	3.465	0.1019
2	FEV(1)	liters/second	3.087	0.067
3	FEV1/FVC%	liters/second	86.764	0.457
4	PEFR(L/S)	liters/second	9.226	0.120
5	FEF 25-75	liters/second	4.577	0.061

The table 1 shows the mean and standard deviation values of 5 dimensions of Long Distance Runners. These values were recorded as variable wise, FVC 3.565 and 0.1019, FEV(1) 3.087 and 0.077, FEV1/FVC% 86.764 and 0.457, PEF (L/S) 9.296 and 0.120, FEF 25-75 4.577 and 0.061 respectively.

Table 2: Mean and standard deviation of 5 dimension of swimmers.

Sr. No.	Variable	Units	Swimmers	
			Mean	S.D.
1	FVC	liters/second	3.805	0.348
2	FEV(1)	liters/second	3.271	0.261
3	FEV1/FVC %	liters/second	85.342	0.643
4	PEFR (L/S)	liters/second	9.667	0.511
5	FEF 25-75	liters/second	4.713	0.149

Table 2 reveals that mean and standard deviation values of 5 variables of Swimmers were recorded as FVC (L) 3.805 and 0.348, FEV(1) 3.271 and 0.261, FEV1/FVC% 85.342 and 0.643, PEFR (L/S) 9.667 and 0.511, FEF 25-75 4.713 and .149 respectively.

Table 3: Comparative Analysis of FVC (L) between Long distance runners and Swimmers

Group	Number	Mean	S.D.	Df	't'value
Long distance runners	10	3.465	0.101	18	0.006
swimmers	10	3.805	0.338		

*Significance at .01 level, Tabulated 't' value 2.88 (18)

Table 3 presents the data pertaining to mean and standard deviation values with regard to long distance runners on the FVC (L) variable which were recorded 3.465 and 0.101 respectively, whereas in the case of swimmers the same were recorded 3.805 and 0.338 respectively and were found to be statistically significant results, because calculated t-value 0.006 was more than tabulated t-value (2.88) at 0.01 level where the swimmers shows higher FVC(L) value in comparison to long distance runners.

Table 4: Comparative Analysis of FEV1(L) between Long Distance Runners and Swimmers

Group	Number	Mean	S.D.	df	't'value
Long distance runners	10	3.067	0.057	18	0.006
swimmers	10	3.251	0.221		

* Significant at .01 level, Tabulated 't' value 2.88 (18)

The perusal of table 4 that the mean and standard deviation values of long distance runners on the FEV(1) variable were recorded as 3.067 and 0.057 respectively where as in case of swimmers the same were recorded as 3.251 and 0.221 respectively. There has been significant difference between long distance runners and swimmers at .01 level where calculated 't' value 0.006* is less than tabulated 't'-value 2.88.

Table 5: Comparative Analysis of FEV(1)/FVC% between Long Distance Runners and swimmers

Group	Number	Mean	S.D.	df	't'value
Long distance runners	10	86.764	0.537	18	0.044
swimmers	10	86.252	0.653		

*Significant at .01 level, Tabulated't' value 2.88 (18)

Table 5 indicates that the mean and standard deviation values of long distance runners on the FEV(1)/FVC% were recorded as 86.764 and 0.537 respectively where as in case of swimmers the same were recorded 86.252 and 0.653 respectively, there has been slight difference between long distance runners and swimmers. Calculated't' value 0.044 is less than tabulated 't' value 2.88. No significant difference was observed where the mean value shows that the long distance runners are better than the swimmers in this parameter.

Table 6: Comparative Analysis of PEF(L/S) between Long Distance Runners and swimmers

Group	Number	Mean	S.D.	df	't'value
Long distance runners	10	9.224	0.130	18	0.007
swimmers	10	9.656	0.414		

*Significant at .01 level, Tabulated 't' value 2.88 (18)

The perusal of table 6 shows that mean and standard deviation value with regard to long distance runners on PEF (L/S) variable were recorded 9.224 and 0.130 respectively where as in case of swimmers the same were recorded as 9.656 and 0.414 respectively. There has been significant difference between long distance runners and swimmers where swimmers performed better then their counterparts long distance runners because calculated 't' value is 0.007* is less than tabulated 't' value 2.88.

Table 7: Comparative Analysis of FEF 25-75 between Long Distance Runners and Swimmers

Group	Number	Mean	S.D.	df	't'value
Long distance runners	10	4.577	0.70	18	0.014*
swimmers	10	4.723	0.159		

*Significant at .01 level, Tabulated 't' value 2.88 (18)

Table 7 indicates the mean and S.D. values with regard to swimmers on FEF 25-75 variable were recorded 4.577 and 0.70 respectively whereas in case of long distance runners the same were recorded as 4.723 and 0.159. There has been significant difference between long distance runners and Swimmers, where the swimmers have performed better than long distance runners. Calculated 't' value 0.014* is less than tabulated 't' value 2.88.

6. Discussion of the findings

The statistical analysis of data shows that the vital capacity of long distance runners and swimmers was found statistically significant with regard to FVC(L), FEV(1), FEV1/FVC%, PEF (L/S), FEF 25-75 (L/S) where the swimmers had performed better than the long distance runners. If we look into the physiological status of both the categories both have almost similar profile and requirement as per the requirement of their games. The major difference among both the groups is of resistance and their training. In this variable the swimmers had out performed to long distance runners. Swimmers have to tackle with water resistance and because of this all vital capacity parameters have been affected. Thus it can be concluded that resistance and training of individual play important role in vital capacity. From the results it is further suggested that to raise the performance of long distance runners should undergo through maximum resistance training factor has to be considered. If we do resistance exercise or training it will result in increase of size of heart and lungs. These findings suggest that swimmers may have achieved greater lung volumes than either runners or control subjects, not because of greater inspiratory muscle strength, or differences in height, fat free mass, alveolar distensibility, age at start of training or sternal length or chest depth, but by developing physically wider chests, containing an increased number of alveoli, rather than alveoli of increased size. However, in this cross-sectional study, hereditary factors cannot be ruled out, although we believe them to be less likely. Selecting taller players vital capacity of players will be more and they will be able to supply more of oxygen to different body parts and the energy production from the body cells will be increased thus the performance of players will be increased. However, there are many other contributing factors e.g. comfortable life style, dieting habit, physiological and social attitude towards physical activity contribute a lot to make long distance runners better in variables on FVC(L), FEV(1), FEV1/FVC%, PEF (L/S), FEF 25-75 (L/S) These findings are in agreement with the findings of Marton *et al*. 1979, Kaufman *et al*. (1974) [8], Grimby & Sodarholm (1963) [7].

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