

Comparative Study on Cardio-Pulmonary Functional Capacity of Obese and Non-Obese Secondary School Students

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Abstract

Physical fitness is a positive and dynamic quality of a continuum from abundant life to death. It is related to the ability to meet the demand of the environment specifically to preserve, to withstand stress, to resist fatigue and to possess the energy for an abundant life. The cardio-pulmonary (C.P) index, which employs seven parameters, namely:- pulse rate, systolic blood pressure, diastolic blood pressure, vital capacity, maximum expiratory pressure, maximum breath holding time and the age, provides invaluable information concurring endurance of heart and lungs, by estimating the functional capacity of cardiovascular and pulmonary system. Skinfold measurement of 300 students studying in classes eleven through fourteen was taken in order to select three study groups. Each consisting of 50 students, representing lean group with less than 7% fat, average group with 10 to 15% fat and obese group with more than 20% fat. In order to determine the fat percentage, the skinfold measurement at four different sites i.e Biceps, Triceps, Subscapular and Supra-iliac was recorded in millimeters with the help of skinfold caliper. The total value of skinfold of all the four sights was referred to the converting chart prepared by Durnin and Rehman. The measurements of all the seven parameters (i.e pulse rate, systolic and diastolic blood pressure, vital capacity, maximum expiratory pressure, maximum breath holding time and age) was collected using proper procedure with the help of standard equipments. To compare the lean, average and obese individuals in the functional status of cardio-pulmonary system analysis of variance (F-ratio) was employed. Scheffe's post hoc test was applied to the groups where ever significant differences exist. The cardio-pulmonary index (adynamic) indicates the cardio-pulmonary efficiency of an individual in pre-exercise condition. It could be observed from the result that the lean and average groups did not differ significantly, whereas lean and average groups were found significantly better than obese groups in their cardio-pulmonary efficiency. It may be due to the fact that fat puts extra burden on the physiological system by decreasing the ability of cardio-respiratory system to supply oxygen to various parts of the body, therefore lowering one's cardio-respiratory endurance capacity. Fat not only places over load on circulatory system and heart to pump more blood to larger vascular system, but fat also acts as dead weight in the body (thus offering extra resistance to movement) while contributing nothing to muscle contraction.

INTRODUCTION

Physical fitness is a positive and dynamic quality of a continuum from abundant life to death. It is related to the ability to meet the demand of the environment specifically to preserve, to withstand stress, to resist fatigue and to possess the energy for an abundant life. Physical fitness is minimal in seriously ill and is maximum in the highly conditioned

persons. While energy demands of daily task vary for individuals. Some population between these minimal and maximal poles is satisfactory for most people.

The cardio-pulmonary (C.P) index, which employs seven parameters, namely:- pulse rate, systolic blood pressure, diastolic blood pressure, vital capacity, maximum expiratory pressure, maximum breath holding time and the age, provides invaluable information concurring endurance of heart and lungs, by estimating the functional capacity of cardio-vascular and pulmonary system.

The presence of oxygen in the cell is essential for sustaining prolonged muscular activity. Atmospheric oxygen is made available to the cell by the cooperative action of respiratory and circulatory systems. The degree to which these systems function efficiently during muscular work has often been used in apprising physical fitness.

With the availability of above C.P. index, an attempt has been made to find the functional capacity of cardio-pulmonary system in obese and non-obese (Lean and Average) college men to enable the physical education teachers to prepare appropriate programme for obese and non-obese students according to their need.

METHOD

Skinfold measurement of 300 students studying in classes eleven through fourteen was taken in order to select three study groups. Each consisting of 50 students, representing lean group with less than 7% fat, average group with 10 to 15% fat and obese group with more than 20% fat. In order to determine the fat percentage, the skinfold measurement at four different sites i.e Biceps, Triceps, Sub-scapular and Supra-iliac was recorded in millimeters with the help of skinfold caliper. The total value of skinfold of all the four sights was referred to the converting chart prepared by Durnin and Rehman.

To determine the functional status of cardio-pulmonary system of obese and non-obese individuals, C.P. Index was used as criterion measures. The measurements of all the seven parameters (i.e pulse rate, systolic and diastolic blood pressure, vital capacity, maximum expiratory pressure, maximum breath holding time and age) was collected using proper procedure with the help of standard equipments.

The cardio-pulmonary index was calculated using the following formula.

$$\text{C.P. Index} = \frac{\text{VC} + \text{MBH} + \text{MEP} + \text{Age}}{\text{SP} + \text{DP} + \text{PR}}$$

Where,

VC = Vital capacity in 100ml units.

MBH = Maximum breath holding time in seconds

Age = Actual age in years

SP = Systolic blood pressure

DP = Diastolic blood pressure

PR = Pulse rate per minute

To compare the lean, average and obese individuals in the functional status of cardio-pulmonary system analysis of variance (F-ratio) was employed. Scheffe's post hoc test was applied to the groups where ever significant differences exist.

FINDINGS:-

The findings pertaining to the status of functional capacity of obese and non-obese (lean and average) groups in their cardio-pulmonary system has been given below.

Table-1

Analysis of variance of the means of lean, average and obese groups in the functional status of their cardio-pulmonary system.

Source of Variance	df	Sum of square	Mean sum of square	F-ratio
Between groups	2	1975173.89	987586.9	
				99.49*
Within groups	147	1459136.65	9926.1	

* F.05 (2,147) = 3.06

It is evident from above table that there were significant differences among three study groups as the obtained F-ratio of 99.49 was very high compared to the F-value of 3.06.

As the F-ratio was found significant, the Scheffe's post hoc test was applied to determine the significance of difference between the paired means.

The analysis pertaining to post hoc test is given in table-2

Table-2

Paired means and differences between means for the lean, average and obese groups in the status of the functional capacity of their cardio-pulmonary system.

Groups			Difference between means
Lean	Average	Obese	
366.43	378.91		12.48
366.43		174.84	191.59*
	378.91	174.84	204.07*

* Significant at .05 level of Confidence

Confidence interval = 49.38

It is evident from above table that the difference between lean and average groups (12.48) was not found to be significant. Whereas the difference between the paired means

of lean and obese groups (191.59) and average and obese groups (204.07) was found to be significant as the confidence interval of 49.38 was less than these values.

Graphical presentation on the above analysis has been presented in figure-1

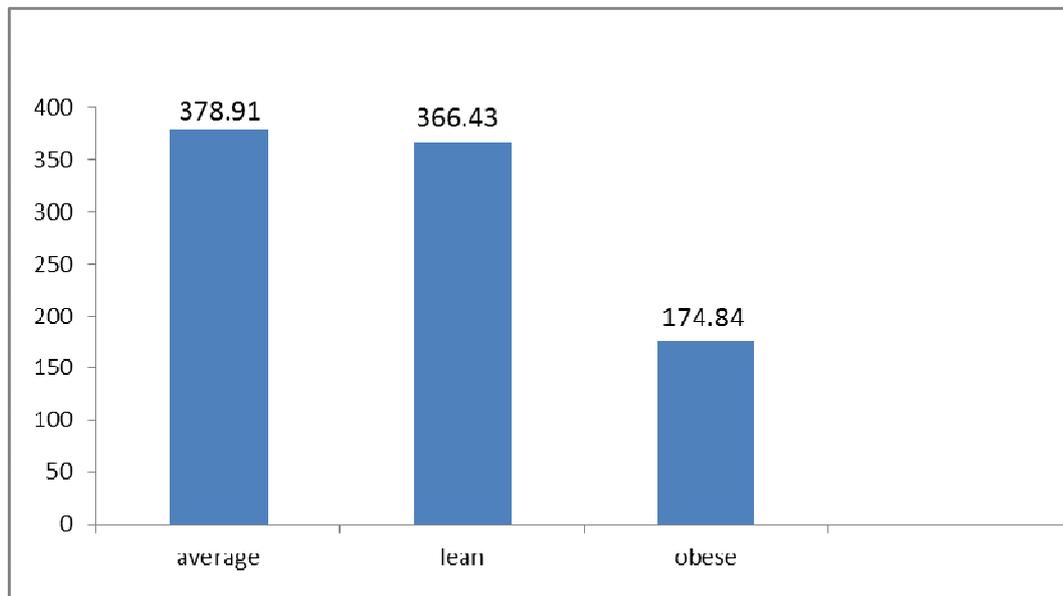


Figure-1 Difference between means of average, lean and obese groups in the functional status of their cardio-pulmonary system.

DISCUSSION OF FINDINGS:-

The cardio-pulmonary index (adynamic) indicates the cardio-pulmonary efficiency of an individual in pre-exercise condition. It could be observed from the result that the lean and average groups did not differ significantly, where as lean and average groups were found significantly better than obese groups in their cardio-pulmonary efficiency. It may be due to the fact that fat puts extra burden on the physiological system by decreasing the ability of cardio-respiratory system to supply oxygen to various parts of the body, therefore lowering one's cardio-respiratory endurance capacity. Fat not only places over load on circulatory system and heart to pump more blood to larger vascular system, but fat also acts as dead weight in the body (thus offering extra resistance to movement) while contributing nothing to muscle contraction.

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