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Effect of Exercise On Vital Capacity in Different Posture of Young Indian Subjects.

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ABSTRACT

Vital capacity in normal healthy individuals decreases from sitting to supine position. Exercise can strengthen the respiratory muscles and thus cause increase in VC. This project was being conducted to find the influence of exercise on vital capacity in young adult males and females in different postures. This is a cross sectional study done on 80 males and 80 female subjects, of age 18-21years. Standard informed consent was taken from all the subjects following approval from the college ethics committee. VC was noted in sitting, standing and in supine position using student's spirometer. Student t test was used to do the analysis. A statistical package SPSS version 17 will be used. P≤0.05 was considered as significant. VC in females in standing and sitting posture is highly significantly decreased in non-exercising compared to exercising subjects.VC in females in supine posture is significantly less in non-exercising subjects compared to exercising subjects. Vital capacity is high in standing and sitting position compared to supine position. So sitting positions can be adopted in patients who have respiratory insufficiency to increase the gas exchange in the lungs.

Keywords: Vital capacity, Exercise, effect of posture, diaphragm.

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INTRODUCTION

Vital capacity is a good indicator of the functional status of the lungs. London surgeon, Hutchinson, in his Classic treatise "On the capacity of lungs and respiratory functions" introduced the concept of spirometry[1]. Measurement of VC is useful diagnostically and is an important pulmonary function test[2].Vital capacity gives us useful information about the strength of the respiratory muscles. VC is affected by many factors like size of the thoracic cage, age, strength of respiratory muscles, gravity and posture.

Exercise brings about various physiological changes in the body. It strengthens our muscles including the respiratory muscles causing increase in the vital capacity. It has been found that athletes have a higher vital capacity compared to normal individuals[3,4]. In this study we tried to find a correlation between exercise and vital capacity.

It has been reported that the vital capacity in normal healthy individuals decreases from sitting to supine position[5,6]. This reduction in vital capacity is due to changes in position of diaphragm and the weight of the abdominal viscera pressing against the diaphragm and shifting of blood to the pulmonary vasculature [7-12]. But in a recent study it is reported that the vital capacity of a normal healthy individual increases from sitting to supine position. The height of the diaphragm as studied from the radiographs vary considerably with different postures. Height of the diaphragm is maximum in supine position so the movement of the diaphragm will be more during quiet breathing [13]. Therefore, in supine posture as the diaphragmatic movements increases, vital capacity showed greater values when compared to that recorded in sitting posture [14], which is in contradistinction to findings of previous report.

This project was conducted to find the effect of exercise on vital capacity in young adult males and females from standing, sitting and supine position.

MATERIALS AND METHODS

This was cross sectional study done on 160 healthy young first year medical students of which 80 were males and 80 females, of age 18-21years, of Kasturba Medical College Mangalore. The subjects who were doing any type of regular physical exercise like walking, jogging, any type of sports or yoga for a period of minimum 30minutes a day for a minimum of three times a week is categorized into exercising group and those who are not engaged in any regular physical activity were in non-exercising group. A standard informed consent was taken from all the subjects following approval from the college ethics committee. The procedure of spirometry to measure the VC was explained to the subjects. The spirometry was performed between 4:30 to 5:00 PM, 4 hours after the lunch at 12:30 PM. VC was noted in sitting, standing and in supine position with the help of a spirometer. The VC was measured using student's spirometer (water sealed). Subjects were demonstrated first about the spirometry and then three satisfactory readings were taken at intervals of 5 min and the highest among the three was accepted. Same instrument was used to measure the VC of all the subjects.

Exclusion Criteria

Smokers, Subjects with any respiratory diseases, Subjects with chest wall deformity, Subjects with any other disease and on medication, Subjects undergoing any physical training, Obese subjects(BMI more than 30), Subjects using musical instruments of blowing type.

Statistical Analysis

Student t test was used to do the analysis. A statistical package SPSS version 17 will be used. $P \leq 0.05$ was considered as significant.

RESULT

In females VC in standing and sitting posture is decreased in non-exercising compared to exercising subjects and it is statistically highly significant. In supine posture VC is less in non-exercising subjects compared to exercising subjects and shows statistical significance. In males exercising subjects had overall increased

values in standing and supine posture compared to non-exercising subjects but without any statistical significance.

Table: Comparison of Vital capacity in males and females of exercising and on-exercising groups in 3 different posture (standing, sitting, supine)

		Exercising	Non-exercising	P value
Males (n=80)	Standing	3.007 ± 0.520	2.886 ± 0.541	0.3110 NS
	Sitting	2.076 ± 0.536	2.840 ± 0.611	0.2932 NS
	Supine	2.913 ± 0.520	2.700 ± 0.530	0.0735 NS
Females (n=80)	Standing	2.340 ± 0.325	2.114 ± 0.337**	0.0031 HS
	Sitting	2.300 ± 0.322	2.075 ± 0.336**	0.0031HS
	Supine	2.172 ± 0.377	1.987 ± 0.356*	0.0268 S

NS-not significant; S-significant; HS- highly significant.

DISCUSSION

Vital Capacity is an important parameter of pulmonary function tests which is a long term predictor for overall survival rates according to Buffalo health study. Comparing the VC among exercising and non-exercising individuals, it is found to be higher among the former [3,4]. According to a review article, military personnel and athletes also have higher VC as they are more physically fit[3]. Our study is in concordance with the previous studies. Moreover, in our study we compared VC in different positions among exercising and non-exercising individuals and found VC to be significantly raised among exercising females in sitting and supine positions. Among exercising male subjects also, the VC was raised in standing and supine positions but was not statistically significant. According to a study done by Pavlov et al, tidal volume of athletes are significantly raised compared to non athletes [4] which might account for the rise in vital capacity among the exercising subjects in our study.

A study done by R.Chowdhury[14] shows that VC is maximum in supine position. But in our study we found that VC is less in supine position compared to standing position which was in concordance with older studies.

CONCLUSION

Physical exercise increases vital capacity which is a long term predictor of overall survival rate. Also vital capacity is high in standing and sitting position compared to supine position. So sitting or propped up positions can be adopted in patients who have respiratory insufficiency to increase the gas exchange in the lungs.

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