Chapter II

REVIEW OF RELATED LITERATURE

The research scholar made an attempt to present a summary review of the related literature, which may be helpful in understanding the basic trends available and to bring-out the meaningful outcomes of the present study. The scholar tried his level best to gather the best available literature. For this purpose, investigator has visited number of libraries like: Bangalore University, Bangalore, University of Mysore, Mysore, Karnataka University, Dharwad, Mangalore University, Mangalore, Shivamoga University, Shivamoga, Tumkur University, Tumkur, Laxmibai National University of Physical Education, Gwalior, Jiwaji University, Gwalior and Punjabi University, Patiala etc, to get the related data information of the study in the form of M.Phil and Ph.D thesis etc.

Also researcher visited the inflibnet centre at Gulbarga University central library and various websites for the published materials in the form of Abstracts, Articles, Journals, and Books etc. are collected, studied and information retained as documents for the review of related literature. In addition to the above sources, the investigator searched various related
websites on internet and available personal and supervisor's literature etc.

This chapter includes reviews of related literature for the present study which has been taken by the researcher. The scholar has undertaken the extensive search for the reviews and has collected the following reviews of the critical literature: A few investigators have been reported in the part throwing light on the relationship of Vital capacity and sports.

Abhishek Singh (2014), the aim of the study was to compare the selected physiological variables among handball, Volleyball and Hockey players. For the purpose of the study, 90 athletes (30 from each group) of age 21±3 years were chosen from Lakshmibai National institute of Physical Education, Gwalior (M.P). The variables which had been tested were vital capacity (VC), Peak expiratory flow rate (PEFR), resting pulse rate (RPR) and resting respiratory rate (RRR).

The dry Spiro-meter and the methods selected for the collection of the data are highly valid and reliable. As a statistical tool, one way ANOVA was employed. After the data analysis, ANOVA was found insignificant in case of VC, RPR and RRR but in case of PEFR, it was found significant. Post Hoc test
on PEFR reveals that the Volleyball players have low PEFR in comparison with the Hockey and handball players.

Keywords: Vital Capacity, Dry Spiro-Meter, Peak Expiratory Flow Rate, Resting Pulse Rate.

Mr. Kalidas Karak and Dr. Susanta Jana (2013), the purpose of the study was to compare the level of Vital Capacity and Peak flow rate of active and inactive middle aged male. Total 52 subjects were taken for the study. They were Active & Inactive Groups. Twenty-six (26) active and Twenty-six (26) in active middle aged male (40-50 years) were randomly selected for the study. All the parameter i.e. Vital Capacity and Peak flow rate were measured by a reputed physician. For statistical analysis and interpretation of data ‘t’-test was conducted. It was observed that there was significant difference in Vital Capacity and Peak flow rate. Result showed Active men have higher level of Vital Capacity and Peak flow rate.

Key Words:- Vital Capacity, Peak Flow Rate, Active & Inactive Middle Aged Men.

Pradeep Kumar et.al (2013), the purpose of the study was Comparative Analyze the Physiological Variables of All India Intervarsity Level Batsmen’s, Pace Bowlers, Spin Bowlers, Wicketkeepers, and All-Rounders men cricketers of
India. For the purpose of this study, one hundred and fourteen cricket players which consists 22 batsmen, 40 bowlers (i.e. 25 medium pace and 15 spin bowlers) 14 wicket keepers, and 38 all-rounder’s were selected.

The following physiological variables were considered to be the major factors contributing to the performance in the cricket - Resting pulse rate, Resting blood pressure, Hb content, Vital capacity, Anaerobic power, and Aerobic capacity. To prepare profiles of All India Intervarsity Level cricket Men players of India, descriptive analysis i.e. mean and S.D. was done. For the comparison of the physiological variables analysis of variance (ANOVA) and test Schafee,s post hoc test was applied.

The mean of Hemoglobin of batsmen’s, pace bowlers, spin bowlers, wicketkeepers, and all-rounders were 13.79 mm/Hg, 13.32 mm/Hg, 13.16 mm/Hg, 13.13 mm/Hg., and 13.66 mm/Hg, Resting Pulse rate were 69.68 bt/min., 70.12 bt/min., 70 bt./min., 70.64 bt./min., and 70.34 bt./min., systolic blood pressure were 115.81, 116.28, 116.9, 116.64, and 117.2, diastolic blood pressure were 92.00, 93.24, 92.80, 89.21, and 92.97, the mean of Vital Capacity were 3.16 ltr, 3.1 ltr 2.99 ltr, 2.52 ltr., and 2.95 ltr, Anaerobic Power were 724.57 Watt, 703.59 Watt, 706.2 watt, 704.93 Watt., 687.690
Watt, Aerobic Power were 35.13 Watt, 35.66 Watt, 35.88 Watt, 39.19 and 38.66 Watt.

On comparatively analysis it was found that only Vital Capacity among All India Intervarsity level Cricket Batsmen’s & wicketkeepers was significant and no other physiological variable were not found significantly different among Batsmen’s, Pace Bowlers, Spin Bowlers, Wicketkeepers, and All-Rounders men cricketers of India at .05 level of significance.

Key Words: Physiology, Anaerobic, Aerobic, Hemoglobin and Vital Capacity.

Parvinder Singh (2013), Anthropometry and physiology play an important role in deciding the particular build of the body with various measurements of the segments of the body it has also its importance in the field of Kabaddi and Kho-Kho game.

Somewhat or altogether the body height length of various level and measurements of the varies body segments, pulse rate blood pressure Haemoglobin, vital capacity and body composition have definite effects on the performance of these game players. The investigator in the present study made an effort to test this hunch to compare the difference between the various physiological and Anthropometrical

In the present investigation, Kho-Kho and Kabaddi players were the field of study. In the present study, 120 male Kabaddi and 120 male Kho-Kho players of Haryana who participated in Haryana Olympic Games and Haryana State Kho-Kho and Kabaddi Championships. The players who remained in last ten teams were selected during the State Championship. To know the difference between Kho-Kho and Kabaddi players in relation to anthropometry and physiological variables, ‘t’ test was applied.

From the results, it may be concluded that there is a significant difference in weight of Kho-Kho and Kabaddi players. The weight of Kabaddi players is much higher in comparison to weight of Kho-Kho players.

It was also concluded that there is a significant difference in linear measurements such as, height, lower leg length, foot length, foot width, total arm length, forearm length, sitting height in comparison to Kho-Kho players. Kabaddi players are found more in weight, weight, height, lower leg length, foot length, foot width, total arm length, forearm length, sitting height in comparison to Kho-Kho
players. But no significant difference was found in total leg length, thigh length, upper arm length, hand length, trunk length. Regarding body circumferences, there is a significant difference in shoulder, chest, hip, thigh, calf between Kabaddi and Kho-Kho players.

Kabaddi players are found more in shoulder, chest circumferences, hip, thigh, calf, but there is no significant difference was found in abdomen. Regarding bone diameter, there is a significant difference in biacromial and ankle diameters. Kabaddi players are found more in biacromial and ankle diameters in comparison to Kho-Kho players. But no significant difference was found in bitrochanteric diameters and femur bicondylar between Kabaddi and Kho-Kho players. Regarding skin-fold, there is a significant difference in biceps, and suprailiac. Kabaddi players are found more in biceps and suprailiac in comparison to Kho-Kho players. But no significant difference was found in triceps, subscapular, thigh and calf between Kabaddi and Kho-Kho players. Regarding body composition, there is a significant difference in, Fat percent, fat weight and lean body mass. Kabaddi players are found more in Fat percent, fat weight and lean body mass in comparison to Kho-Kho players. There is a significant difference in body density between Kabaddi and
Kho-Kho players. Kho-Kho players are more in body density in comparison to Kabaddi players.

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bt/min., 70 bt./min., 70.64 bt./min., and 70.34 bt./min., systolic blood pressure were 115.81, 116.28, 116.9, 116.64, and 117.2, diastolic blood pressure were 92.00, 93.24, 92.80, 89.21, and 92.97, the mean of Vital Capacity were 3.16 ltr, 3.1 ltr 2.99 Ltr, 2.52 ltr., and 2.95 ltr, Anaerobic Power were 724.57 Watt, 703.59 Watt, 706.2 watt, 704.93 Watt., 687.690 Watt, Aerobic Power were 35.13 Watt, 35.66 Watt, 35.88 Watt, 39.19 and 38.66 Watt.

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Key Words: Physiology, Anaerobic, Aerobic, Hemoglobin and VitalCapacity.

Narayan Bahadur Mahotra and Lava Shrestha (2013), Introduction: Due to regular exercises, athletes tend to have an increase in pulmonary capacity when compared to non-exercising individuals. Intensity and severity of sports engaged in by the athletes probably determines the extent of strengthening of the inspiratory muscles with a resultant
increase in the pulmonary functions. So, this study has been carried out to establish a relationship between the type of sports and pulmonary functions in Nepalese athletes.

Methods: This study has adopted a cross sectional observational comparative research design. Spirometry was conducted in 84 different national level athletes [25.71 (± 4.55) years]. The athletes were from five different sport groups. Out of them, there were 16 weight lifters, 41 footballers, 10 swimmers, 8 marathon runners and 9 sprinters. Among them weight lifters, marathoners and sprinters were selected from the National sports council, Tripureshower, Kathmandu and footballers and swimmers were from the Nepal army club, Kathmandu, Nepal.

The spirometry was done in sitting position using MIR SPIROLAB II spirometer based on American Thoracic Society (ATS) recommendations. Pulmonary function was assessed based on Forced Expiratory Volume in first second (FEV1), Forced Vital Capacity (FVC) and Peak Expiratory Flow Rate (PEFR) expressed as percent predicted for the age, sex, height, weight and race.

Results: When comparing the mean values of FVC, FEV1 and PEFR among the five different sport groups, as expected,
athletes who have more strenuous respiratory muscles exercise had significantly superior pulmonary function parameters.

For example weight lifters and swimmers had 111.84 and 109.56 percentage of predicted values on FVC (P=0.008) respectively. But marathoners, footballers and sprinters had 105.83, 99.25 and 98.34 percentage of predicted values respectively.

Similarly, weight lifters, swimmers, marathoners, footballers and sprinters had 110.63, 110.15 and 110.28, 102.52 and 99.23 percentages of predicted values on FEV1 (p=0.090) respectively. Swimmers, marathoners, footballers, weight lifters and sprinters had 106.03 and 107.34, 104.37, 102.08 and 86.58 percentage of predicted values on PEFR (p=0.027) respectively.

Conclusion: Athletes who have most strenuous respiratory muscle exercise like swimming and weight lifting have better pulmonary function tests (PFTs) compared to other athletes like sprinters who have less strenuous muscle exercise.

Key words: athletes, FEV1, FVC, and PEFR, pulmonary function test
Majda Seddig Shanta (2013), this study was carried out to examine the difference between the respiratory volumes in athlete and non-athlete adolescent females, how does exercise affect the respiratory volumes and how could the effects of exercise on the respiratory system affect the heart rate?

Introduction: The respiratory and circulatory systems are the most important systems in the body as they involve vital organs (lungs and heart). They are affected by several factors, which may improve or weaken their function. Exercise positively affects their function.

Methods: In this study 2 groups were compared: athletic and non-athletic females using a spirometer to measure the respiratory volumes before and after running. The heart rate and blood pressure were also measured in both groups. The statistical analysis and graphs were done using excel 2007.

Results: The pre-test mean vital capacity in non-athletes was 2600.0 ± 496.7 and in athletes: 2642.9 ± 340.9. Whereas post-test mean vital capacity of lungs in non-athletes was 2385.7 ± 429.8 and in athletes: 2428.6 ± 407.1. Pre-test mean blood pressure in non-Athletes was 94.6 ± 9.3 mmHg and in athletes was 86 ± 8.1 mmHg
but post-test mean blood pressure in non-athletes was 113.8 ± 31.6 mmHg and in athletes: 99.1 ± 8.8 mmHg. The pre-test mean heart rate in non-athletes was 89±5.2 beat per min while in the athletes it was 86 ± 6.5 beat per min.

Conclusion: On the short term exercise increases the heart rate, decreases the blood pressure, decreases the lung capacity and increases tidal volume. Whereas long term effects involve increased lung capacity and tidal volume; and decreased blood pressure and heart rate.

Bhavikkumar H Kantesariya and Yajuverdarsinh L Jethwa (2013), The purpose of this research was to investigate the relationship of running performance with the selected variables of physiology and body composition i.e. vital capacity, fatigue index and BMI, body fat, and leg muscles mass.

Vital capacity was measured by using peak flow meter whereas Running Based Anaerobic Test (35m X 6) was applied to assess fatigue index. BMI, body fat and leg muscles mass were measured by body composition analyzer. 37 boys, age 10 to 18 years who regularly come to play one or the other game at sports club were selected as the subjects for the study.
purpose. Product moment correlation coefficient test (r at 0.05 level of significance) was applied to test hypothesis.

Result of the study shows that there is not any significant relationship found between running performance and vital capacity. There is negative significant relationship between running performance and fatigue index, and leg muscles mass whereas positive significant relationship between running performance and BMI, and Body fat.

Sanjay V. Deshmukh (2013), the purpose of the present study was to compare the selected Physiological variables between Basketball and Volleyball Male Players of S.G.B.A.U. Amravati University, for the purpose of the study 60 male university/college level players (30 Basketball Players and 30 Volleyball Players) were randomly selected, as the subjects for the present study. The subject's age ranged from 18 to 25 years.

The variables for study were-Blood Pressure (Systolic Blood Pressure and Diastolic Blood Pressure), Vital Capacity, Resting Heart Rate, Breath Holding Capacity (Positive Breath Holding Capacity and Negative Breath Holding Capacity), and Body Fat Percentage. To Comparison of selected physiological variables Basketball and Volleyball male players mean
difference method (t-ratio) ‘t’ test was used. The level of significance was set at 0.05 levels.

Results showed significant difference in Fat percentage and insignificant differences were found in Systolic Blood Pressure, Diastolic Blood Pressure, vital capacity, Resting Heart Rate, Positive Breath Holding Capacity, Negative Breath Holding Capacity, and Negative Breath hold capacity.

Key words- Vital Capacity, Resting Heart Rate, Breath Holding Capacity, Breath Holding Capacity, and Body Fat Percentage.

A. S. Nageswaran (2013), the purpose of the this study was to analyze the body’s pulmonary functions, such as vital capacity (VC), Forced Vital Capacity (FVC) and Maximum voluntary ventilation (MVV) of Indian Youth Elite Basketball players by using spirometer, with special reference to their playing positions. Sixty male basketball players (n=20 forwards, n=20 guards, n=20 centers; age =17.4 ± 1.18 yrs.) representing in the 27th national youth basketball championship for boys & girls at Tiruchirappalli, Tamilnadu from 1st to 8th June 2010, were selected as subjects.

Spiometric tests were conducted on them considering the parameters VC, FVC and MVV and the data were collected by
using Jaeger Flow Screen Spirometer. To examine the mean differences of pulmonary functions on selected criterion variables with reference to playing positions, Analysis of Variance (ANOVA) was applied.

The result reveals that there was a significant difference among playing positions on selected criterion variables. The forwards showed greater pulmonary functions in all the selected variables, followed by guards and then the centers.

Keywords: Vital capacity, Forced vital capacity, Maximum voluntary ventilation and Basketball.

Leili Zeiaadini et.al (2013), Exercise-induced bronchospasm is more evident in the athletes of endurance sports and other sports which need minute ventilation. Seeing the lack of researches in this arena within Iran, we decided to conduct a study on the frequency of exercise-induced asthma in Kerman professional endurance runners in order to develop the background necessary to later studies. To do so, 25 professional endurance runners (22.6 ± 5.5 years) were chosen intentionally and voluntarily, 25 non-athletes were also chosen randomly and homogeneously along the runners group.
All subjects first filled the standard questionnaire of exercise asthma, then the pulmonary function test was done on both groups before, immediately after, and 10 minutes after the Cooper test in order to investigate the lung volumes. The obtained data were then analyzed using SPSS 19 through independent T-test.

Results showed that the rate of exercise asthma was 20 % in the athletes group and 16 % in the non-athletes one. The results of the exercise challenge, which is a 15 % or more decrease in forced expiratory volume in 1 second (FEV1), indicated that 16 % of the runners and 12 % of the non-athletes were suffering from exercise asthma. The lung volumes FEV1 and FVC (forced vital capacity) decreased in both groups. The decrease was more evident in runners when compared before and after the exercise, this decrease was not significant, however.

Keywords: Exercise Induced Bronchospasm; Pulmonary Function Test; Respiratory Symptoms.

Syeda Sadia Fatima, (2013),

Objective: To assess and compare changes in pulmonary functions before and after exercise in young healthy adults.
Methods: The case-control study was carried out from January to March 2010 on 292 medical students aged 18-24 years at Bahria University Medical and Dental College, Karachi.

Baseline values for forced expiratory volume (FEV1) and forced vital capacity (FVC) were measured with a digital spirometer, and the FEV1: FVC ratio was calculated. The lung functions of Group I comprising 192 volunteers after aerobic exercise of 30 minutes daily, for five days over eight weeks, was compared with Group II having 100 controls who did not participate in any physical activity. SPSS 15 was used for statistical analysis.

Result: At the end of eight weeks, there was a significant rise in FEV1 (2.49 ± 0.82 to 2.59±0.79 liters), decline in FVC (2.80±0.92 to 2.7±0.87 liters) and an increase in the FEV1: FVC ratio (89.52±12.66 to 95.56±13.42) in Group I students.

Conclusion: Improvement in pulmonary functions was noticed as a result of physical activity.

Keywords: Forced expiratory volume, Forced vital capacity, FEV1/FVC ratio.

ShobhaRani Vedala, et.al (2013), Background: Pulmonary function assessment has achieved a lot of importance nowadays owing to a steep rise in air pollution. Lung function parameters tend to have a relationship with lifestyle such as
regular exercise and non-exercise. Hence the present study was undertaken to assess the effects of exercise in athletes on respiratory system and compared with sedentary group.

Aims & Objective: To compare the differences in pulmonary function test among the athletes and sedentary group.

Materials and Methods: A total of 152 subjects comprising athletes and sedentary were assessed for pulmonary function test. The parameters used as determinants of lung function were FVC, FEV1, FEV3, PEFR and FVC/FEV1 ratio were recorded as per standard procedure using Medspiror.

Results: Pulmonary Function Profile was analyzed and compared between the study groups. In our study the athletic group were having higher mean of percentage value of FVC 88.0 ± 12.8%, FEV1 of 86.8 ± 22.0%, FEV3 of 86.5 ± 13.7 %, PEFR of 93.0 ± 12.8% and FEV1/ FVC ratio of 92.1 ± 4.4% as compared to sedentary group.

Conclusion: The FVC, FEV1, FEV3, PEFR and FEV1/FVC ratio were higher in athletes than in the normal sedentary control individuals. This study suggests that regular exercise has an important role in determining and improving lung functions.

Key words: Pulmonary function test, Athletes, Sedentary, Medspiror.
Pavlos Myrianthefs and George Baltopoulos (2013), we investigated whether professional athletes may require higher tidal volume during mechanical ventilation hypothesizing that they have significantly higher “normal” lung volumes compared to what was predicted and to non-athletes. Measured and predicted spirometric values were recorded in both athletes and non-athletes using a Spirovit SP-1 spirometer (Schiller, Switzerland).

Normal (6 mL/kg of predicted body weight) was calculated as a percentage of measured and predicted forced vital capacity (FVC) and the difference was used to calculate the additional required using the equation: New = . Professional athletes had significantly higher FVC compared to what was predicted (by 9% in females and 10% in males) and to non-athletes. They may also require of 6.6 mL/kg for males and 6.5 mL/kg for females during mechanical ventilation. Non-athletes may require of 5.8 ± 0.1 mL/kg and 6.3 ± 0.1 mL/kg for males and females, respectively. Our findings show that athletes may require additional of 10% (0.6/6 mL/kg) for males and 8.3% (0.5/6 mL/kg) for females during general anesthesia and critical care which needs to be further investigated and tested.
Pradeep Singh Chahar (2013), 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.

Key Words: Spirometer, Vital Capacity, Different Sports, Sportsmen.

Bruce J. Noble & Carl M. Maresh (2013), ten basketball
players and two coaches ([Vdot]O₂ max = 51.08 ml/kg · min) were studied at their place of residence in Chadron, Nebraska (1,000 m, P_B = 661 mm Hg), and 6 days later in Laramie, Wyoming (2,200 m, P_B = 584 mm Hg). Subjects rode the bicycle ergometer through several submaximal workloads until voluntary exhaustion. Laramie tests took place within 8 hours after arrival and at the same time of day as the Chadron tests.

Sub-maximal heart rate, oxygen consumption, pulmonary ventilation, carbon dioxide production, respiratory quotient, and perceived exertion were not significantly altered by the altitude change; however, ventilatory equivalent was significantly higher in Laramie (p < .05). The hypoxia-induced decrease in the anaerobic threshold (workload = 906 kpm/min at both sites) which was hypothesized was not observed. Likewise, resting hematocrit and hemoglobin were not affected by the 1,200 m altitude increment (44.88 vs. 44.53% and 15.39 vs. 15.01 gm%, respectively).

Maximum aerobic power, heart rate, and ventilation were not statistically significant. Maximum ventilatory equivalent increased and vital capacity decreased
significantly in Laramie. In general, basketball players with moderately high aerobic power who reside at an altitude of 1,000 m do not display the hypoxic response to an altitude of 2,200 m expected of sea level residents and aerobically trained athletes.

Nikola Foretic et.al (2013), this investigation was conducted on 85 handball players, 35 seniors, 29 juniors and 21 cadets, with the aim of defining their pulmonary function and determining the difference between the groups, if any. Following parameters of pulmonary function and anthropometry were measured: VC, FEV1, MEF50, MEF25, PEF, body height, body weight. Respondents reported a chronological age and the status of tobacco smoke exposure. T-test for independent samples revealed differences in spirometry and anthropometric parameters.

Anthropometric differences between groups were significant and defined by the structure and demand of handball game in different age categories. Vital capacity was significantly higher for seniors than for juniors and cadets. Juniors achieved significantly better results in variables FEV1 and PEF (highly correlated) than the other groups.
The differences between seniors and cadets are not significant. This is explained with poorer status of anaerobic energy components in senior respondents. Variables for assessment of small airways showed significantly lower scores for senior respondents than in the cadets and juniors.

T-test showed that the senior respondents are significantly more exposed to tobacco smoke. It has greatest negative impact in the variables MEF50 and MEF25. Differences in pulmonary function between different age categories of handball players are conditioned by the structure of a sport, anthropometric characteristics, training methods and lifestyle.

Key words: anthropometric characteristics, handball, pulmonary function, spirometry

Lalit Mohan Tiwari et.al (2012), the purpose of the study was to compare the physical & physiological variables among the Inter District & Inter State Levels of Basketball players. Sixty (60) Male basketball players (30 inter district and 30 interstate) were randomly selected from Uttar Pradesh as a subject. The age of the subjects were ranged from 17-28 years. It was hypothesized that there would be a significant difference in the physical fitness variables and physiological variables among the Indian basketball players of different
levels of competitions. The physical variables chosen were speed, endurance and power which were measured by 50m dash (sec), 2.4km. run (min.) and sergeant jump. The physiological variables were resting heart rate measured by manual methods and vital capacity which is measured by dry spirometre. The data collected on the different level of basketball player were analyzed by independent “t” test. The level of significance for testing the hypothesis was set at 0.05 level of confidence. It is found that the interstate level players were better than inter district players with respect to speed, power and endurance. In terms of physiological variables namely RHR and vital capacity both the group were not differ significantly.

Tiwari & Singh (2012) in their study were to compare the physical and physiological variables among the inter district and Inter State level of Basketball players. Sixty (60) male basketball players (30 inter district and 30 interstate) were randomly selected from Uttar Pradesh as a subject. The age of the subject ranged from 17 – 28 years. It was hypothesized that there would be a significant difference in the physical fitness variables and physiological variables among the Indian basketball players of different levels of competitions. The physical
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The physiological variables were resting heart rate and vital capacity. The data collected on the different levels of basketball players were analyzed by independent “t” test. The level of significance for testing the hypothesis was set at 0.05 level of Confidence. It was found that the inter-state level players were better than inter district players with respect to speed, power and endurance. In terms of physiological variables namely RHR and vital capacity, both the group did note differ significantly.

Tulin Atan et.al, (2012), the purpose of this study was to research pulmonary functions of sedentary males and athletes in different team sports branches in the same age group. This study was conducted on male athletes in 15-16 age group who participate in matches with license in Samsun. 50 athletes from each of the team sports of football, volleyball, basketball and handball players and 50 sedentary males participated as well; being in total 250 athletes.

Among respiratory functions tests; vital capacity (VC), forced vital capacity (FVC) and maximum voluntary ventilation (MVV) values were measured. As a result of the measurements VC values of sedentary males were lower than
football and handball players (p<0.01).

It was determined that VC values of handball players was higher than football, volleyball, basketball players and sedentary males (p<0.05 and p<0.01). When FVC values were analyzed, first of all it was determined that handball, football and basketball players have significantly higher values compared to sedentary males (p<0.01). In the comparison between branches FVC values of volleyball players were significantly lower than football and handball players (p<0.01).

FEV1 values were significantly higher among football and handball players compared to volleyball players and sedentary males (p<0.01). When MVV values were analyzed, it was observed that football players have higher values compared to volleyball and sedentary males (p<0.01). MVV results of handball players were significantly higher than sedentary males (p<0.05). When the respiratory rates (RR) were analyzed, it was determined that values were not significantly different between subjects (p>0.05).

As a conclusion, it was determined that respiratory functions were higher among individuals who do exercise compared to those who do not. That the respiratory parameters of athletes doing exercise are higher than those
who do not show the positive effect of training on respiratory system.

In addition to this, the difference of respiratory functions between branches shows that the sport branch influences the respiratory capacity.

Keywords: Athletes, vital capacity, forced vital capacity, maximum voluntary ventilation.

Amarpreet Singh and N.S. Deol (2012), the purpose of this study is to analysis the differences of physiological variables of basketball players at different levels of competitions. This study is a part of doctorate study having a title “Study of Physiological, Body Composition and Psychomotor variables of Basketball Players at different levels of Competitions”. Study was conducted on 50 basketball male players (25 inter college and 25 under-19 School male basketball players) from. In this study physiological variables were taken (i. Vital Capacity (FVC, PIF & PEF) ii. Vo2max).

Results showed that there exists a significant difference between Inter College and Under-19 School Male Basketball Players among their Physiological variables. It showed that Vital Capacity and VO2max is Higher in Inter College Basketball
Male Players when statistically compared with Under-19 School basketball male players.

Key Words: Physiological Variables, Competition and Players.

Archana Chahal et.al, (2012), Talent identification, selection, training and improvement (TISTI) programs were scanty in team sports especially in consideration of Indian female Basketball. This study tested the hypothesis that predicting excellence in junior Indian female basketball players in relation to anthropometric, physiological variables and then helpful to determine the squads of other levels. The regression and factorial analysis to predict the excellence were applied.

The study measured anthropometric measures (height, weight, arm length, palm length, leg length and the girths of the upper arm, wrist, thigh and calf) and physiological variables (anaerobic power, peak flow rate, vital capacity and four skin folds for body fat percentage) of ninety six female players competing at junior National Basketball championship.

To collect the data of selected variables were taken on each subject individually during rest hours with the help of standard scientific instruments and techniques. Significant relationships were found between performance in relation to palm length (0.32), leg length (0.29), upper arm circumference
(0.24), anaerobic power (0.30), peak flow rate (0.69), vital capacity (0.22) and body fat percentage (0.37).

The performance in junior female basketball players could be attributed to selected anthropometrical and physiological variables followed by prediction equation. Factor analysis of data showed four prominent factors. Application of the findings may prove more beneficial and effective TISTI program to optimize playing ability at appropriate chronological and competitive age (peak performance age).

Key words: factor analysis, anaerobic power, body fat percentage, peak flow rate, vital capacity

Jin-Tae Han and Sang-Yeol Lee (2012), the aim of this study was to compare the vital capacity (FVC, FEV₁, MVV) of normal and underweight women in their 20s. [Subjects] Thirty-four healthy non-smoking young women (age 20-25 years) participated in this study. [Methods] Based on body mass index (BMI), subjects were divided into two groups: the normal weight group (n=18, 18.5<BMI≤25.0) and the underweight group (n=16, BMI≤18.5). FVC, FEV₁ and MVV were measured using a respiratory function instrument, Spiropalm (A-M systems, USA), which fulfills the American Thoracic recommendation for diagnostic spirometry.
The independent t-test was used to compare vital capacities (FVC, FEV₁ and MVV) between the normal and underweight group. [Results] The underweight group had significantly lower FVC and FEV₁ than the normal weight group. MVV of the underweight group was also lower than that of the normal weight group, but the difference was not significant.

[Conclusion] Our results indicate that low body weight is related to reduction of vital capacity in women. These results also suggest that the maintenance of adequate body weight may be important for improving the vital capacity of women.

Vaithiyanadane.V, (2012), Background: The thoracic and abdominal muscle strength plays an important role in pulmonary function and diffusing lung capacity. The purpose of this study is to observe chest and abdominal muscles following period of breath holding which is a part of training for swimmers.

Aims and objectives: To compare the pulmonary function test among swimmers and non-swimmers and to test the hypothesis that ventilatory drive is modified by swimming.

Materials and methods: In this study 20 subjects aged between 19-35 with 2-5 years swimming experience were taken and 20 controls who were in the same age group in SRM medical
college were included after obtaining ethical clearance and consent. 'Easy one pro Spiro meter' was used to find out the pulmonary function test.

Results: Statistically parameters were analyzed by student’s ‘t’ test. There was no significant difference in age, weight, height, BMI between swimmers and non-swimmers. There was a significant difference in mean and standard deviation of pulmonary parameters with the p-value <0.005 in swimmers which shows that they have greater ventilatory drive.

Conclusion: Swimming engages practically all muscle groups. Hence O2 utilization for the muscle is higher in swimmers. Regular swimming produces a positive effect on the lung by increasing pulmonary capacity and thereby improving the lung functioning. Swimmers have greater pulmonary efficiency than non-swimmers which acts as a predictor of performance.

Keywords: Swimmers, Spiro meter, Pulmonary function tests.

Myrianthefs, P et.al (2012), Objective: To compare spirometric measurements in athletes and non-athletes to predicted values. Method: Healthy athletes and non-athlete volunteers were tested by spirometry using an American Thoracic Society/ European Respiratory Society (ATS/ERS) approved spirometer, the Schiller SPIROVIT SP-1 (Schiller, Switzerland), and performed following ATS/ERS Task Force
recommendations. Comparisons between predicted and measured values were performed using the repeated measures multivariate analysis of variance (MANOVA) test.

Results: The study included 296 healthy volunteers, 168 of whom were athletes and 128 non-athletes. Of the athletes, 104 were men aged 27.2±0.7 years, with height 182.2±0.9 cm and weight 81.9±1.3 kg, and 64 were females, aged 26.6±0.7 years, with height 171.3±0.9 cm and weight 64.1±1.2 kg. The male athletes were volleyball players (13), basketball players (28), football players (28) and swimmers (35), with a mean duration of athletic activity of 11.8±6 years. The female athletes were volleyball players (20), basketball players (22) and swimmers (20), with a mean duration of athletic activity of 11.8±6 years.

Of the 128 non-athletes, 68 were men aged 33.8±0.9 years, with height 179.1±0.8 cm and weight 87.9±1.5 kg, and 60 were women, aged 31.9±1.1 years, with height 165.0±0.9 cm and weight 64.9±1.3 kg.

In the athletes, the spirometric values forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) were significantly higher than the predicted values in both men and women (p<0.0001). Among the non-athletes,
only in the women were the FVC values significantly higher (p<0.002) than the predicted values. The FEV1/FVC ratio was found significantly higher (p<0.002) in all groups compared to the predicted values, except for the male athletes.

Conclusions: Greek athletes have significantly higher spirometric values compared to predicted values and thus there is a need for careful evaluation of spirometry when athletes attend physicians with respiratory symptoms.

Pinaki Chatterjee et.al, (2010), Vital capacity is an important index in pulmonary function. At present, it is difficult to achieve accuracy in clinical diagnosis because of lack of unified standard of the normal reference value in younger women's vital capacity in Nepal.

So, the present study was carried out to evaluate vital capacity of healthy Nepalese young females and compare their values with healthy Indian counterparts to know whether Indian prediction equations for vital capacity can be used for Nepalese population or not. Ninety six (42 were Indians and 54 were Nepalese) young, non-smoker, female students of 18 to 20 years of age were recruited for this study.
The mean vital capacity of Nepalese and Indian girls were 2650.31 ± 464.34 and 2629.21 ± 449.97 ml respectively. As no significant difference was found in the mean vital capacity of Nepalese and Indian female students, prediction equation made for Indian females may be used for Nepalese subjects.

Therefore, an attempt has been made to formulate a regression equation from the combined Indian and Nepalese subjects. A stepwise, multiple, linear, regression equation was performed for this purpose. The regression equation based on height for the combined Indian and Nepalese adult females is calculated as: Vital capacity (ml) = 26.2 × Height (cm) – 1467.21.

Yuksel Savucu (2012), long-term handball training has a significant impact in increasing cardiovascular resistance and the performance of ventilation on the respiratory system. In the present study, we investigated the effects of the long-term handball training of young female athletes on respiratory function and echocardiography (ECG) values. Thirty (30) girls (12.58±0.51 years) participated in the study.

Some physical measurements, respiratory function test and ECG values of female athletes were measured in pre and post-training. There were significant differences on physical
values (p<0.001). In comparison of pre-training and post-training results for lung function values, significant differences were found in forced vital capacity (FVC) Pred and forced expiration volume (FEV1) Pred values (p<0.05 level). Also, significant differences were found in FVC-MEAS, FEV1-MEAS and FEV1-FVC Pred values (p<0.001). Significant differences were not found in the other respiratory function parameters.

When we investigated the effect of pre and post-training values of subjects in ECG parameters, significant differences were not found in PR and QRS values (p>0.05). In heart rate (HR) values, we found a significant difference (p<0.05). Also, there was a significant difference between QT interval and corrected QT (QTc) interval (p<0.001).

As a result, it was seen that systematic handball trainings affect the level of physical development, pulmonary functions and ECG values of young girls significantly. Female players achieved major degree at the end of Turkish young women's championships.

Key words: Handball, training, respiration, echocardiography.

Markovic Sasa et.al (2012), Introduction: The anaerobic resources of energy are phosphagenic energy systems (ATP
and CP) and the glycogen-lactic acid system. These energy resources enable highly intensive, but short-term physical activity. In addition, in long-term physical activities, anaerobic energy is significant during certain periods of such an activity, whereas in some cases it may be of decisive importance.

The finish in middle and long distance running, as well as the explosive breakthroughs in handball, football, or basketball are based on anaerobic capacities despite the above-stated facts; the investigations of anaerobic capacities were performed considerably less frequently than the investigations of aerobic capacity. The aim of this investigation was to assess anaerobic capacity in female elite handball players in the most significant part of the competition period.

Methods

Eleven female handball players of the team participating in the National Championship and Cup and the European Champions League were included in the investigation. The remaining three team players were injured at the time of the investigation. The examinees were introduced to the investigation protocol, and before the beginning of the investigation, they gave written informed consent, confirming voluntary participation. The investigation was performed in the
most significant part of the competition season between the last match in the European Champions League and the Serbia and Montenegro Cup Final, when the investigated team won the Cup.

The investigation protocol consisted of anthropometric measurements, investigation of pulmonary function and Wingate anaerobic test. The examinees were admitted for laboratory examination at 11 a.m. after at least 8 hours of an overnight rest, and a light breakfast at least 2 hours before the laboratory examination. Examinees completed their previous training 16 hours prior to examination.

During the examination, all examinees were using the same equipment they use at competitions. Stature was measured by using a stadiometer to the nearest 0,1 cm. Body weight was determined using electronic balance scale to nearest 0,1 kg. Pulmonary function expressed as forced vital capacity (FVC) and forced expiratory volume at one second (FEV1) were measured using computerized spirometer before test.

Anaerobic capacity was assessed by Wingate test on electrodynamic cycle ergometer. The communication between computer and bicycle ergometer was achieved by the interface
via computer ports and an electronic measurement device (bicycle ergometer).

Data registration was performed using the computer program specially designed according to standards of the author's test and announced technical description of the system for computer data registration. The rest of the Wingate standardization elements were applied following the author's recommendation. The results obtained during the test were automatically recorded and computed.

The investigated parameters of anaerobic capacity were expressed both in the absolute (W), and in the relative values (W·kg⁻¹).

Discussion/Conclusion

The existence of similar investigations was not known to us, what further disabled direct comparison of obtained results.

The measured values for FEV1 and FVC are statistically significantly higher than the reference values referred to age and gender. Peak power is the maximal power value achieved at any moment of the test, and represents the explosive characteristics of the muscular power in examinees. This value is the closest one to the examinee's effectively highest power.
Mean power represents mean power expressed during the period of 30 sec.

This parameter represents local muscular endurance. The examination of functional capacities aims to enable the adequate selection, and to predict, within possible limits, the competition results. Considering the sample of examinees, and the use of new methodology, the results of our investigation should serve as a standard for further examinations. We hope that this investigation will be of immediate practical use in planning and designing the training period of handball teams.

Recep Kurkçu, Ismail Gokhan (2011), 20 students doing sports average age 12,65 ± 0,98 in the school team of Yunus Emre elementary school of Şanlıurfa and 16 students not doing any sports, average age 11,93 ± 0,57 are, voluntary involved in this study which aims to determine the effect of the training done by the students aged 10-13 in school teams on respiration and blood circulation systems.

The study group consisted of handballer who for at least 2 years had regularly undertaken 2 hours training per day at least 3 days per week. The control group was formed from of similar age who did no sports and led a normal life. Groups Measures for age, height, weight, resting pulse measures,
systolic and diastolic blood pressure measures, vital capacity (VC) in respiration system, force vital capacity (FVC), Force expiration volume (FEV), and maximum desired ventilation (MVV) values are measured.

The findings obtained were studied with SPSS 11.0 statistics programme on PC while the difference between the averages of groups were examined with independent t-test method in the meaningful ranges from $p<0.05$ to $p<0.01$. The differences between groups in terms of age, height, weight and diastolic blood pressure valves are not significant ($P>0.05$). Significant differences have been detected in resting pulse measures, systolic blood pressure, valves ($p<0.01$), vital capacity, force vital capacity and force expiration volume valves, maximum desired ventilation of the group doing sports. ($P<0.05$).

In conclusion, resting pulse measures and blood pressure values of the students who do training in the school teams were found to be lower than those of the students not doing sports and the respiration values VC, FVC, FEV1 and MVV higher.

Keywords: Handball; circulation; respiration; child and sports.
Vatan Kavak et.al (2005), what can be done to reach the Olympic records and high efficiency level? Can our players be Olympic champions? The aim of this study is to reveal the properties of proper persons, suitable to the branch of sports. This study is a body result of 16 male players, take active roles in the hand ball team of the university. Variables are; age, height, weight, measurements of body fat percentages, 30m sprint speed measurement, heart beat measurement during rest, systolic-diastolic blood pressure, vital capacity, maximum VO\textsubscript{2} (Cooper test). Measurements; taken from 0,5 kg intevaled balance with shorts on and without shoes.

In this study age average, as 21.81 m 2.34; height average, as 176.12 m 6.21 cm; weight average, as 74.81 m 8.85 kg.; Qindex average, as 420.42 m 47.28 weight kg/hwight cm.1000; body fat percentage average, as 10.10 m 2.58mm; 30m sprint (sn)average, as 4.55 m 0.15 m/sn; Vertical jump average as 58.75m6.43 cm; pulse average, as 82.00+5.25(pulse/minute); systolic tension average, as 121.87m11.67mm/hg; diastolic tension average, as 76.56mm/hg; Vital capacity average, as 4.74 m 0.45ml; Maximum VO\textsubscript{2}, as 44.32 m 5.02(ml/kg.min) were
determined. Correlation and regression statistical methods were used to evaluate the data.

Key Words: Handball, Sportsman, Physical, Physiological Properties.

Sukhdev Singh et al. (2010), the purpose of present study was to compare the peak flow rate and vital capacity between district level and state level baseball players. The subjects consist of 30 (District level:15 and State level:15) randomly selected male baseball players, between the age group of 18 to 28 years, studying at different colleges affiliated to Guru Nanak Dev University, Amritsar, Punjab, India.

Peak flow rate was measured with a peak flow meter whereas vital capacity was measured by spirometer. The between-group differences were assessed by using t-test. The level of p<0.05 was considered significant.

Keywords: Baseball Players, Peak flow Rate, Vital Capacity.

Dimitris G. Papadopoulos and Kapetanakis (2010),

Background

The aim is to reveal the connection between scoliosis characteristics such as Cobb angle, Surface Rotation etc. in
comparison with the Vital Capacity in young teenagers as well as in adults.

Material and methods

We have examined 115 young teenagers (107 females and 8 males) and 15 adults (12 females and 3 males), with Thoracic Scoliosis. The age of the teenagers was between 7y and 18y (average 14,2y) and the age for the adults was between 19y and 60y (average 30y). We have used digital X-ray control for the Cobb angle determination, the Formetric 4D for the Surface Rotation and Kyphosis and with the Chest Graph HI 101 Spirometer for determine the Vital Capacity. All the data were analyzed by statistical methods, as well as one by one.

Results

The Cobb angle was measured from 19° to 66° (average 35,4°) for the young patients and 22° to 135° (average 58,73°) for the adults. The Surface Rotation was measured through 1° and 16° (average 7,9°) for the young and 1° and 29° (average 8,9°) for the adults. The Vital Capacity was measured between 46,1% and 116,9% (average 78,9%) for the young and 27% and
105,4% (average 74,68%) for the adults.

We found that was no correlation between Cobb angle, surface rotation and Vital Capacity except for the fact that angles that exceeded 50° seemed that influenced the Vital Capacity in young non athletic patients. The same was noticed in the adult's group and especially in adults with Cobb angles higher than 100°, in which the Vital Capacity was measured even at 19,5%.

In total we have found that the only correlation that influences the Vital Capacity was the Hypokyphosis, in which more smaller is the angle such less becomes the Vital Capacity. As these patients are in Scroth program of rehabilitation and Cheneau brace for the last 9 months, we are waiting to see if the results will be changed.

Conclusion

There is no correlation between Cobb angle, Surface Rotation and Vital Capacity but seems it is influenced from the Hypokyphosis. In more seems that sports, singing and special respiratory exercises affect the Vital Capacity.
V. Fuster et.al (2008), to identify the extent of physical performance differences between active and sedentary subjects taking into account sexual dimorphism. Physical activity level was recorded by interview from a sample of 319 young university students of both genders. Anthropometric variables and physical performance values were obtained.

The sex factor was the main variable explaining the differences in physical performance between active and sedentary young. Also, contributors to those differences were forced vital capacity (FVC), heart rate after exercise and rest heart rate, together with the explosive component of strength (vertical jump).

The effect of physical activity was shown in the increment of FVC and the decrease of resting heart rate. In the overall sample, heart rate after exercise, either in active males or active females, was lowered with respect to the sedentary subjects, showing that active females experienced a greater cardiovascular benefit following adaptation to training than sedentary.

Key words: physical activity, physical performance, males, females
The difference between an athlete's lungs and those of a non-athlete.

Objectives/Goals

The goal of this project was to find the difference between an athlete's lungs and those of a non-athlete. I wanted to test the effect that staying active has on one's body, and therefore, I chose to measure the tidal volume and the vital capacity of each of my participants' lungs. My collecting this data, I was able to find out exactly how much of a difference there is between the two groups' lung volume.

Methods/Materials

Began by gathering 20 athletes and 20 non-athletes, along with about 15 woodwind musicians and proceeded to record their age, gender, height, weight, and activity level (if any). Proceeded to calculate the subjects' expected lung capacity (or, the volume of air contained in the lungs at the end of maximal respiration) with the information provided from their body surface area, using Mosteller's equation.

Went on to estimate the subjects' vital capacity by multiplying the products from the person's body surface area by 2500 (for males) and 2000 (for females). After estimating the participants' lung and vital capacities, continued on to perform the procedure of measuring the tidal capacity and the
vital capacity of the various people using the "balloon method". Stretched out a round balloon several times (to relax the material) for each new volunteer, and then proceeded to measure the tidal capacity by having the person inhale normally and then exhale normally into the balloon.

After pinching the end of the balloon to keep the air in, the diameter of the balloon was measured. After recording the data from three trials, commenced with the second test. Using the same balloon and the same subject, the person inhaled as much air as they could and then exhaled forcefully into the balloon, this measures one's vital capacity. Then, pinching the end, the diameter was measured and data was recorded after three trials.

After calculating the average diameter, went on to look at a graph that had lung volumes (in cubic centimeters) in correspondence with the average diameter of the balloon. Then according to the graph, record the volume of the individuals' lungs.

Results

As predicted, the athletes tested had greater lung capacities than non-athletes, though some participants showed varying results.
Fuster, Vicente (2008), to identify the extent of physical performance differences between active and sedentary subjects taking into account sexual dimorphism physical activity level was recorded by interview from a sample of 319 young university students of both sexes.

Anthropometric variables and physical performance values were obtained. The sex factor was the main variable explaining the differences in physical performance between active and sedentary young. Also contributors to those differences were forced vital capacity (FVC), heart rate after exercise and rest heart rate, together with the explosive component of strength (vertical jump).

The effect of physical activity was shown in the increment of FVC and the decrease of resting heart rate. In the overall sample, heart rate after exercise, either in active males or active females, was lowered with respect to the sedentary subjects, showing that active females experienced a greater cardiovascular benefit following adaptation to training than sedentary.

Kilinc F (2008), the purpose of this study was the investigation of the effects of an intensive combined training program based on the pre-test scores of a university women's
basketball team on their physical, physiological, biomotoric, and technical features. Twenty-four university volunteers were equally divided into two groups: an experiment group (intensive combined training group) and a control (technical training) group.

The 10-week intensive combined training program was performed on the experiment group according to their pre-test outcomes. Before and at the end of each period of training, which was scheduled four times a week, the physical, physiological, biomotoric, and technical performance of each subject were determined.

With respect to the pre- and post-test measurements, the basketball group showed significant differences ($p < 0.05$) in girth measurements (shoulder, waist, hip, arm, thigh, and calf), in skinfold measurements (percent body fat), in physiological measurements (vital capacity and forced vital capacity), in biomotoric tests (right-left hand grip, dynamic and countermovement jump, sit-up, push-up, 1500-m endurance), and in technique tests (free and inside shooting).

It can be concluded that a 10-week intensive combined training program performed on university women basketball players had a significant effect on improving their physical,
physiological, biomotoric, and technical features. It proved to be highly recommendable for female basketball players who are preparing for short-term tournaments; the basketball group in this study won a championship.

Twelve cigarette smoking and 10 non-smoking healthy human volunteers, 25 to 38 yr of age, performed lung function and treadmill performance tests over two periods of 3 wk duration while taking either ascorbic acid (300 mg daily) or placebo tablets in a cross-over design. The two exercise periods were separated by a one-month inactive phase. Tablets were administered in a random, double-blind manner. Plasma vitamin C levels were significantly increased after 3 wk of ascorbic acid supplementation in both smokers and non-smokers as compared to initial levels in the same subjects. No differences between ascorbic acid and placebo treatments of smokers and non-smokers were observed for 1-s forced expiratory volume, forced vital capacity, 1-s forced expiratory percent, resting heart rate, resting and post-exercise systolic and diastolic blood pressures, treadmill workload, post-exercise blood lactic acid, and ventilation measurements. The post-exercise systolic blood pressure values of the non-smokers were lower, although not quite significantly, after the ascorbic
acid treatment than after the placebo. The 300-mg ascorbic acid supplement appeared to have little effect on the lung function and physical performance of healthy smoking and non-smoking males.

Ostojic, Sergej M (2006), the purpose of this study was to describe structural and functional characteristics of elite Serbian basketball players and to evaluate whether players in different positional roles have different physical and physiological profiles. Five men's basketball teams participated in the study and competed in the professional First National League. Physiological measurements were taken of 60 players during the final week of their preparatory training for competition. According to positional roles, players were categorized as guards (n = 20), forwards (n = 20), and centers (n = 20). Guards were older (p < 0.01) and more experienced (p < 0.01) as compared with both forwards and centers.

Centers were taller and heavier than guards and forwards (p < 0.01), whereas forwards had significantly higher height and weight than guards (p < 0.01). Centers had more body fat (p < 0.01) as compared with forwards and guards. Also, centers had significantly lower estimated \([\text{latin capital V with dot above}] \text{O}2\text{max}\) values (p < 0.01) compared with forwards
and guards. In addition, the highest heart rate frequencies during the last minute of the shuttle run test were lower in guards \((p < 0.01)\) as compared with forwards and centers.

Vertical jump power was significantly higher in centers \((p < 0.01)\) as compared with guards. The results of the present study demonstrate that a strong relationship exists between body composition, aerobic fitness, anaerobic power, and positional roles in elite basketball.

Pringle EM et.al (2005), the purpose of this study was to investigate the relationship between selected measures of respiratory function and capacity and performance in a 10 Km race. Thirty-five subjects completed a local 10 Km road race.

Subjects were measured for the following variables: inspiratory capacity (IC), forced vital capacity (FVC), functional residual capacity (FRC), total lung capacity (TLC), maximal voluntary ventilation in 12 sec (MVV), maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), and forced expiratory volume in 1 sec (FEV 1.0). Results showed a significant \((p<0.05)\) negative relationship between run time and FVC \((r=-0.39)\), MVV \((r=-0.52)\), and IC \((r=-0.35)\).
Using stepwise multiple regression analysis it was found that MVV explained 27.0% of the variance in 10 Km run time, FVC explained 15.2% and IC explained 12.3%. Results of this study suggested that selected measures of lung capacities were related to performance in a 10 Km race.

Key Words: Lung Function, Athletic Performance, Endurance Exercise.

Kyle J. Scaffidi (2004), Objectives/Goals: The objective of my experiment was to determine if athletes have a larger lung capacity than non-athletes.

I hypothesized athletes, because of their consistent aerobic activity, would exhibit a significantly greater lung capacity.

Methods/Materials: I tested eighty sixth-grade students: 20 male athletes, 20 male non-athletes, 20 female athletes, and 20 female non-athletes. Each subject inhaled as much as they could and then exhaled into a balloon as much as they could.

The experimenter then measured the diameter of the balloon to quantify the lung capacity of the subject. Each subject completed three trials, with adequate rest in between each trial.
Results: Both the male and female athletes blew the balloon up on the average over one inch larger than the non-athletes to validate my hypothesis. There was a seven percent increase in lung capacity for female athletes when compared to female non-athletes and a four percent increase for male athletes when compared to male non-athletes of the same age.

Constant aerobic activity also affected the consistency of lung capacity as male and female athletes' measurements ranged 6.3 inches and 4.8 inches respectively while male and female non-athletes' scores ranged 9.5 inches and 16.0 inches respectively.

Conclusions/Discussion: My experiment proved a significant advantage to exercise for both genders. My averages show consistent aerobic activity leads to a larger lung capacity for males and females, eleven to twelve years of age.

A greater lung capacity leads to a more efficient respiratory system to distribute oxygen throughout the body, especially important while exercising.

Angyan L (2003), the purpose of this pilot study was to investigate the importance of the athlete's motor capabilities in success in sport. More precisely, the association of anthropometrical and physiological attributes, as well as motor
abilities of elite basketball players with play elements of basketball.

The subjects were seven elite basketball players. At the end of the competitive season, the anthropometrical and physiological features were measured to establish the physical fitness of the subjects. Both general and sport-specific motor tests were done. The coach estimated the performance of each player during the games of the competitive season. The coach's data sheet incorporated 14 parameters of the game.

Regression analyses indicated significant correlation between certain variables of the laboratory tests and the data of the coach's estimation statistics. Knowing these relationships provides us with valuable predictive information about player's capabilities in sport.

Jan Helgerud (2001), Purpose: The aim of the present study was to study the effects of aerobic training on performance during soccer match and soccer specific tests. Methods: Nineteen male elite junior soccer players, age 18.1 0.8 yr, randomly assigned to the training group (N 9) and the control group (N 10) participated in the study.

The specific aerobic training consisted of interval training, four times 4 min at 90–95% of maximal heart rate, with a 3-
min jog in between; twice per week for 8wk. Players were monitored by video during two matches, one before and one after training.

Results: In the training group: a) maximal oxygen uptake (VO2max) increased from 58.1 4.5 mL·kg⁻¹·min⁻¹ to 64.3 3.9 mL·kg⁻¹·min⁻¹ (P 0.01); b) lactate threshold improved from 47.8 5.3 mL·kg⁻¹·min⁻¹ to 55.4 4.1 mL·kg⁻¹·min⁻¹ (P 0.01); c) running economy was also improved by 6.7% (P 0.05); d) distance covered during a match increased by 20% in the training group (P 0.01); e) number of sprints increased by 100% (P 0.01); f) number of involvements with the ball increased by 24% (P 0.05); g) the average work intensity during a soccer match, measured as percent of maximal heart rate, was enhanced from 82.7 3.4% to 85.6 3.1% (P 0.05); and h) no changes were found in maximal vertical jumping height, strength, speed, kicking velocity, kicking precision, or quality of passes after the training period. The control group showed no changes in any of the tested parameters.

Conclusion: Enhanced aerobic endurance in soccer players improved soccer performance by increasing the distance covered, enhancing work intensity, and increasing the number of sprints and involvements with the ball during a match. Key Words: VO2max, lactate threshold, running economy, skill.
Birkel and Edgren (2000) conducted a study with a purpose to find-out the vital capacity of the lungs which is a critical component of good health. Vital capacity is an important concern for those with asthma, heart conditions, and lung ailments; those who smoke; and those who have no known lung problems. Objective: To determine the effects of Yoga postures and breathing exercise on vital capacity. Design of the study, using the Spiro-meter, researchers measured vital capacity. Vital capacity determinants were taken near the beginning and end of two 17 week semesters. No control group was used. Setting: Midwestern University Yoga classes taken for college credit participants.

A total of 287 college students, 89 men and 198 women, Intervention: subjects were taught Yoga poses, breathing techniques, and relaxation in two 50 minutes class meetings for 15 weeks. Main out-come measures were: Vital capacity over time for smoker’s asthmatics, and those with no known lung disease. Results: The study showed a statistically significant (P< .001) improvement in vital capacity across all categories over time. Conclusions: It is not known whether these findings were the result or Yoga poses, breathing
techniques, relation, or other aspects of exercise in the subject's life. The subject's adherence to attending class was 99.96%.

The large number of 287 subjects is considered to be a valid number for a study of this type. These findings are consistent with other research studies reporting the positive effect of Yoga on the vital capacity of the lungs.

Prateek Kumar Mehrotra (1998), regular exercise has proved to be beneficial for the human body and the lungs are no exception. The present study was undertaken to assess the relation between the quality of exercise performed and the quantitative effect of these exercises on the lungs. Pulmonary function tests of sportsmen engaged in various sports were compared with each other and with that of the controls. Players playing football (n=18), hockey (n=19), volleyball (n=20), swimming (n=20) and basketball (n=18) were chosen for this study. Medical students (n=20) were chosen as controls.

The parameters taken into account in this study were forced vital capacity (FVC), forced expiratory volume (FEV-I), and peak expiratory flow rate (PEFR). The
results indicate that all the sportspersons had higher values of lung functions compared to the controls. Among the various groups of players chosen for this study, the swimmers showed the maximum increase in their lung functions.

Key words: Pulmonary functions, FEV-l.

Mahmod Yhya (1998), Introduction: The functional status of the vital organs of the body is an important indicator of health statuses, which is upon the individual and improves the work of these bodies and linked mainly to individual activity.

Research objectives: A study of some vital functions of the basketball players, boxing, and power play. Comparison between the players under study activities in some vital functions.

Hypotheses: There were statistically significant differences between the activities of the players, basketball, boxing and athletics in some vital functions under study. The research sample was selected sample of football players, basketball, boxing and athletics.

Measurements: Physical Proficiency Assessment (pwc 170 Use the equation Kariman Measure vital capacity Measure vital capacity of the lungs.
Results: The presence of statistically significant differences for the basketball players and runners. The presence of statistically significant differences for basketball players and boxers. The results showed that basketball players filed in most biometrics.

Recommendations: The need to the attention of the coaches’ changes that occur to the internal organs of the body and recorded for each player on the unit so as to regulate training loads and determined on a scientific basis.

J. Heller, T. et. al (1998), baseline physiological and kinanthropometric data were collected for 11 male and 12 female elite taekwon-do athletes from the Czech national team for evaluation of anthropometry, aerobic and anaerobic capacities, strength, visual reaction time, pulmonary function, flexibility and explosive power of the lower limbs (vertical jump).

Both male and female taekwondo black belts demonstrated low adiposity (8.2 and 15.4% fat, BMI 21.9 and 22.0 kg m\(^{-2}\), respectively), normal reactivity and pulmonary function, above average muscular strength, PWC-170 (3.4 vs 2.7 W kg\(^{-1}\)) and aerobic power (54 vs 42 ml min\(^{-1}\) kg\(^{-1}\)), and a
high flexibility (37 and 38 cm) and anaerobic performance (peak power output from a 30 s Wingate test = 14.7 and 10.1 W kg\(^{-1}\); anaerobic capacity = 334 and 242 J kg\(^{-1}\), in males and females, respectively).

In male athletes, competitive performance was significantly related to maximum power output and upper limb reaction time only, whereas in females, performance was related to maximum power output and ventilatory threshold level. These variables accounted for 66 and 67% of the performance rank in males and females, respectively.

Time-motion analysis of competition taekwondo fighting (two times 2 min) revealed 3-5 s bouts of maximum exercise alternating with low-intensity periods. This elicits high heart rates (100% HR\(_{\text{max}}\)) and lactate responses (11.4 mmol 1\(^{-1}\) = 81% LA\(_{\text{max}}\)), which agrees well with the physiological characteristics of taekwon-do black belts measured in laboratory exercise tests.

Michael S. Benninger et. al (1992), the patency of the nasal airway may directly affect pulmonary ventilation, with obstruction and increased nasal resistance resulting in increased pulmonary resistance, hypoxia, and hypercapnea.
Nine aerobic athletes were evaluated to assess the role of the nasal airway on aerobic capacity and athletic performance.

A step-ladder graded maximal aerobic capacity test was performed under three test conditions: obstructed, decongested with oxymetazoline hydrochloride, and saline control. No differences in maximum VO2, work load, oxygen saturation, maximal blood pressure, heart rate, or respiratory rate were noted between test conditions.

Pre-exercise nasal resistance was lower in the decongested compared to control conditions, but no differences were found after exercise. Athletic performance was not influenced by nasal patency in this model.

M. W. A. Biersteker and P. A. Biersteker (1985), slow inspiratory vital capacity was measured in 226 healthy young adults, aged from 17 to 35 years. The group included 119 men and 107 women, 87 trained subjects, 71 untrained subjects who intended to take part in a training program for competitive rowing, and 68 untrained subjects who never took part in any competitive sport.

The vital capacity increased with height, weight, fat-free mass, height×fat-free mass, and height-independent fat-free mass, with men having significantly higher vital capacities than
women of the same height or weight. In both males and females vital capacity showed the best relation with height×fat-free mass (correlation coefficients are 0.78 and 0.57 respectively). Multiple regression on vital capacity with height, weight, fat-free mass, height×fat-free mass, height-independent fat-free mass, percentage body fat, and age increased the correlation coefficient only slightly (0.80 and 0.59 respectively).

The subjects had vital capacities that were much higher than those predicted for them by equations originating from the USA. There was no difference between the observed vital capacities and those predicted by equations originating from Europe. There is a difference in vital capacity between the European subjects studied and subjects of similar height studied in the USA. This implies that equations derived from subjects in the USA cannot be applied to European subjects.

From our results we conclude that vital capacity is not increased by physical activity. We derived one simple equation that can be used to predict the vital capacity for male and female, trained and untrained young adults, who have a similar genetic background to our subjects. Dill DB, Hillyard SD, Miller J (1980), Vital capacity (VC) rarely may decrease 35-60% in
healthy mountain climbers associated with high-altitude pulmonary edema (HAPE). In the age range 58-71 yr, five of six men during a week or more on White Mt. in 1962 had decreases in VC from 20 to 32% without frank symptoms of HAPE, Dill, one of the five, had decreases in VC again on White Mt. in 1977 and 1978.

Yet none of 11 young climbers on White Mt. studied by Hultgren (personal communication) had a significant decrease in VC. Dill's arterial O2 saturation at age 87 at 485 Torr was about 79% in rest and 74% when VO2 was 0.74 ml/min.kg. His aerobic capacity at age 87 yr was 18 ml/min.kg at 695 Torr and 15 at 485 Torr.

McKenzie DC et.al (1983), Nineteen aerobic, non-atopic, athletes (10 females, 9 males) were studied in a double-blind fashion to determine the effect of a therapeutic dosage of salbutamol on pulmonary function, oxygen consumption (VO2max), heart rate (HR), and anaerobic threshold (AT). A placebo and salbutamol (in aerosol form) were administered in a dosage of two puffs four times per day. Forced vital capacity (FVC), FEV1.0, and mid-maximal expiratory flow were assessed prior to a maximal treadmill run, and at 5, 10, and 15 min of recovery.
Resting and maximal HR, VO2max, AT, and VE were determined prior to and immediately after the 1-wk experimental period. Pre-test results showed no evidence of airway obstruction in any athlete. There was no significant change in any pulmonary function variable as a result of salbutamol administration. Maximal oxygen consumption showed a slight, non-significant (P greater than 0.05) decrease in both the salbutamol and placebo groups.

There was also a similar non-significant decrease in pulmonary function in both groups. Resting and maximal HR and AT were unchanged. These results indicate that therapeutic administration of a selective beta-2 agonist does not affect pulmonary function or performance-related variables in non-atopic elite athletes.

Martin BJ and Stager JM (1981), do the ventilatory muscles (VM) of normal persons become fatigued while high ventilation is maintained during strenuous exercise? If so, then one effect of the intense training performed by endurance athletes should be an increase in VM endurance.

To investigate this possibility, eight female endurance-athletes and eight female non-athletes were compared in studies of both short-term and long-term maximal ventilation.
The two groups were matched for age, body size, and vital capacity. While athletes and non-athletes had similar short-term maximal ventilation (12-s MVV), the athletes displayed greater ventilatory endurance on two-long-term breathing tests. In the first, ventilation was increased 30 l/min every 4 min. Before exhaustion, athletes reached a ventilation that was a significantly greater fraction of their 12-s MVV (75% vs 67%, P less than 0.01), than did non-athletes.

Although the energy cost (VO2) of submaximal levels of ventilation was identical in the two groups, athletes reached a significantly greater peak VO2 during this progressive test (P less than 0.05). In the second test of ventilatory endurance, 80% of the 12-s MVV was sustained until exhaustion. Endurance times averaged 11 min for athletes and 3 min for non-athletes (P less than 0.01). While these results do not rule out the possibility of genetic predisposition to high VM endurance in athletes, they are consistent with the possibility that VM training may occur in normal persons during forms of endurance exercise training.

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71 yr, five of six men during a week or more on White Mt. in 1962 had decreases in VC from 20 to 32% without frank symptoms of HAPE, Dill, one of the five, had decreases in VC again on White Mt. in 1977 and 1978.

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William Shapiro, C. E. et.al (1964), Pressure-volume-flow relationships during maximum-effort expirations and inspirations were analyzed in 27 studies on 7 superbly conditioned non-smoking athletes, 5 nonathletic non-smokers, and 7 nonathletic smokers.

The athletes had larger mean vital capacity and maximum breathing capacity as well as higher airflow during the first half of forced inspiration than the other subjects. In contrast, smokers exhibited lower mean vital capacity, lower air flows, and higher transpulmonary pressures during forced expirations than the non-smokers.
Transpulmonary pressures at peak flow during maximal forced expirations were higher in the present study than those commonly reported and may have been due to the technique used to perform this maneuver. Limiting factors apparently operate to prevent superior athletic conditioning from effecting comparable improvement in Ventilatory performance. The favourable alterations in this performance which were observed in the athletes do not seem sufficient to explain their greater endurance.

Mild decreases in Ventilatory performance were exhibited by the smokers, probably due to the chronic effects of cigarette smoking on the pulmonary airways respiratory pressure-volume-flow relationships; vital capacity and maximum breathing capacity in athletes; esophageal balloon system for measuring transpulmonary pressure.

Douglas G. Stuart and W. D. Collings (1959), the vital capacity (VC), maximum breathing capacity (MBC) and MBC/VC measurements of 20 athletes and 20 non-athletes were compared. The mean VC score of the athletes was significantly higher than the mean non-athlete VC, but insignificant differences existed between the two groups in MBC and MBC/VC. It is suggested that the difference in VC is
due to increased development of respiratory musculature incidental to regular physical training. This increase is not reflected in the MBC since this measurement would appear to be more concerned with the presence or absence of obstructive Ventilatory defects that are unaffected by physical training. Results are compared with data from the literature.

M. W. A. Biersteker and P. A. Biersteker (2006), slow inspiratory vital capacity was measured in 226 healthy young adults, aged from 17 to 35 years. The group included 119 men and 107 women, 87 trained subjects, 71 untrained subjects who intended to take part in a training program for competitive rowing, and 68 untrained subjects who never took part in any competitive sport. The vital capacity increased with height, weight, fat-free mass, height x fat-free mass, and height-independent fat-free mass, with men having significantly higher vital capacities than women of the same height or weight. In both males and females vital capacity showed the best relation with height x fat-free mass (correlation coefficients are 0.78 and 0.57 respectively). Multiple regression on vital capacity with height, weight, fat-free mass, height x fat-free mass, height-independent fat-free mass, percentage body fat, and age increased the correlation coefficient only slightly (0.80 and 0.59 respectively).
The subjects had vital capacities that were much higher than those predicted for them by equations originating from the USA. There was no difference between the observed vital capacities and those predicted by equations originating from Europe. There is a difference in vital capacity between the European subjects studied and subjects of similar height studied in the USA. This implies that equations derived from subjects in the USA cannot be applied to European subjects. From our results we conclude that vital capacity is not increased by physical activity. We derived one simple equation that can be used to predict the vital capacity for male and female, trained and untrained young adults, who have a similar genetic background to our subjects.

Respiration Values of Athletes Vs Non Athletes Physical Education Essay.

The purpose of this lab was to compare the lung capacities of six different individuals, within three different categories: smoker, athlete, and non-athlete. This report in particular focuses on the specific lung volumes and capacities of an athlete and a non-athlete.

Physical activity has a very definite effect on how deeply a person can breathe. It was therefore hypothesized that due to their increased amount of aerobic or anaerobic activity, an
athlete would exhibit greater lung volumes and have a significantly greater lung capacity than a non-athlete. To determine respiratory values, both individuals were tested using a spirometer. The results from this experiment then proved that non-athletes have lower respiratory values than athletes.

Introduction: This study was performed to show the difference in lung capacities among different people, in this case when exercise or aerobic activity is involved. Generally, total lung capacities in adults depend on several factors including height, weight, gender, age, or physical fitness (harding, pinkerton, plopper). This case is specifically comparing an athlete and a non-athlete.

Aerobic activity can be defined generally as exercise that uses a lot of oxygen, while targeting a specific muscle group for an isolated period of time. It is usually low in intensity, and long in duration. Aerobic activities include things like walking, jogging, biking, or swimming. Anaerobic activity on the contrary does not require much oxygen, and usually leaves a person feeling drained or fatigued. Most athletes fall under this general category. Anaerobic activities include most almost all sports and weight lifting (Miller, Swenson, Wallace).
Regardless of which type of activity a person participates in, in almost all cases athletes have a higher lung capacity than non-athletes simply because they use their lungs more. Increased oxygen intake and lung usage allow the lungs to grow in strength and therefore can expand more readily and take in more air. Exercise is not just limited to increasing lung capacity however. Activity also increases blood flow to the heart, increased metabolic breakdown, and endurance of muscles (Bird, Smith, James).

All of these factors combine with increased lung capacity for an overall healthy body. A non-athlete however has atrophied muscles, decreased metabolic enzymes and a diminished lung capacity.

From all of this information, it can be hypothesized that due to their increased amount of aerobic or anaerobic activity, an athlete would exhibit greater lung volumes and have a significantly greater lung capacity than a non-athlete. The point of this particular experiment was to prove this by using a spirometer to measure respiratory values and to prove whether or not physical activity has a significant affect on a person’s lung capacity.

Materials/Methods: In this experiment, the main instrument that was used was a non-recording spirometer. In order to
work, a subject simply exhales into the device and the indicator moves to indicate the value. This experiment began by choosing two individuals, an athlete and a non-athlete, to perform the procedure. In this case, both subjects were male. The values that were measured were the tidal volume (TV), the inspiratory reserve volume (IRV), expiratory reserve volume (ERV), and vital capacity (VC). To measure the TV, the subject was asked to inhale a normal breath and then exhale normally as well into the spirometer. The instrument was also used to find ERV and IRV. ERV was measured by having the individual inhale a normal breath, then exhale forcibly into the spirometer. IRV is somewhat similar. Instead of inhaling a normal breath however, the subject is asked to inhale the maximum amount of air possible, then exhale into the spirometer.

This should be a relatively high number depending on the subject. All three of these values, TV, IRV, and ERV, were then used to find the VC. VC is simply a sum of these three numbers, and it describes the total amount of air that a person can take into their lungs. Another important value in this experiment was the minute respiratory volume (MRV). Although it does not contribute to the overall VC, it is still a significant measurement.
It describes the total amount of air that a person can take into their lungs in a period of one minute. In order to find this value, the subject was asked to breathe normally for one minute, while their partner counted their total respirations during that time. Then this number was multiplied by the tidal volume (TV) to find the measured respiratory volume (MRV).

Results: For this experiment, an athlete and a non-athlete were asked to perform five individual tests in order to find certain respiratory values. It was performed in a Kent State University lab using a spirometer. The results show that the athlete had higher values in every category. The individual results for TV were: 233 ml for the athlete, and 116 ml for the non-athlete; for MRV, 2563 ml for the athlete and 1972 ml for the non-athlete; for ERV, 1500 ml for the athlete and 1400 ml for the non-athlete; for IRV, 2900 for the athlete and 1917 for the non-athlete; and finally in the category of VC, the athlete’s was 4622 ml and the non-athlete’s was 3433 ml.

Not only were the athlete’s values significantly higher than the non-athlete, but in some cases they were almost double, proving their higher overall lung capacity.

Discussion: It is generally assumed that an athlete would breathe better than a non-athlete. This experiment’s hypothesis made this claim, and the data from this experiment proved it
to be correct. the athlete’s results surpassed, and were almost double in some areas, that of the non-athlete, therefore demonstrating that amount physical activity is a direct determiner of a person’s overall lung capacity.

Although physical activity plays a huge factor, there are also some genetic and environmental factors that contribute to the subjects’ lung capacity and thus could have affected the results of this experiment. First of all, both subjects were male and had relatively the same weight, therefore gender and weight could not be used to argue the results. However, the athlete is 6’3 in height, while the non-athlete is only 5’8 in height. According to “Volume of Human Lungs”, taller individuals automatically have a greater lung capacity than shorter individuals (Elert).

This means that even before this test was performed, the athlete was more likely to breathe deeper than the non-athlete. In addition to the height advantage, environment also may have influenced the experiment results. Subject one, the athlete, grew up in a mountainous area of Pennsylvania. On the contrary, subject two, the non-athlete, was born and raised in an area in Alabama that is close to sea-level.

According to Respiratory Physiology & Neurobiology, a person who lives in an area at sea-level will develop a slightly
smaller lung capacity than someone who grew up in an area with higher altitudes, such as the mountains (Morris). The reason behind this is that the partial pressure of oxygen is lower in an area of higher altitude, which means that oxygen doesn’t diffuse into the bloodstream as readily. Unlike normal lungs, this causes the body’s diffusing capacity to increase in order to process more air. In both of these realities, height and environment, the athlete has an advantage over the non-athlete as far as lung capacity.

These two factors do not necessarily falsify these results, but they could partially explain why the athlete had much higher respiratory levels. If the two subjects were of the same height and from the same area, the results might have been much closer.

On a different note, even though the athlete had much higher respiratory factors than the non-athlete, this does not mean that the non-athlete had necessarily normal levels either. The normal tidal volume (TV), or normal inhalation and exhalation, for the average adult male are 500 ml. Both the athlete and the non-athlete were recorded as having much lower levels than this, the athlete’s being 233 ml and the non-athlete’s. The normal IRV for an adult male is 3 litres (Morris). Again, even though the athlete had a
significantly higher value than the non-athlete, both of these values were below the normal number.

Even in the category of vital capacity, for which the normal level is 4.6 L, the non-athlete recorded 3.4 L, which is well below average. The athlete barely scored in the normal range with a value of 4.62 L. The only category in which both subjects had values above that of normal levels was the ERV.

This presents a very important question: even though the athlete had values higher than the non-athlete in every area, why were almost all of the values for both subjects below that of the average male? Due to the results of the experiment, it is clear that even with the added factors of height, environment, and physical activity, that the non-athlete has an abnormally small lung capacity, while the athlete simply has an average one.

Notes/Disclaimers: This test, for the most part, was very straightforward. There were no errors with the experiment nor the research. The only possible improvements that could have been made for this test would be to perhaps use individuals who were much more similar in height and weight in order to keep these from being a factor in skewing the results.

Conclusion: As a whole, this experiment proved how physical activity can play a role in overall lung capacity, as shown
through the comparison of an athlete to a non-athlete. Testing for simple lung volumes in actuality plays a very big role in the progress of medical research. Therefore experiments similar to this are very important as far as clinical research because they can help doctors and scientists gain new insight about the respiratory system and can help them gain a better understanding of respiratory diseases and problems.

Doughlas G. Stuart and W.D. Collings (2001), in a study intended to compare the Vital Capacity and maximum breathing capacity of 20 athletes comprising members of varsity teams with those of medical students, matched the two groups on the bases of height, weight and body surface area and the varsity players produced higher capacity.

Best and Taydor reported that athletes and other persons in good physical conditions have in general greater vital capacity than others. Gupta and Giri states Vital capacity and respiratory system of an individual are important inherit and environment factors which contribute to ease and efficiency in different athletic events and also in the performance of many physical activities”.

Individual with low vital capacity and smaller expiratory phase. An individual having more vital capacity and longer
expiratory phase can an essential constituent required to perform each physical activity for longer duration. Dreyer found it desirable to classify all people of the same status into three major groups as below:

- Those who are active in regular athletic or military training.
- Those who are indulged in vigorous outdoor labor.
- Those who are occupied in tasks less orders or less conductive to physical development.

He found that persons in first group had higher vital capacity values than those of second and third groups.

Pardivala states that: “Strength does not mean bulk of muscular or muscular or muscular power; it means the strength of the heart and lungs”.

Dial and Afflendt found that vital capacity is related to strength endured the working pattern of heart and lungs.

Weismen reports that changes in lung capacity result in variation in strength aspect of an individual.

Worringen found the average vital capacity of height lifters. Soccer players and trackman was 3900 cc. 4300 and
4700 cc. Respectively as compared with 3250 cc. for non-athletes.

Lemon and Moerch reviewing the work of prayer in the field have stated that those who active in athletics. Military trainer or vigorous outdoor activates had higher vital capacity values than those who occupied in tasks which is less conductive to physical development”.

White and McGuire found that moderate increase of absent five percent of vital capacity during a period of military training camp.

Robinson reported that the lung volume of an athlete was more than a person of sedentary habits. A selected group of South Indians known to indulge in regular physical activity had vital capacity of 3.72 liters and a group of health Anglo Indian at an average value of 3.78 liters.

Kannan found out that the vital capacity of Rural Boys are more than that of Urban Boys at the age of eleven years and found an increase in the vital capacity in the urban boys than that of Rural Boys at the age of fifteen. He believed it was because of more participation in physical activities. He also found that the vital capacity is related to the degree of regularity in physical activities. His study revealed that the
participation in physical activities produced little higher vital capacity.

Krishnan and Vereed reviewing the work of Schneider, state that; regular exercise result in an increase in the vital capacity, especially in adolescent children and young adults.

More house and Miller reviewing the work of Scheider, state that, regular exercise result in increase in the vital capacity, especially in adolescent children and young adults.

Arther C. Guyton states that any factor that the ability of the lungs to expand also reduces the vital capacity.

B.E. Sheshadri states that the practice of breathing exercise showed significant improvement in vital capacity and the duration of Kabaddi cant.

Thanga Rangan in her investigation concluded that age is not significantly correlated with vital capacity in case on non-athletes. She also further stated that correlation between vital capacity and weight is significantly higher in the case of non-athletes showing there by that participation in sports favors physical growth.
Teland and Bhagwat from Western India estimated the vital capacity of 172 adult males between 18 to 29 years of age and found the mean values were around 2.950 liters.

Dobais and Dobois have established that there is a significant relationship between capacity and body surface area.

Thomas K. Cureton studied the long capacity and concluded that the vital capacity is one of the important fitness elements of an individual. Better health and physical fitness will result in increase of vital capacity.

The measurement of vital capacity was the only technique used in earlier years to know the capacity of lunge. Though Thackroach (1831) attempted to measure the vital capacity with a crude technique. The credit goes to Hutchinson (1846) who invented a Spirometer to measure accurate vital capacity.

After Hutchison, Simon (1848), Fabius (1853), Wintrichi (1854), Schnugal (1854) Muller (1868) Waldenberg (1880) George Cormt (1884), Rubow (1908) Siebeek (1910) and Plesom (1993) had contributed their own knowledge on vital capacity.