"EFFECT OF UPPER BODY RESISTANCE TRAINING ON RESPIRATORY FUNCTION IN SEDANTARY MALE SMOKERS"

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

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In partial fulfilment of the requirements

for the award of the

MASTER OF PHYSIOTHERAPY

Degree Programme

Submitted by

Reg.No : 271530207

PPG COLLEGE OF PHYSIOTHERAPY

9/1 KEERANATHAM ROAD,

SARAVANAMPATTY

COIMBATORE – 641 035

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Under the guidance of

Prof. K S.RAJA SHENTHIL M.P.T (Cardio-Resp)., MIAP.,(PhD).,

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CHENNAI

Dissertation Evaluated on ______________________________

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This is to certify that the dissertation Entitiled **"EFFECT OF UPPER BODY RESISTANCE TRAINING ON RESPIRATORY FUNCTION IN SEDANTARY MALE SMOKERS"** is a bonafide compiled work, carried out by **Register No: 271530207,** PPG College of Physiotherapy,Coimbatore-641035 in partial fulfillment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree from **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-32.** This work was guided and supervised by **Prof. KS.RAJA SHENTHIL M.P.T (Cardio-Resp).,MIAP.,(PhD).,**

DATE: **PRINCIPAL**

PLACE:

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ABSTRACT

Back ground of the study:

Improvement in diaphragmatic excursion and peak expiratory flow rate (PEFR) in sedentary male smokers using upper body resistance training along with conventional breathing exercises.**Purpose of the study:** To evaluate the effect of upper body resistance training on diaphragmatic excursion and Peak expiratory flow rate in sedentary male smokers.

Study design:

The Research approach for the study was an randomized quasi experimental study.

Methodology: The study included 40 male volunteers with sedentary life style.40 were randomly allocated by lot system to control group and experimental group.

Control group - receives conventional breathing exercise.

Experimental group - receives conventional breathing exercise with upper body resistance training. The Experimental group were assigned to exercise for 4 weeks, 3 times weekly on non-consecutive days using Upper body resistance training program and breathing exercise. In the Control group only breathing exercise was given for 10 min.

Intervention effect was tested using inch tape and PEFR (peak expiratory flow rate) .

Conclusions:

Four weeks of UBRT program brought about significant changes in the pulmonary function in male sedentary smokers promoting an increase in, diaphragmatic excursion and peak expiratory flow rate in chronic obstructive pulmonary disease.

Keywords: Pulmonary function, resistance training, smokers, upper body exercise

CHAPTER I

INTRODUCTION

Cigarette smoking has been clearly documented as a primary cause of impaired pulmonary function. It is known to cause cardiovascular and cerebrovascular disorders, chronic obstructive pulmonary diseases (COPD), and cancers. It is believed that smoking, either active or passive, has negative influence on lung function, especially Forced expiratory volume in one second (FEV1).

In India, approximately 25 % of men and 3 % of women are current smokers. Results of the Global Adult Tobacco Survey (GATS) in Kerala found that 42 % of adults were exposed to smoke. Estimates show over 5,500 youth start using tobacco every day.
It has been found that muscular exercise increases O_2 consumption, rate of diffusion, and the rate and depth of respiration. Moreover, it has been shown that moderate-to-high levels of regular physical activity are associated with a lower lung function decline and risk of COPD in active smokers. The most recent guidelines on pulmonary rehabilitation (PR) recommends the inclusion of exercise training targeted at the muscles of the upper extremities (UEs) in physical therapy programs specific to subjects with COPD.

During activities involving the UEs, respiration becomes ineffective because the accessory respiratory muscles work to sustain the shoulder girdle, which may contribute to producing early fatigue and dyspnea. In addition, there is a shift in respiratory work to the diaphragm. This is associated with severe dyspnea, and termination of exercise at low workloads, especially in subjects with more severe bronchial obstruction.

Upper limb exercise training for subjects with COPD has been shown to increase upper limb work capacity, improve endurance, and reduce O2 consumption at a given workload.

In addition to UBRT, breathing exercises are capable of increasing the pulmonary ventilation and improving mobilization of the chest wall, drainage of trachea bronchial secretions; promote relaxation, which contributed to a significant increase in FEV1, and peak expiratory flow (PEF). Though smoking is inversely associated with lung function, it seems to have a more deleterious effect than sedentary lifestyle on lung function. Physically active smokers had higher lung function than their non-physically active counterparts.

1.1 BACK GROUND OF THE STUDY

Cigarette smoking is well correlated with lung diseases such as chronic obstructive pulmonary disease. It is common among men than women in India. In addition, sedentary lifestyle is associated with less efficient pulmonary function. Effectiveness of upper body resistance training (UBRT) in improving pulmonary function is unclear. Keeping all these factors in view, this study aims to examine the effect of UBRT on pulmonary function in male sedentary smokers.

1.2 NEED OF THE STUDY

1 examine the effect of upper body resistance training on pulmonary function in sedentary male smokers. The sedentary lifestyle is associated with less efficient pulmonary function. Moderate-to-high levels of regular physical activity are associated with a lower lung function decline and risk of COPD in active smokers.

Early life involvement in smoking during childhood might prevent the lung from attaining complete development and increase chances of illnesses. In addition, airflow limitation resulting from sedentary lifestyle is an independent predictor of future cardiovascular events in patients with various cardiovascular risk factors.

Elimination of smoking and incorporating physically active lifestyles can help to increase respiratory capacity. This is important information for use with health promotion and health education programs that are geared towards reducing the negative effects of smoking as one of the main risk factors for chronic diseases, such as cancer, lung diseases, cardiovascular diseases, and the cardio-respiratory functions.

1.3 AIM OF THE STUDY

This study aims to evaluate the efficacy of UBRT on pulmonary function so that more appropriate choices can be made when designing exercise programs for individuals with decreased pulmonary function and to assist in maintenance of normal pulmonary function, particularly in smokers.

1.4 OBJECTIVES OF THE STUDY

To evaluate the effect of upper body resistance training on improving diaphragmatic excursion and peak expiratory flow rate in sedentary male smokers. .

To evaluate the effect of breathing exercise on improving diaphragmatic excursion and Peak expiratory flow rate in sedentary male smokers.

1.5 HYPOTHESIS

Null hypothesis

- There was no significant effect of upper body resistance training on diaphragmatic excursion in sedentary male smokers.
- There was no significant effect of upper body resistance training on peak expiratory flow rate in sedentary male smokers.

Alternate hypothesis

- There was significant effect of upper body resistance training on diaphragmatic excursion in sedentary male smokers.
- There was significant effect of upper body resistance training on peak expiratory flow rate in sedentary male smokers

1.6 OPERATIONAL DEFINITIONS

Resistance training:

Resistance training (also called strength training or weight training) is the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles. (5th edition) C.Kisner.

Sedentary

Sedentary lifestyle was defined as the lowest quartile of the total physical activity score. It is a type of lifestyle with no or irregular physical activity.

Brenda W. Campbell Jenkins

Diaphragmatic excursion:

Diaphragmatic excursion is the movement of the thoracic diaphragm during breathing.

Normal diaphragmatic excursion should be 3–5 cm, but can be increased in well-conditioned persons to 7–8 cm. This measures the contraction of the diaphragm. It is performed by asking the patient to exhale and hold it.

Donna Frownfelter-3rd edition

Forced expiratory volume in one second (FEV1):

The maximal volume of air that can be expired in one second starting from a maximal inspiratory force.

Ellen A.Hillegass, EdD, PT,CCS

Peak expiratory flow rate:

The peak expiratory flow (PEFR) rate is a measure of pulmonary function that may be defined as the greatest flow assessed in a forced expiration from a full inspiration at total lung capacity level.

J Paediatric.2000; 76:447-52.

CHAPTER II

REVIEW OF LITERATURE

Y Cheng, C Macera et al (2003):

Effects of physical activity on exercise tests and respiratory function:

The results of this study describes, Change in physical activity habits is associated with change in cardiorespiratory fitness and improved pulmonary function in healthy sedentary people.

Dugan D,Walker R, Monroe DA (1995):

These findings indicate that pulmonary rehabilitation programs can help patients realize improved lung function, improved emotional states, increased knowledge about their disease states, and an increased cardiovascular fitness level. The results of this study suggest a regimen that can improve the quality of life for patients with chronic lung disease.

Ozlu T, Bulbul Y (2005):

Smoking and Lung cancer:

It is estimated that deaths attributable to tobacco use will rise to 10 million by 2025, and one-third of all adult deaths are expected to be related to cigarette smoking. The association between cigarettes and lung cancer has been proven by large cohort studies. Tobacco use has been reported to be the main cause of 90% of male and 79% of female lung cancers. 90% of deaths from lung cancer are estimated to be due to smoking. The risk of lung cancer development is 20-40 times higher in lifelong smokers compared to non-smokers. Environmental cigarette smoke exposure and different types of smoking have been shown to cause pulmonary carcinoma.

Smoller JW, Pollack MH et al (1996):

Patients with pulmonary disease, particularly those with obstructive lung disease, have a high rate of panic symptoms and PD. There is reason to believe that pulmonary disease constitutes a risk factor for the development of panic related to repeated experiences with dyspnea and life-threatening exacerbations of pulmonary dysfunction, repeated episodes of hypercapnia or hyperventilation, the use of anxiogenic medications, and the stress of coping with chronic disease.

Kerstjens H, Rijcken et al (1997):

It has long been shown that smoking – both active and passive – has a negative influence on lung function. On average, moderate to heavy male smokers roughly have a 15ml/year larger decline in lung function than non-smokers.

J M Harsoda, GeetanjaliPurohit (2005):

Our study found that repeated periodic exercise helped in improving lung functions, especially FEV1.Periodic measurement of FEV1 with regular exercise can help in generating awareness regarding lifestyle modifications, and acquiring a healthy habit of being active. Exercise is a stressful condition that produces marked change in body functions, improves endurance and reduces breathlessness. Skeletal muscle control many crucial elements of aerobic conditioning, including lung ventilation.

Judith Garcia-Aymerich et al (2007):

This prospective study shows that moderate to high levels of regular physical activity are associated with reduced lung function decline and COPD risk among smokers.Higher levels of regular physical activity could reduce the risk of COPD by modifying smoking-related lung function decline. Active smokers with moderate to high physical activity had a reduced risk of developing COPD as compared with the low physical activity group.

Ries AL, Bauldoff GS et al(2007):

Pulmonary rehabilitation has become a standard of care for patients with chronic lung diseases. This document provides a systematic, evidence-based review of the pulmonary rehabilitation literature that updates the 1997 guidelines published by the American College of Chest Physicians (ACCP) and the American Association of Cardiovascular and Pulmonary Rehabilitation.

There is substantial new evidence that pulmonary rehabilitation is beneficial for patients with COPD and other chronic lung diseases.

Costi S, Crisafulli E et al (2009):

We studied the effects of 15 sessions of unsupported UEET on functional exercise capacity, the ability to perform activities of daily living (ADL), and symptoms perceived during activities involving arms in patients with COPD. Our trial corroborates the effectiveness of unsupported UEET in specifically improving functional exercise capacity of patients with COPD.

Holland AE, Hill CJ et al (2004):

This study compares the effects of upper limb and lower limb training with lower limb training alone on exercise capacity, symptoms, and quality of life with COPD.Unsupported upper limb training has been shown to improve upper limb endurance, but its effects on symptoms and quality of life have not been examined.

Celli BR, Criner G, Rassulo J (1988):

To test the hypothesis that during unsupported arm exercise (UAE) some of the inspiratory muscles of the rib cage partake in upper torso and arm positioning and thereby decrease their contribution to ventilation, we studied 11 subjects to measure pleural (Ppl) and gastric (Pga) pressures, heart rate, respiratory frequency, O2 uptake (VO2), and tidal volume (VT) during symptom-limited UAE. We used leg ergometry (LE) as a reference. . This results in a shift of the dynamic work to the diaphragm and abdominal muscles of exhalation. In a few subjects UAE results in an irregular breathing pattern and very short exercise tolerance.

Epstein Sk et al (1997):

We investigated whether unsupported arm training, as the only form of exercise, could decrease the VO2 and VE cost (percentage increase from resting baseline) associated with unsupported arm elevation and exercise, respectively and we conclude that arm training reduces the VO2 and VE cost of UAE and UAEX, possibly through improved synchronization and coordination of accessory muscle action during unsupported arm activity.

Wright PR et al (2002):

This study evaluates the efficiency of hypertrophic maximal strength training on various COPD relevant parameters and supports the hypotheses that a short term high intensity strength training programme is suitable to improve performance measures of patients with moderate to severe COPD and it might also improve pulmonary function.

Galvan CC, Cataneo AJ (2007):

This study evaluates the effect of utilization of a specific training program of respiratory muscles on pulmonary function in tobacco smokers. The application of the protocol of respiratory exercises with and without additional load in tobacco smokers produced immediate improvement in the performance of respiratory muscles, but this gain was more accentuated after 2 weeks of exercise.

Prakash S, et al (2007):

Cross sectional observation study was conducted to determine if yoga and athletic activity (running) are associated with better lung functions as compared to subjects with sedentary lifestyles and how does athletes and yogis differ in lung function. Spiro metric parameters were assessed in randomly selected 60 healthy male, non-smoking; non-obese subjects-athletes, yogis and sedentary workers. The groups differed significantly in FEV1 and PEFR. The highest mean FEV1 and PEFR were observed in yogis. Both yogis and athletes had significantly better FEV1 as compared to sedentary workers. Yogis also had significantly better PEFR as compared to sedentary workers and athletes. Yogis and athletes had similar lung functions except for better PEFR amongst yogis. Involvement in daily physical activity or sport preferably yoga can help in achieving better pulmonary function.

Schneider CM et al (2007):

The current study suggested that moderate intensity, individualized, prescriptive exercise maintains or improves cardiovascular and pulmonary function with concomitant reductions in fatigue during and after cancer treatment.

Panton LB et al (2004):

The purpose of the present study was to investigate the effects of resistance training in addition to aerobic training on functional outcomes in patients with COPD.Resistance training may be a useful addition to aerobic programs for COPD patients. This study demonstrated that progressive resistance training was well tolerated and improved functional outcomes in COPD patients that were currently involved in an aerobic training program.

Ries AL, et al (1988)

We designed and evaluated two simple, practical, and widely applicable upper-extremity training programs in 45 patients with COPD participating concurrently in a comprehensive, multidisciplinary pulmonary rehabilitation program. We conclude that specific upper-extremity training may be beneficial in the rehabilitation of patients with COPD and warrants further investigation.

Lake FR et al (1990):

We designed a randomized controlled study to evaluate the benefit of upper-limb exercise training, alone and in combination with walking training, in patients with severe chronic airflow obstruction. . We conclude that exercise training improves exercise performance in severe Chronic Airflow Obstruction that the training is specific for the muscle group trained, and that upper-limb exercises should be included in training programs for these patients.

Clark CJ, Cochrane LM et al (2000):

Upper and lower limb isokinetic maximum and sustained muscle function were compared in 43 COPD patients. The COPD patients had reduced isokinetic muscle function (with the exception of sustained upper limb strength) as compared with healthy sedentary subjects. Muscle function improved after weight training in the COPD patients. Whole body endurance during treadmill walking also improved with no change in maximal oxygen consumption.

O'Donnell DE et al (1998):

We studied the impact of a 6-wk supervised, multimodality endurance exercise training program (EXT) on strength and endurance of ventilatory and peripheral muscles in patients with chronic airflow limitation (CAL), general nonspecific exercise training improved ventilatory and peripheral muscle function in severe CAL, but such improvements did not appear to contribute significantly to reduced exertional symptoms and enhanced exercise performance.

Wasswa-Kintu et al:

Reduced FEV1 is strongly associated with lung cancer. Even a relatively modest reduction in FEV1 is a significant predictor of lung cancer, especially among women.

CHAPTER III

METHODOLOGY

3.1 STUDY DESIGN

The Research approach for the study was a quasi-experimental study design.

3.2 STUDY SETTING:

Techno park workers from Bangalore city.

3.3 STUDY SAMPLING TECHNIQUE:

The study includes 40 male volunteers with sedentary life style. They were randomly allocated by lot system to control group and experimental group.

Control group-receives conventional breathing exercise

Experimental group-receives upper body resistance training program and deep breathing exercise**.**

3.4 SAMPLE SIZE:

40 male volunteers with sedentary life style.

3.5 SELECTION CRITERIA:

Inclusion criteria:

- Sedentary lifestyle male subjects
- Age group of 28-34 years
- Bodymass:80-95 kg
- Height:165 cm- 180 cm

- BMI:26-30

They must have sedentary lifestyle, as in no leisure-time physical activity or activities done for less than 20 minutes or fewer than three times per week.

Exclusion criteria:

- Incapable of realizing the protocol of respiratory exercises,
- Any known pulmonary, cardiac pathologies, musculoskeletal disorders,
- Recent surgery
- Recent Trauma.
- Any infective respiratory illness.
- Any treatment undergoing.

3.6 STUDY DURIATION:

- Weeks: 4
- Duration: 30 minutes /day
- Sittings: Weekly 3 sittings/ person

3.7 MATERIALS:

- PEFR& chart
- Inch tape
- Dumb bells
- 1 Chair
- 1 couch
- 1 towel
- Consent form
- Data collection sheet

3.8 PARAMETERS:

Pulmonary function measures FEV1 Using

- Diaphragmatic excursion (inch tape measurement)
- Peak expiratory flow rate

3.9 PROCEDURE

This experimental study was conducted for 40 subjects with age group of 27-32 years who smokes a minimum of 10 cigarettes/day for at least 10 years and still uses cigarettes. Prior sanction was obtained from the authorities to conduct the study. All the subjects were selected after satisfying the inclusion criteria for the study. The subjects and the bystanders are explained in detail about the procedure and the patients who are willing to take part in the study a consent form is signed by the subject itself. They must have sedentary lifestyle as in no leisure- time physical activity or activities done for less than 20 minutes or fewer than 3 times/week.

These 40 subjects will be then randomly assign in to two groups by lot system namely control group (Group A) and experimental group (Group B).Each group contains 20 subjects. Group A receives breathing exercises. Group B receives upper body resistance training exercises and conventional breathing exercises.

Control Group (CG) =20

They receive breathing exercises only for 4 weeks.

Experimental Group (EG) =20

They receive 4 weeks of UBRT program and deep breathing exercise.

The treatment schedule consists of four weeks. The tool selected for pre-test and post-test measurements of pulmonary function testing was using the peak expiratory flow rate and inch tape for measuring the diaphragmatic excursion.

3.10TECHNIQUE

The 4 week training program includes 30 minutes of UBRT that will be supplemented with 10 minutes of deep breathing exercises for Experimental Group as well as control group.

- **GROUP A -** Control Group
- Receiving diaphragmatic breathing exercise (10 minutes)
- Volunteer was placed in the supine position,
- Volunteer was instructed to inhale through his nose and hold it for 2 or 3 sec ,then slowly expire through the mouth, therapist apply gentle sliding pressure with finger tips, working bilaterally from xiphocostal angle to lower ribs.
- They need to maintain their usual activities and they need not to participate in any form of exercises during their 4 weeks training period.

- **GROUP B**-(Experimental group)
- Receiving diaphragmatic breathing exercise

- The strength training program

Prior to the upper body resistance training exercises, each volunteer was placed in the supine position and submitted to a diaphragmatic breathing exercise maneuver that consists of applying gentle, sliding pressure with the fingertips, working bilaterally from the xiphocostal angle to the lower ribs.

The strength training program includes 5 major muscle groups

1. A Seated press- for strengthen Pectoralis major
2. Lattisimusdorsi pull down- for lattisimusdorsi
3. Seated rows- for biceps, triceps, deltoid
4. Seated Shoulder press- for Triceps, deltoid, pectoralis muscles
5. Shoulder Shrugs- for trapezius

- Initially the upper body strength is assessed using one repetition maximum (1RM) i.e. the maximum weight that could be lifted through the full range of motion one time)
- For the first week, the resistance was 50% of 1RM and during the final week the resistance increases to 85% of 1RM.
- Each exercise was performed as 3 sets of 10 repetitions each. Thereafter, the training Workload was increased when more than 10 repetitions per set could be performed.

- This protocol was repeated for three non-consecutive days of UBRT per week for four Weeks.

- One minute rest period was given between each set and 30 seconds between each exercise
- For each training session, recordings are made for

  -the exercises performed

  -weights used

  -number of sets and repetitions completed for each exercises.
- Five minutes of warm-up period that includes general body active exercises and upper extremity muscle stretching was done prior to the session and five minutes of cool-down period which also included general body active exercises and upper extremity muscle stretching was done at the end of the session.

OUTCOME MEASUREMENT:

Assessment Procedure:

A. Diaphragmatic excursion:

To measure the Diaphragmatic excursion inch tape was used.

Ask the person to take "exhale and hold it" while you percuss down the left scapular line until the sound changes from resonant to dull. Mark the area. This estimates the level of the diaphragm separating the lungs from the abdominal viscera.

Allow the patient to take a few normal breaths. Then, ask the person to "take a deep breath and hold it." Continue percussing down from the first mark to the level where the sound changes to dull. Mark the area.

Measure the two marks. Repeat the same procedure on the right side. It should be equal bilaterally and measure about 3-5 cm. in adults.

B. Peak Expiratory Flow Rate (PEFR):

Insert the mouth piece into the meter, if not already fitted.

Ensure the pointer is set at zero (L/min).

Hold the PEFR so that your fingers are clear of the scale and slot.

Do not obstruct the holes at the end of the PEFR

Stand up if possible or sitting preferably, take a deep breath, place the peak flow rate in the mouth and hold horizontally, closing the lips around the mouth piece, then blow as hard and as fast as you can.

Note the number on the scale indicated by the pointer.

Return the pointer to zero (L/min) and repeat the procedure twice move to obtain three readings. Mark the highest of the three readings on your peak flow chart.

Measure peak flow rate close to the same time each day. You should record the PEFR twice daily.

Keep a chart of PEFR

Measurement:

The best of three readings is used as the recorded value of the peak expiratory flow rate.

3.11 STATISTICAL TOOL

The statistical tools used in the study were paired “t” test and unpaired “t” test.

Paired‘t’ test:

The paired “t” test was used to find out the statistical significance between pre and post-test of sedentary male volunteers treated with diaphragmatic breathing exercise and upper body resistance training exercise.

Formula: Paired “t” test:

$$s = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

d = difference between pre testVspost test values

d = mean difference

n = total number of subjects

s = standard deviation

Unpaired “t” test:

The unpaired “t“ test was used to compare the statistically significant difference between Group A and Group B.

Formula: Unpaired “t” test:

$$s = \sqrt{\frac{(n_1-1)s_1^{\,2} + (n_2-1)s_2^{\,2}}{n_1+n_2-2}}$$

$$t = \frac{\left|\bar{x}_1 - \bar{x}_2\right|}{s\sqrt{1/n_1 + 1/n_2}}$$

n1 = total number of subjects in group A

n2 = total number of subjects in group B

x1= difference between pre testVs. post test of group A

x1= mean difference between pre testVs. post test of group A

x2= difference between pre testVs. post test of group B

x2= mean difference between pre testVs post test of group B

CHAPTER IV

DATA ANALYSIS AND RESULT

4.1 Data analysis

This section deals with the analysis and interpretation of data collected from group A and group B who underwent diaphragmatic breathing exercise and upper body resistance training exercise respectively.

CONTROLGROUP-A

The mean values, mean difference, standard deviation and paired t value between pre test and post test values of sedentary male smokers diaphragmatic excursion was measured by using inch tape for group A who have been subjected to conventional breathing exercise.

TABLE-I

Measurement of Diaphragmatic excursion of Group-A

Diaphragmatic excursion	Mean	Mean difference	Standard deviation	Paired T test
Pre test	24.5	15.6	1.05	3.43
Post test	40.1			

Table -1 shows the analysis of volunteers. The paired t value of pre vs. post sessions of group A was 3.43 at 0.05 level of significance, which was greater than the tabulated value of 2.15. This shows that there is statistical difference in pre vs. post result. The pre test mean was 24.5 and post test mean was 40.1, which shows there is an increase in diaphragmatic excursion.

GRAPH-I

Comparison of pre and post values of Diaphragmatic excursion of group-A

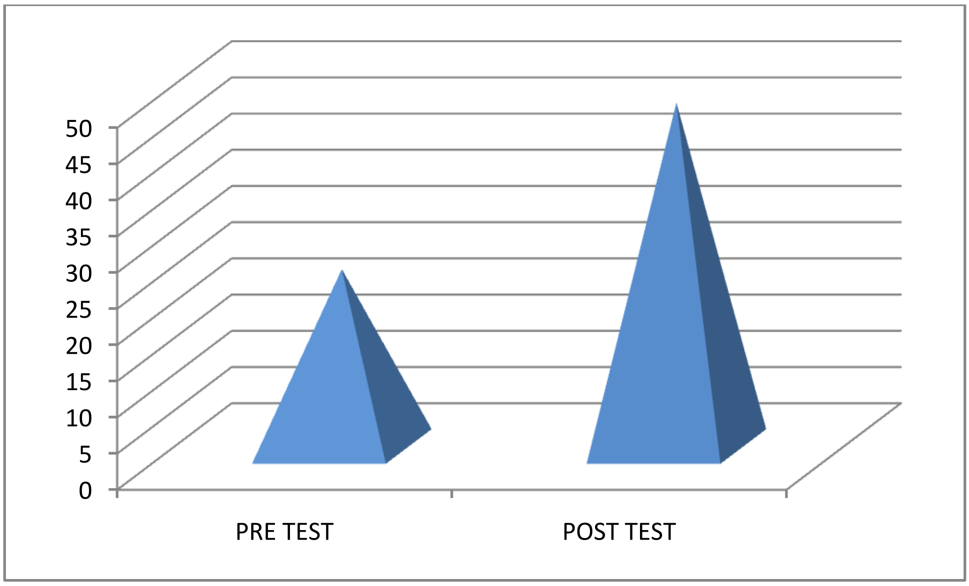


TABLE-II

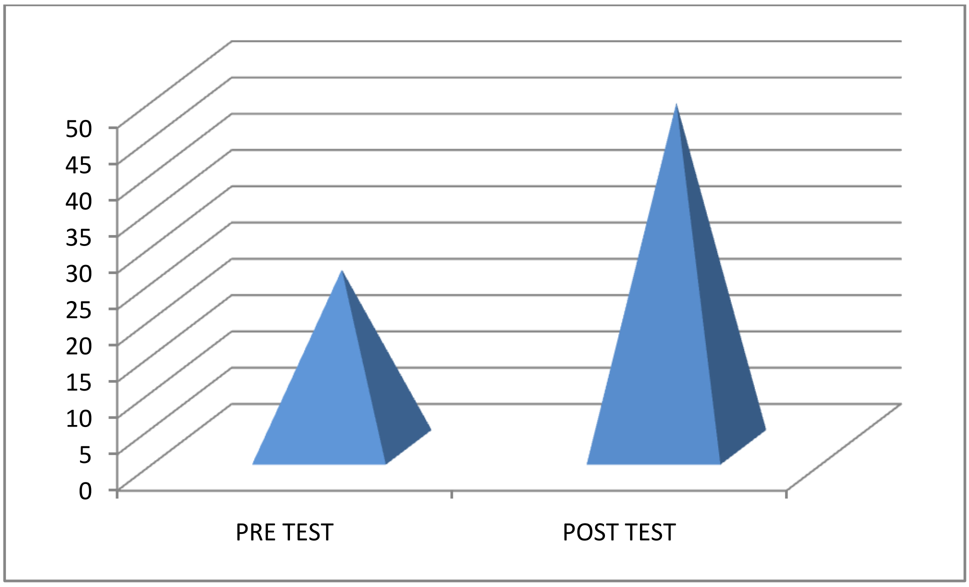
Measurement of Peak expiratory flow rate (PEFR) Group-A

PEFR	Mean	Mean difference	Standard deviation	Paired T test
Pre Test Post test	6727 6991	26.4	1.94	26.7

Table II shows the analysis of volunteers. The paired t value of pre vs. post sessions of group A was 26.7 at 0.05 level of significance, which is greater than the tabulated value of 2.15. This shows that there is a statistical difference in pre vs. post result. In PEFR the pre test mean was 6727 and post test mean was 6991, which shows there is an increase in pulmonary function evaluated by peaked expiratory flow rate.

GRAPH-II

Comparison of pre test and post test values of PEFR group-A



EXPERIMENTAL GROUP B:

The mean values, mean difference, standard deviation and paired t value between pre test and post test values of sedentary male smokers diaphragmatic excursion was measured by using inch tape for group B who have been subjected to conventional breathing exercise and Upper body resistance training exercises.

TABLE-III

Measurement of Diaphragmatic excursion of Group-B

Diaphragmatic excursion	Mean	Mean difference	Standard deviation	Paired T test
Pre test	47.5	33.4	1.78	18.11
Post test	80.9			

Table -II1 shows the analysis of volunteers. The paired ‘t’ value of pre vs. post sessions of group A was 18.11 at 0.05 level of significance, which was greater than the tabulated value of 2.15. This shows that there is statistical difference in pre vs. post result. The pre test mean was 47.5 and post test mean was 80.9, which shows there is an increase in diaphragmatic excursion.

GRAPH-III

Comparison of pre and post values of Diaphragmatic excursion of group-B

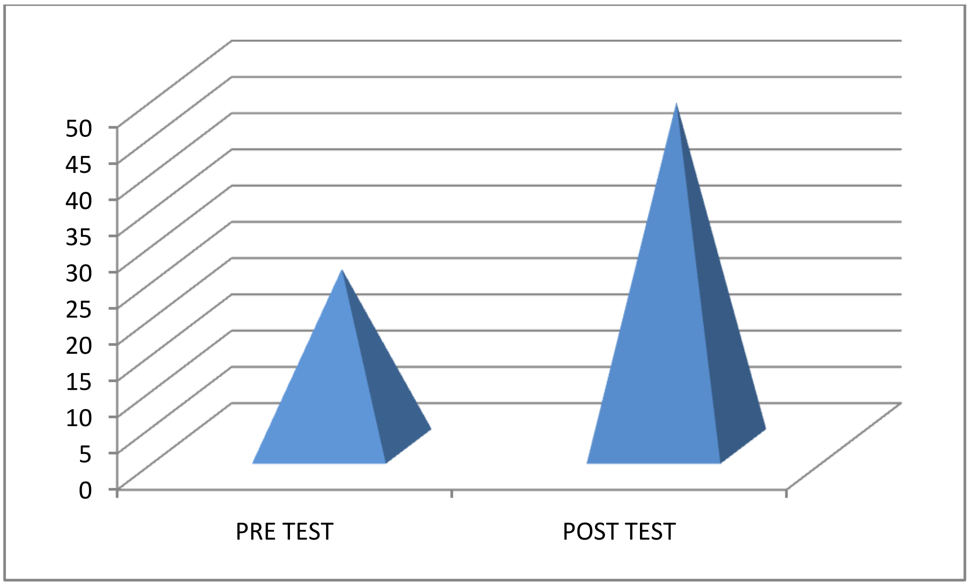


TABLE-IV

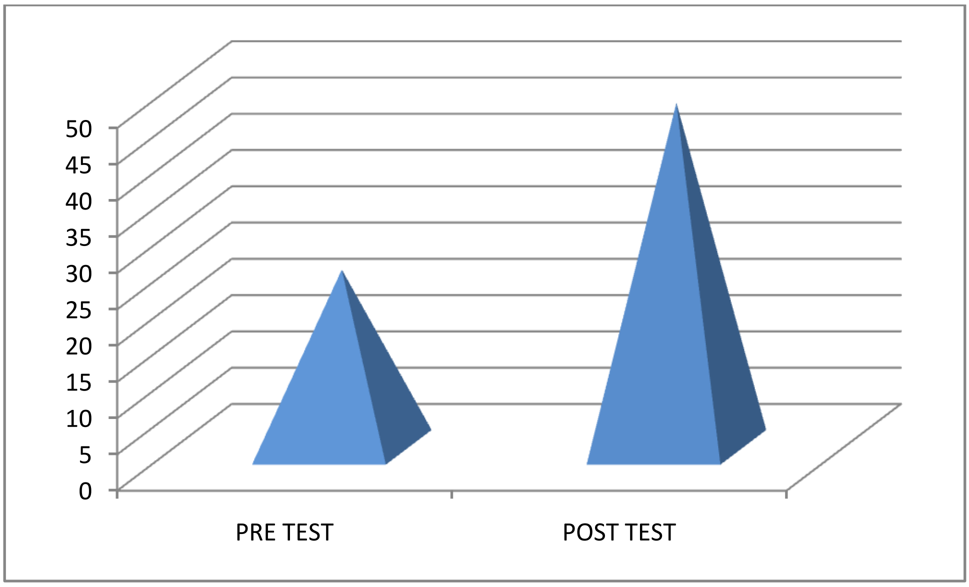
Measurement of Peak expiratory flow rate (PEFR) Group-B

PEFR	Mean	Mean difference	Standard deviation	Paired T test
Pre Test	6938	806	2.01	30.42
Post test	7744			

Table IV shows the analysis of volunteers. The paired t value of pre vs. post sessions of group B was 30.42 at 0.05 level of significance, which is greater than the tabulated value of 2.15. This shows that there is a statistical difference in pre vs. post result. In PEFR the pre test mean was 6938 and post test mean was 7744, which shows there is an increase in pulmonary function evaluated by peaked expiratory flow rate.

GRAPH-IV

Comparison of pre test and post test values of PEFR group-B



4.2 RESULT

It represent the comparative mean values, mean difference, standard deviation, and unpaired "t" value between group A and group B on of sedentary male smokers.

TABLE-V

Diaphragmatic excursion measurement of group A and B

Diaphragmatic excursion	Mean	Mean difference	Standard deviation	Unpaired T test
Group A	24.5	23	1.46	1.64
Group B	47.5			

Table -V shows the unpaired t value of1.64 which is greater than the tabulated "t"value of 2.05 at 0.05 level of significance. This shows that there is statistically significant difference between group A and group B. The mean value of group A is24.5 and post test mean was 47.5, which shows there is greater improvement in group B than group A.

GRAPH-V

Mean Difference of group A and group B of Diaphragmatic excursion.

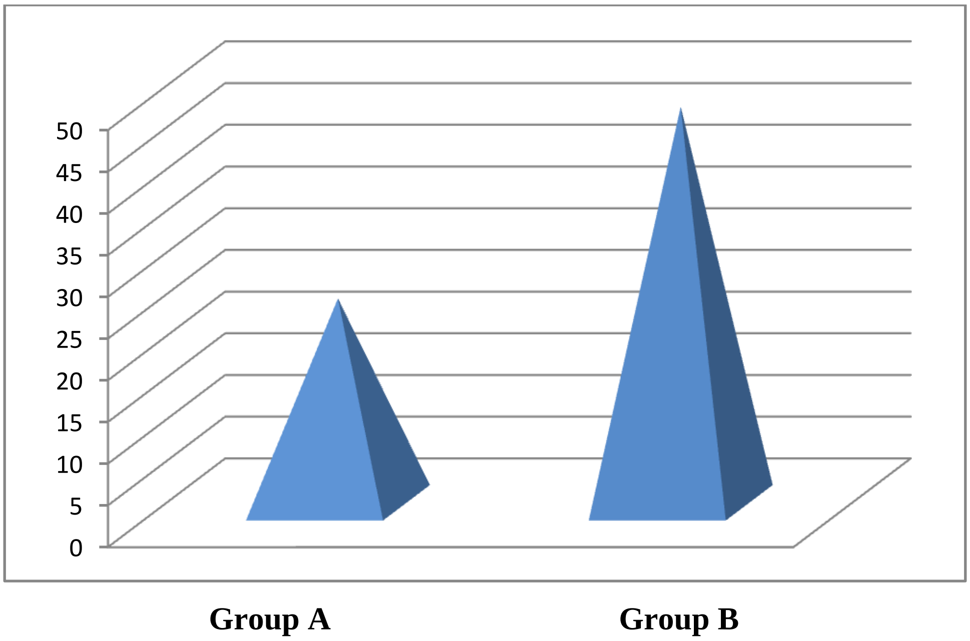


TABLE-VI

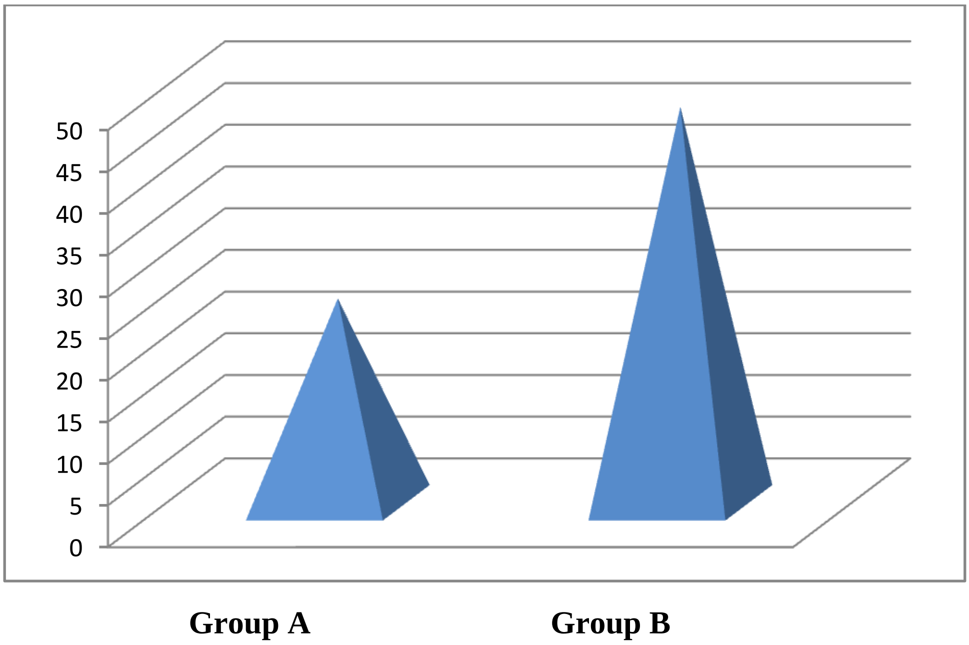
Peak expiratory flow rate of group A and group B

PEFR	Mean	Mean difference	Standard deviation	Unpaired T test
Group A Group B	264 806	542	1.97	7.33

Table -VI shows the analysis of group A and group B.Theunpaired t value of7.33 is greater than the tabulated "t"value of 2.05 at 0.05 level of significance. This shows that there is statistically significant difference between group A and group B. The mean value of group A is264 and post test mean was 806, which shows there is greater improvement in group B than group A.

GRAPH-VI

Mean Difference of group A and group B of PEFR



Therefore the study is rejecting the null hypothesis and accepting the alternate hypothesis.

CHAPTER V

DISCUSSION

To find out the effectiveness of upper body resistance training on Peak expiratory flow meter and diaphragmatic excursion of sedentary male smokers.

Nancy et al (1990): Three measurements of PEFR were obtained by using calibrated mini-Wrights Peak Flow Meter. PEFR was strongly related to age, sex and, height. After adjustments for these factors, low PEFR was associated with chronic respiratory symptoms cough, wheeze, and shortness of breath, exertionaldyspnoea, orthopnoea and paroxysmal nocturnal dyspnoea. PEFR was strongly related to measures of functional ability and physical activity, self-assessment of health and simple measures of cognitive function.

Several studies have described an increase in rib cage contribution to chest wall motion and/or asynchrony between rib cage and abdominal motion in these patients [63-65]. The mechanisms underlying these alterations are not fully elucidated, but appear to be related to the degree of airflow obstruction, hyperinflation of the rib cage, changes in diaphragmatic function, and increased contribution of accessory inspiratory muscles to chest wall motion. Based on the result of above studies, it is concluded that upper body resistance training exercise can be used to improve the diaphragmatic excursion and PERF.

In the analysis and interpretation of diaphragmatic excursion in group A, the paired t value of (3.43) was greater than the tabulated paired t value of 2.15 which showed that there was a statically significant difference at 0.05 level of significance and19 degree of freedom between pre and post results. The pre test mean is (24.5)and post test was (40.1)which shows the improvements regarding improve the diaphragmatic excursion.

In the analysis and interpretation of PERF in group A, the paired t value of (26.7) was greater than the tabulated paired t value of 2.15 which showed that there was a statically significant difference at 0.05 level of significance and19 degree of freedom between pre and post results. The pre test mean is (6727) and post test was (6991) which shows the improvements regarding improve pulmonary function(PEFR).

The above study result support the result of present study in which the conventional breathing exercise has got improvement in above mentioned parameters in group A sedentary male smokers.

In the analysis and interpretation of diaphragmatic excursion in group B, the paired t value of (18.11) was greater than the tabulated paired t value of 2.15 which showed that there was a statically significant difference at 0.05 level of significance and 19 degree of freedom between pre and post results. The pre test mean is (47.5) and post test was (80.9) which shows the improvements regarding improve the diaphragmatic excursion.

In the analysis and interpretation of PERF in group B, the paired t value of (30.42) was greater than the tabulated paired t value of 2.15 which showed that there was a statically significant difference at 0.05 level of significance and 19 degree of freedom between pre and post results. The pre test mean is (6938) and post test was (7744) which shows the improvements regarding improve pulmonary function(PEFR).

J M Harsoda, GeetanjaliPurohit (2005):

Supports the result of present study that repeated periodic exercise helped in improving lung functions, especially FEV1.Periodic measurement of FEV1 with regular exercise can help in generating awareness regarding lifestyle modifications, and acquiring a healthy habit of being active. Exercise is a stressful condition that produces marked change in body functions, improves endurance and reduces breathlessness. Skeletal muscle control many crucial elements of aerobic conditioning, including lung ventilation

IN THE COMPARISON OF GROUP A AND GROUP B

In the analysis and interpretation of Diaphragmatic excursion between Group A and Group B, the unpaired "t" value of (1.64) was greater than the tabulated paired t value of 2.05 at 0.05 level of significance and 38 degrees of freedom which showed that there was statistically significant difference between pre and post results of group A and group B. The mean value of group A was (24.5) and The mean value of group B was (47.5) and the mean difference was 23. Which showed that there was significant improvements regarding diaphragmatic excursion status in group B compared to groupA in response of intervention.

In the analysis and interpretation of PEFR between Group A and Group B, the unpaired "t" value of (7.33) was greater than the tabulated paired t value of 2.05 at 0.05 level of significance and 38 degrees of freedom which showed that there was statistically significant difference between pre and post results of group A and group B. The mean value of group A was (264) and The mean value of group B was (806) and the mean difference was 542. Which showed that there was significant improvements regarding pulmonary function measured inPEFR status in group B compared to group A in response of intervention.

Based on the statistical analysis and interpretation of results, the present study showed that there was significant improvement regarding diaphragmatic excursion and PEFR in sedentary make smokers with upper body resistance training exercise and conventional breathing exercise.

Therefore the present study is accepting the alternate hypothesis and rejecting the null hypothesis.

CHAPTER VI

SUMMARY AND CONCLUSION

SUMMARY

The results of the present study demonstrate that physical therapy intervention using a 4-week program of upper body resistance training exercise for sedentary, male smokers significantly increased the pulmonary function (PERF), and diaphragmatic excursion.

A total number of 40 subjects with sedentary life style were selected by randomly allocated by lot system method after considering the inclusion and exclusion criteria. The informed consents were obtained from the subjects individually. Diaphragmatic excursions, PERF, were taken as the parameters. Pre test data were collected for group A and group B sedentary male smokers and computed. Group A volunteers were subjected to conventional breathing exercise with supervision and Group B volunteers were subjected to conventional breathing exercise along with upper body resistance training exercise for a period of four weeks. The results of the same parameter were recorded for comparison after four week of intervention.

CONCLUSION:

Based on statistical analysis, the result of this study showed that there was significant improvement in both groups. The result also showed that the subjects who participated in experimental Group B had showed good improvement on diaphragmatic excursion and PERF than the control Group A.

Based on the result, this study concluded that conventional breathing exercise improves the diaphragmatic excursion and PEFR. Meanwhile,

Four weeks of high intensity upper body resistance training exercise have an important beneficial impact in promoting an increase in PEFR as well as greater diaphragmatic excursion in male sedentary smokers.

CHAPTER VII

LIMITATIONS AND SUGGESTIONS

Limitations

1. Size of the sample was very small which might have affected the outcome.

2. The study was of short duration.

3. It was not able to assess the other psychological aspects of the volunteers.

Suggestions

1. A large sample size is required to establish the effect of intervention

2. To make the result more valid, a long term study may be carried out.

3. The result obtained suggests that the exercises proposed can be of therapeutic importance in the treatment of respiratory muscles alteration.

4. Further studies are needed inorder to evaluate the effects of lower body resistance training exercise on pulmonary functions.

CHAPTER VIII

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CHAPTER IX

ANNEXURE-I

INFORMED CONSENT FORM

TITLE:

EFFECT OF UPPER BODY RESISTANCE TRAINING ON RESPIRATORY FUNCTION IN SEDANTARY MALE SMOKERS

INVESTIGATOR: _ _ _ _ _ _ _ _ _ _ _ _

PURPOSE OF THE STUDY:

I_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ ,have been informed that this study will work towards improving Pulmonary function in male sedentary workers.

PROCEDURE:

Each term of the study protocol has been explained to me in detail. I understand that during the procedure, I will be receiving the treatment for one time a day. I understand that I will have to take this treatment for four weeks.

I understand that this will be done under investigator, _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ supervision. I am aware also that I have to follow therapist‟s instructions as has been told to me.

CONFIDENTIALITY:

I understand that medical information provided by this study will be confidential. If the data are used for publication in the medical literature or for teaching purposes, no names will be used and other literature such as audio or video tapes will be used only with permission.

RISK AND DISCOMFORT: I understand that there are no potential risks associated with this procedure, and understand that investigator will accompany me during this procedure. There are no known hazards associated with this procedure

. **REFUSAL OR WITHDRAWL OF PARICIPATION:**

I understand that the decision my participation is wholly voluntary and I may refuse participate, may withdraw consent at any time during the study.

I also understand that the investigator may terminate my participation in the study at anytime after researcher has explained me the reasons to do so.

I _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ have explained to …………………………………. the purpose of the research, the procedures required and the possible risks and benefits, to the best of my ability.

…………………………………… ……………………………

Investigator Date

I ………………………………. Confirm that researcher has explained me the purpose of the research, the study procedure and the possible risks and benefits that I may experience. I have read and I have understood this consent to participate as a subject in this research project.

…………………….. …………………………

Subject Date

……………………….. ………………………….

Signature of the Witness

Date

ANNEXURE – II

ASSESSMENT PROFORMA

NAME :

AGE :

SEX :

ADDRESS :

CHIEF COMPLIANT :

PAST MEDICAL HISTORY :

PRESENT MEDICAL HISTORY :

PERSONAL HISTORY :

ON OBSERVATION :

ON EXAMIATION :

DIAGNOSIS :

MODE OF EXERCISE :

MEASUREMENT TOOL : INCH TAPE, PEFR

Anthropometric data.

CONTROL (n = 20)		**EXPERIMENTAL (n = 20)**
Age (years)	27 -32	27 -32
Body mass (kg)	85-95	85-95
Height (cm)	170 to 180	170 to 180
BMI (kg/m2)	26-30	26-30

Signature of the physical therapy student

ANNEXURE-III

MASTER CHART

S no	GROUP-A CONTROL GROUP: PEAK EXPIRATORY FLOW RATE PRE TEST	POST TEST	DIAPHRAGMATIC EXCURSION PRE TEST	POST TEST	GROUP-B EXPERIMENTAL GROUP: PEAK EXPIRATORY FLOW RAT PRE TEST	POST TEST	DIAPHRAGMATIC EXCURSION PRE TEST	POST TEST
1	320	328	336	386	1.3	1.8	2	3.5
2	350	360	352	389	1.4	1.6	2	4
3	335	350	332	375	1	1.4	1	3.2
4	290	307	348	386	1.5	2	2.3	3.5
5	336	343	356	392	1.3	1.8	2.1	4.2
6	352	358	347	383	1	1.9	2.6	3.2
7	332	340	380	400	1	2.2	2.8	3.8
8	348	355	345	396	1.2	2	2.4	3.5
9	356	378	324	380	1	2.3	2.9	4.2
10	347	365	345	394	1.3	1.8	2	4
11	300	320	380	400	1	2	2.5	3.9
12	345	356	345	366	1	1.9	1.9	4
13	324	345	350	394	1	2	2.8	4
14	345	356	325	380	2	2.8	2.4	5
15	380	390	347	385	1	2	2.8	3.8
16	345	358	365	392	2	2.3	2.4	4
17	350	355	320	384	1	1.8	2.8	5
18	325	335	350	395	1.5	2.3	2.5	4.1
19	347	362	335	369	1	2	2.8	5
20	300	330	356	398	1	2.2	2.5	5

LIST OF GRAPHS