"EFFECTIVENESS OF PNF TECHNIQUES TO IMPROVE CHEST MOBILITY AND PULMONARY FUNCTION IN COPD"

A Dissertation Submitted to

The Tamilnadu Dr.M.G.R.Medical University,

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In partial fulfillment of the requirements

For the award of the

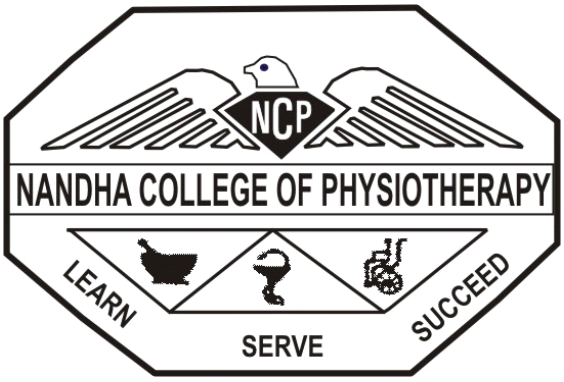
MASTER OF PHYSIOTHERAPY

(Advanced Physiotherapy in Cardio Respiratory)

DEGREE

Submitted by

Reg.No.271430082



NANDHA COLLEGE OF PHYSIOTHERAPY

ERODE

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“EFFECTIVENESS OF PNF TECHNIQUES TO IMPROVE CHEST MOBILITY AND PULMONARY FUNCTION IN COPD”

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ERODE-638052.

The dissertation entitled

Submitted by

Reg.No.**271430082)**

Under the guidance of

Dr.Sarvanan MPT Cardio.,M.I.A.P

A Dissertation Submitted to

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

CHENNAI

Dissertation evaluated on**.....**

Internal Examiner **External Examiner**

CERTIFICATE BY THE HEAD OF THE INSTITUTION

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This is Certify that **(Reg. No. 271430082)** is a Bonafide student of **Nandha College of Physiotherapy, studying Master of Physiotherapy (Advanced Physiotheraphy in orthopaedics)** degree course from the year 2014-2016. The dissertation entitled, **"EFFECTIVENESS OF PNF TECHNIQUES TO IMPROVE CHEST MOBILITY AND PULMONARY FUNCTION IN COPD"** is a record of original and independent work done by her under the guidance of me.

I wish her a great success in her dissertation work.

Place : Signature of Principal

Date :

CERTIFICATE BY THE GUIDE

This is to certify the dissertation entitled **"EFFECTIVENESS OF PNF TECHNIQUES TO IMPROVE CHEST MOBILITY AND PULMONARY FUNCTION IN COPD"** is a bonafide complied work,carried out by **REGISTER NUMBER:271430082** Nandha College of physiotherapy Erode-638052. in partial fulfilment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree of **THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY Chennai-32.** This work was done under my personal guidance.

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DECLARATION

I here, by declare and present my project work entitled **“EFFECTIVENESS OF PNF TECHNIQUES TO IMPROVE CHEST MOBILITY AND PULMONARY FUNCTION IN COPD ”**is outcome of original research work was under taken and carried out by me under the guidance of **Dr.Sarvanan MPT Cardio.M.I.A.P**

To the best of my knowledge this dissertation has not been formed in any other basic for the award of any other degree, diploma, associateship, fellowship, previously form, any other medical university.

Register No:

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CONTENTS

CHAPTER : 1

INTRODUCTION

COPD is characterized by airflow obstruction that is usually progressive not fully reversible and does not change markedly over several months

COPD is now the preferred term for patient with airflow obstruction like chronic bronchitis, emphysema and bronchial asthma.

The common characteristic of these diseases is obstruction to air flow out of the lungs causing poor gas exchange and lack of breath control.

According to both THE AMERICAN THORACIC SOCIETY and THE EUROPEAN RESPIRATORY SOCIETY, it is a disorder that is characterized by reduced maximal expiratory flow and slow forced emptying of the lungs; this limitation in airflow is only minimally reversible with bronchodilators.

COPD Ranks fourth among the leading cause of death in America accounting for 123,974 deaths annually and age adjusted death rate is 43.5 deaths per 100000 populations

EPIDEMIOLOGY

- COPD is continuing to rise, but the global differences in prevalence are decreasing. [2] Increasing air pollution, fast modernization, and widespread construction work are some of the reasons for COPD to thrive. The situation is complicated by poor access to medical services, high price of effective drugs, and poor health education among the affected population. Increased urbanization may have modified the traditionally low incidence of COPD in the Third World. Diets becoming more westernized, improvement in standard of living, decrease in exercise rates, more dust mites, and more pollution has been blamed. [1]

➢ PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION

PNF technique and methods of treatment were used to obtain the maximum quantity of activity, which can be achieved at each voluntary effort and the maximum possible number of repetition of the activity to facilitate the response.

In the development of PNF techniques, greater emphasis was placed on the application of maximal resistance throughout the range of motion, using many combinations of motion that were related to primitive patterns and the employment of postural and righting reflexes.

In the modern field, the advanced physiotherapy techniques of PNF are being applied as a means of stimulating response and strengthening muscles related to respiration.

PNF mobility exercise aims in improving the decreased pulmonary functions and the mobility of chest wall, trunk and shoulder. Breathing exercise and other ventillatory techniques also have a vital role in influencing the rate, depth and distribution of ventilation.

1.1 OPERATIONAL DEFINITION

COPD:

Chronic obstructive pulmonary disease, is a condition characterized by airflow obstruction that is usually progressive, not fully reversible and does not change markedly over several months.

COPD is a disease of the lungs in which an obstructive ventilation disturbance of the respiratory passages evokes a feeling of shortness of breath.

COPDis a condition of the lungs which is characterized by periodic, reversible constriction (narrowing) of the bronchi.

Constriction occurs because bronchi are hyper reactive to a variety of stimuli to which the patient is exposed intermit

COPD is a disease of the lungs in which an obstructive ventilation disturbance of the respiratory passages evokes a feeling of shortness of breath

Heart rate:

Heart rate is the number of heart beats per minute. It is 72 beats per minute

Respiratory rate:

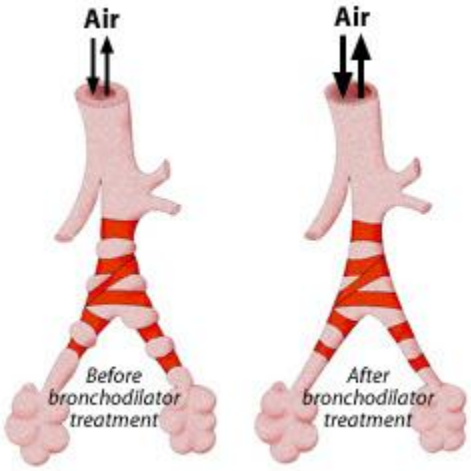
Respiratory rate is the number of breath per minute. It is 12 breaths per minute.

Pressure rate:

pressure exerted by the flowing blood at the lateral side of the wall of the blood vessels. It is 120/80 mm hg.

1.2CLINICALS:

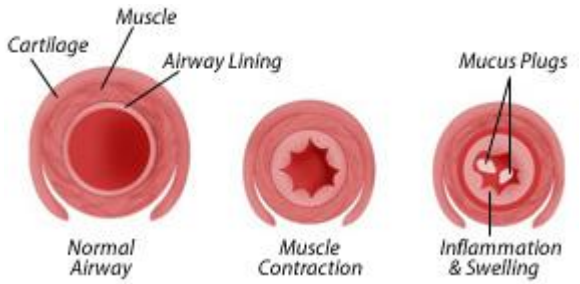
Bronco constriction



The condition when bronchi are narrowed by squeezing is called "bronco constriction." This occurs when muscles, wrapped around the bronchi like a series of elastic bands, tighten and restrict the passage of air. It's normal for these muscles to occasionally close the airway. But in COPD these muscles sometimes overreact, become twitchy and constrict or block the bronchi.

Inflammation

For many years, bronco constriction was thought to be the main cause of asthma. More recently, we've become aware of another problem: Bronchial Inflammation. This occurs when the walls of the bronchi swell up and produce mucus, in reaction to some sort of irritation.



It's normal for the bronchi to produce mucus in order to trap breathed-in irritants, and protect the lungs. But some asthmatics can produce an overabundance of mucus, and the bronchi can become chronically inflamed, resulting in blocked airways and asthmatic symptoms.

So there are two possible conditions associated with a COPD airways, bronco constriction and bronchial inflammation. In fact it is widely believed that the more an airway is inflamed, the more likely it is that the bronchial muscles will constrict.

CAUSING FACTORS:

- **Respiratory infection**
- **Exercises**
- **Cold air**
- **Tobacco &smoke**
- **Other pollutants**
- **Stress or Anxiety**
- **Food allergies**
- **Drug allergies.**

SYMPTOMS & CLINICAL FEATURES OF COPD:

- Dyspnoea
- Wheezing
- Constriction in the chest
- Non productive cough
- Tachypnoea
- Tachycardia
- Systolic hypertension
- Anterior-posterior diameter is increased
- Adventitial breath sound
- Very high pitched wheezing
- Assessorymusclesbecomesactive, frequently
- A paradoxical pulse
- Thick and stringy mucus

COMPLICATION

- Atelectasis
- Pneumothorax
- Pneumo mediastinum

1.3 NEED FOR STUDY

COPD is the most common pulmonary problem that affects the normal function of an individual; there is an intensive need for pulmonary rehabilitation of those individuals. Patients with COPD have increased resistance to airflow, air trapping and hyperinflation of the lung. This contributes to breathing difficulty and reduction in ventilation and increase in heart rate, pressure & respiratory rate.

Here I have incorporated the PNF technique reducing the sympathetic hyper activity in COPD patient.

AIM

- To analyses effectiveness of PNF technique to improve chest mobility and pulmonary function in COPD patients.

OBJECTIVES

- To analyze the effectiveness of PNF to improve chest mobility and pulmonary function in COPD patients.

ASSUMPTION

The study had been conducted assuming proprioceptive neuromuscular facilitation will have an efficacy over the pulmonary function in COPD patients.

PROJECTED OUTCOME

❖ Sufficient research works in their reviews concluded that PNF technique will have an efficacy over the improvement of chest mobility and pulmonary function. Based on the literature reviews the outcome of my study will be that PNF technique will have an efficacy to improve chest mobility and pulmonary function in COPD patients.

1.4 HYPOTHESIS

Null Hypothesis

There is no significant difference in effect of PNF technique to improve pulmonary function in COPD patients.

Alternate Hypothesis

There is significant difference in effect of PNF technique to reduce dyspnea in COPD patients.

CHAPTER 2

REVIEW OF LITERATURE

1.Bake, Dempsey, Dean 2001, PNF movement of the chest wall can be coordinated with breathing, coughing to improve ventilation.

2. Dean Elisabeth et al 1996 conducted the studies on controlled diaphragmatic breathing pattern with hold-relax technique to determine the effect of PNF technique on pulmonary functions. The studies conclude that the controlled diaphragmatic breathing exercises with hold-relax technique facilitated an increase in vital capacity by increasing the volume of ventilation.

3. Donna Frown Felter, E.Dean et al 1996, the intercostals muscle and diaphragm contains sensory muscle spindles that respond to elongation. A signal is sent it spinal cord and anterior horn cells. These neurons signal make more muscle fibers to contract (recruitment) & thus increase the strength. Stretching the ribs and diaphragm activate the stretch reflex & help the patients to take a deep breath

4. E.Dean, Donna Frown Felter 1996, research is needed, however to establish the therapeutic role of PNF techniques based on stretch – reflex theory in altering pulmonary functions. Stated that ventilation has been improved, chest wall muscles are being maximally stretched and ribs are naturally opening up in butterfly technique where the inspiration with trunk extension, shoulder flexion, abduction and external rotation (D2 flexion) with upward

eye gaze and the expiration with trunk flexion, shoulder extension, adduction and internal rotation(D2 extension) with downward eye gaze.

6. GUPTA S, DOLWANI S. A study of autonomic status and its effect on ventilatory functions. Bronchial asthma. Indian J. chest Dis allied sci 1996; 38:147-156.

7. Jennifer Nitz, Bradon Burke et al 2002, the application of these respiratory physiotherapy interventions (PNF techniques) elicits an improvement in respiratory function.

8. Kendall,et al,1993, success of proper positions to enhance inspiratory muscles; is to improve length tension relationship of accessory vetilatory muscles, incorporate passive stretch of chest wall, use of natural coordination of the trunk-chest wall movement with inspiration and exhalation, pattern to maximize movement.

9. Levenson et al 1992, since compressive force to the thorax is greater producing increased chest wall displacement, the stretch to the respiratory muscles may produce increase inspiratory effect.

10. Mary Massery,Donna et al 1996, in working with ill patients, it is essential that optimal body positions is accomplished to facilitate maximal ventilatory potential.

11. S.S.Adler, Beckers & Buck, PNF in Practice, the procedures are used in the area of care. A PNF technique is applied in line with normal chest motion. Use the stretch reflex to initiate inhalation & continue with repeated stretch is repeated contraction.

12.Wood hall, MC Neal 1992, pelvic alignment is a key component in upright posture. An anteriorly tilted pelvis in healthy adult will reduce thoracic curve and scapula and improve upper extremity rage of motion and vetilatory potential

13. ZAID G, BEALL GN, Bronchial response to beta-adrenergic blockade. N Eng J Med 1966; 275; 580-584

CHAPTER 3

MATERIALS AND METHODOLOGY

MATERIALS

- **Pillow**
- **Couch**
- **Arm rest chair**
- **Stethoscope**
- **Inch tape**
- **Cardio respiratory assessment chart**
- **Recording sheet.**

METHODOLOGY

3.1 Study Design

This study compares pretest and post test measures.

3.2 Study Group

This group consists of 15 COPD patients who will receive PNF techniques

3.3 Sample Design

Purposive sampling method to select who fulfill the criteria.

3.4 Study Setting

- Outpatient Department,Nandha college of physiotherapy, Erode.
- Government Head Quarters Hospital, Erode.

3.5 Study Duration

- 7 months.

3.6 CRITERIA FOR SAMPLE SELECTION

3.6.1 Inclusion Criteria

- COPD patients of age 40-50
- Males and females
- Voluntary participation of patients
- Medically stable

3.6.2 Exclusion Criteria

- Unstable cardiovascular conditions

- ❖ Age below 40 and above 50
- ❖ Neuromuscular weakness
- ❖ Smokers
- ❖ Upper limb fractures and deformities.
- ❖ Unstable vital signs.
- ❖ Non cooperative patients.

3.7 PARAMETERS

Dyspnea

Chest expansion

Statistical tool

To compare the effect of pulmonary function, student 't' test for paired values.

$$t = \frac{|\bar{d}| \times \sqrt{n}}{S}$$

$\bar{d}$ = Mean

s = standard deviation (S.D)

n = number of observation

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

This chapter deals with the analysis and interpretation of data's collected from the PNF to compare their effectiveness in improving the pulmonary function collected data were analyzed and tabulated below ,

DYSPNEA GRADING

PRESENTATION OF MEAN, STANDARD DEVIATION AND PAIRED'T' VALUES

The table shows the values of mean difference, standard deviation and paired't' on values of the parameters that were used to assess the pulmonary function

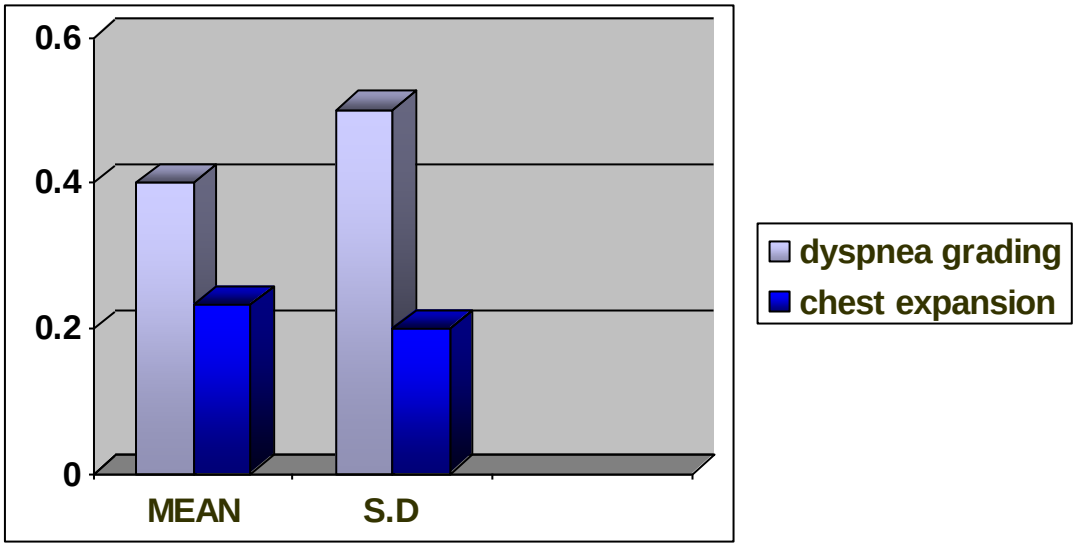
S.NO	PARAMETERS	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 'T' VALUE
1	DYSPNOEA GRADING	0.40	0.5	3.096
2	CHEST EXPANSION	0.233	0.2	4.45

The table shows the values of Mean difference, Standard Deviation and paired 't' values of the parameters that were used to assess the pulmonary function.

Dyspnea Grading

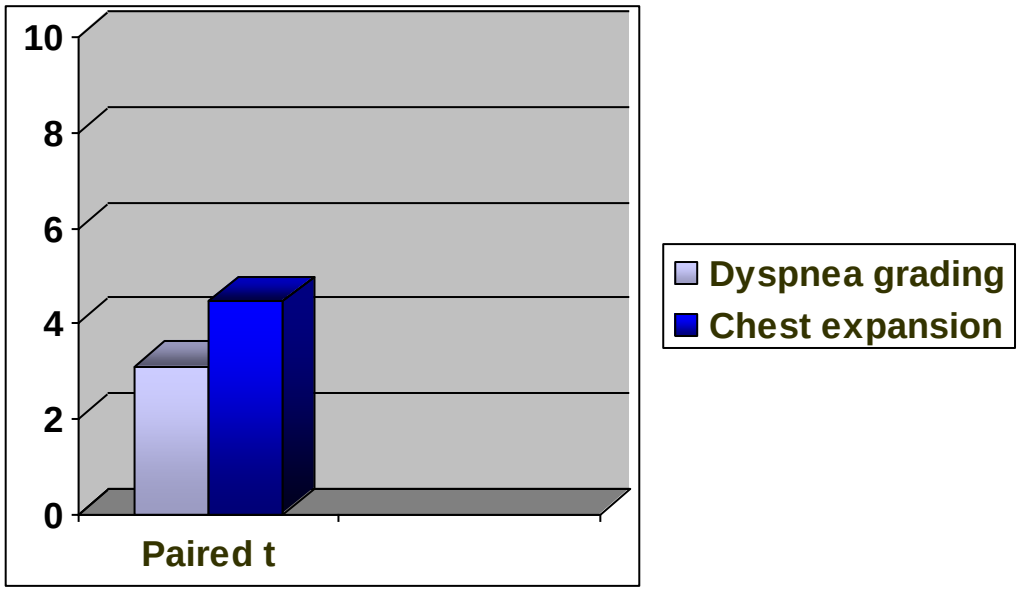
Graph – 1

GRAPHICAL PRESENTATION OF MEAN AND STANDARD DEVIATION



Graph - 2

GRAPHICAL PRESENTATION OF PAIRED T



CHAPTER 5

RESULTS AND DISCUSSION

5.0 RESULTS:

Calculated 't' values are > table value 2.02 at 5% level of significance ($p<0.05$),rejection of Null Hypothesis and the Alternate Hypothesis is accepted.

The result obtained from statistical analysis indicates that there was an improvement in pulmonary function in COPD patients.

The increase in pulmonary function was seen in all subjects received ventilator exercises irrespective of the technique PNF.

By analyzing the mean values, the result showed the subjects who received PNF are found to be more effective in improving the pulmonary function.

5.1 DISCUSSION:

The purpose of the study was to analyze treatment effectiveness of PNF in improving the pulmonary function in COPD patients.

A total of 15 COPD patients with age group of 40-50 years were selected for the study. The pulmonary function was assessed by Dyspnea grading, was taken as the parameter to quantity the effective ness of the treatment.

The reports provided were documented and then subjected to statistical analysis. The results of statistical analysis revealed that PNF is more effective and reliable in improving the pulmonary function in COPD patients.

5.2 RECOMMENDATION:

- ❖ Similar comparative study can be done on a large group.
- ❖ The study can be entitled to a longer period of time.
- ❖ In bronchial asthma patients PNF can be used as an effective technique to improve the pulmonary function since it is more reliable and accurate.
- ❖ Further studies on COPD can also be done by other chest physical therapy techniques.

CHAPTER 6

SUMMARY AND CONCLUSION

The aim of the study was to analyze the effective ness of the technique, PNF in COPD patients. PNF group consists of 15 subjects who were assigned by purposive sampling technique accordingly. The total study duration was 7 months. The mean values were used to compare pre Vs post treatment scores. Patients are benefited more in post treatment sessions. Based on the statistical analysis there was significant difference in the treatment efficacy in PNF.

We here reject the null hypothesis and accepting the alternate hypothesis which states that 'there was significant difference in effect obtained by the treatment technique PNF group'.

So it was concluded that, PNF technique is effective in improving the pulmonary function in COPD patients.

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APPENDIX – I

PHYSICAL THERAPY ASSESSMENT CHART

Name:

Age:

Sex:

Occupation:

P.M.R:

Weight:

Date:

Chief complaints:

Associated problems:

Surgical notes/ Physical observation (if any):

Medical history:

Past history:

Present history:

Drug history:

Family history:

Social history:

Vital signs:

Temp: **PR:** **RR:** **BP:**

Pain assessment:

Location:

Nature:

Aggravating factors:

Relieving factors:

Others if any:

Inflammatory signs:

Tenderness:

Warmth:

Redness:

Others if any:

Physical built:

CARDIO THORACIC ASSESSMENT

External appliances:

Chest deformities:

Clubbing:

Cyanosis:

Edema:

- **pitting / non-pitting:**
- **Area:**

Cough:

- **Type:**
- **Frequency:**

Sputum:

- **Quantity:**
- **Color:**

- **Consistency:**
- **Odour:**

Wheeze:

Chest pain:

- **Character:**
- **Location:**
- **Duration:**
- **Behavior:**

Peripheral pulses:

Respiration:

- **Type:**
- **Depth:**
- **Pattern:**

Vocal fremitus:

Percussion note:

- **Hyper- resonant/ normal/ dull/ stony-dull**

Auscultation:

- **Air entry:**
- **Breath sounds:**
- **Added sounds:**
- **Heart sounds:**

Thoracic expansion:

- **Axilla –**
- **Nipple –**
- **Xiphoid –**

Range of motion(of relevant joints):

Special tests(if any):

Functional assessments:

Investigations:

Clinical diagnosis:

Treatment plan:

APPENDIX 2

DYSPNOEA GRADING:

NEW YORK HEART Association classification of Dyspnoea

- **Grade 1:No dyspnoea**
- **Grade 2:Dyspnoea on moderate exertion**
- **Grade 3:Dyspnoea on mild exertion**
- **Grade 4:Dyspnoea at rest.**

APPENDIX 3

PNF TECHNIQE

D1 flexion and D1 extension, elbow straight:

Starting position- standing.

Procedure:

- Ready
- Close your hands and turn them towards your face
- Pull up and across the face.
- Open your hands turn away from your face
- Then push down and away. And repeat again.

While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth.

D2 flexion and D2 extension, elbow straight:

Starting position- standing.

Procedure:

- Ready
- Open your hands and turn the thumbs up and out.
- Now raise your arms and reach up and away.
- Close your hands and bend your wrist towards your little finger side
- Then pull down and across through the opposite hip and repeat again.

While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth.

D1 flexion, elbow flexion, D1 extension, elbow extension.

Starting position- standing.

Procedure:

- Ready
- Close your hands and turn them towards your face
- Now pull your arms up and across as you bend your elbows across your face.
- Open your hands thumbs turned down and away.
- Now reach down and out as you straighten your elbows and repeat again.

While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth.

D2 flexion, elbow flexion, D2 extension, elbow extension

Starting position- standing.

Procedure:

- Ready
- open your hands thumbs turn up and away
- Now bend your elbows as you rise your arms up and away, point your elbows up and out.
- Close your hands and bend your wrist towards your little finger side

- Now reach down and across to the opposite hip as you straighten your elbows and repeat again.

  While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth.

D1 flexion, elbow extension, D1 extension, elbow flexion:

Starting position- standing.

Procedure:

- Ready
- Close your hands and turn them towards your face
- Now reach up and across straighten your elbows and across your face.
- Open your hands thumbs turned down and away.
- Now bend your elbows and pull down and out to the side and repeat again

  While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth.

D2 flexion, elbow extension, D2 extension, elbows flexion:

Starting position- standing.

Procedure:

- Ready
- Open your hands thumb towards your ears.

- Now rise your arms, straighten your elbows as your hands reach up and away, reach as for as you can..
- Close your hands and bend your wrist towards your little finger side.
- Then pull your elbows towards your middle so that each points to the opposite hips and repeat again.

While rising the arms and across the face, take a deep breath i.e. inspire through your nose and while lowering your arms expire through your mouth

Starting position:

All the bilateral symmetrical patterns are done in standing, and after every two patterns rest is given.

Repetition:

Each bilateral symmetrical patterns are done five times in each sessions. Exercise will be done in three sessions, in the morning, afternoon and evening.

Duration:

In the experimental group the duration time is 30 minutes which is divided into 15 minutes for PNF technique used in upper exercise training program along with conventional physiotherapy which takes another 15 minutes duration. Rest intervals as required.

In the control group the duration is 30 minutes.

APPENDIX 4

Chest mobility

Chest expansion is defined as the circumferential change from full forced expiration to maximum inspiration.

During maximum inhalation, the thorax is enlarged in three diameter transverse, anteroposterior and vertical.

Chest expansion refers to the change in the transverse and anteroposterior dimensions and therefore relates to intercostals function.

The intercostals a muscle lie between the ribs and consists of short parallel fibers the external intercostals muscles lift the ribs to increase the size of the thoracic cavity. The internal intercostal depresses the ribs and decreases the size of the thoracic cavity.

The diaphragm and the intercostals work together to expand the chest by increasing the volume of air in to the lungs.

The chest expansion is measured at three levels-Axillary,Nipple and xiphisternal level.

Normal chest expansion is,

Axillary level – 1 – 2 cm.

Nipple level – 2 – 3 cm.

Xiphisternal level – 3 – 5 cm

Technique:

- Inch tape should be placed around the chest.
- Ask the patient to breath out as for as possible, then he is asked to breath in deeply as for as possible.
- These two measurements are recorded.
- Difference between these two measurements gives chest expansion values.
- The measurements are taken at three levels.

APPENDIX 5

DYSPNEA GRADING TABLE

Table 2:

S.No	Pre Test	Post Test
1	1	1
2	1	1
3	1	1
4	2	1
5	2	1
6	1	2
7	2	1
8	2	2
9	2	1
10	2	2
11	1	1
12	2	1
13	1	1
14	2	1
15	2	2

Mean = 0.40

S.D = 0.50

Paired 't' value = 3.096

CHEST EXPANSION

TABLE 3:

S.No	Pre Test	Post test
1	2	2.3
2	2.3	2.6
3	2.5	2.5
4	1	1.4
5	1.7	2.4
6	2	2.3
7	2	2.2
8	1.5	2
9	2	2.3
10	1.5	1.5
11	1.4	1.5
12	1.8	1.8
13	1.6	1.7
14	2	2.1
15	2.2	2.4

Mean = 0.233

S.D = 0.2

Paired ‘t’ value = 4.45