EFFECTIVENESS OF 90/90 SUPPORTED HIP SHIFT WITH HEMI BRIDGE BALL AND BALLOON EXERCISES ALONG WITH FORCED BREATHING TECHNIQUE ON IMPROVING PULMONARY FUNCTION AND REDUCING PAIN IN PATIENTS WITH CHRONIC BACK PAIN

A Dissertation Submitted To

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

CHENNAI

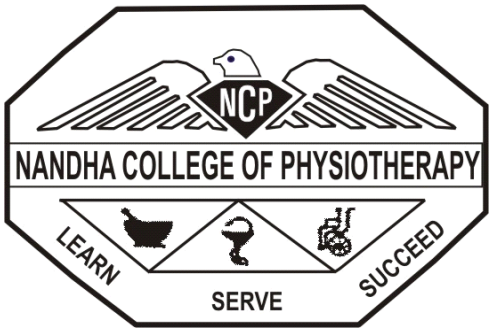
In partial fulfillment of the requirements for the awards of the

MASTER OF THE PHYSIOTHERAPY

(ADVANCED PHYSIOTHERAPY IN CARDIO RESPIRATORY)

Submitted by

Reg. No. 271730081



NANDHA COLLEGE OF PHYSIOTHERAPY

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The dissertation entitled

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Under the guidance of

Prof. R.SARAVANAKUMAR M.P.T (CARDIO).,

The Dissertation Submitted To

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CHENNAI

Dissertation evaluated on …….

Internal Examiner External Examiner

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I wish him a great success in his dissertation work.

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Place : Erode

Date : **Guide Signature**

DECLARATION

I hereby and present my project work entitled "EFFECTIVENESS OF 90/90 SUPPORTED HIP SHIFT WITH HEMI BRIDGE BALL AND BALLOON EXERCISES ALONG WITH FORCED BREATHING TECHNIQUE ON IMPROVING PULMONARY FUNCTION AND REDUCING PAIN IN PATIENTS WITH CHRONIC BACK PAIN"

is outcome of original research work was undertaken and carried out by me under the guidance of **Prof. R. SARAVANAKUMAR M.P.T (CARDIO).,**

To the best of my knowledge this dissertation has not been formed in any other basic for the award of any other degree, diploma, associate ship, fellowship, preciously from any other medical university.

Reg.No.271730081

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Last but not the least, I would like to pay my gratitude to **My Parents &Friends** who always had so much confidence in me and always provided me with a constant silent support, encouragement and inspiration.

PREFACE

It was immense pleasure for me to present this project work on "**EFFECTIVENESS OF 90/90 SUPPORTED HIP SHIFT WITH HEMI BRIDGE BALL AND BALLOON EXERCISES ALONG WITH FORCED BREATHING TECHNIQUE ON IMPROVING PULMONARY FUNCTION AND REDUCING PAIN IN PATIENTS WITH CHRONIC BACK PAIN"** because this opportunity made me learn a lot about this condition.

I have done this work with my best level by referring many Cardiology books, journals and websites. I have assessed and given treatment to patient to improve their condition. I believe this project work will prove to be very useful for the physiotherapists to give a better knowledge while assessing and treating the low back pain patients and improving the pulmonary functions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER-I

1. INTRODUCTION

In order to breathe, coordinated contraction of the respiratory muscles is required. The action of the downward contraction movement of the diaphragm and the expansion of the ribs in a superior outward direction increases lung volume and decreases the pressure inside the thoracic cavity, inducing inhalation by the inflow of air into the lung cavity. As the contracted muscles become relaxed, the space inside the thoracic cavity is reduced, and pressure is elevated, inducing exhalation by the outflow of air **(Yang SH)** Limited pulmonary function results in symptoms such as cough, sputum, chills, high fever, chest pain, and difficulty breathing during exercise, all of which can be caused by various modern life-related factors, such as smoking, air pollution, occupational exposure, allergies, infection, genetic predisposition, and aging. If symptoms continue to deteriorate due to persistent pulmonary disease, complications, such as the development of acute lung diseases, bacterial infection, and heart failure, often follow **(Jin SR)**

Therefore, various treatments for lung disease have been developed, among which respiratory muscle-strengthening exercises have been shown to have various therapeutic effects. These effects include improved pulmonary function, exercise performance, respiratory function, and respiratory muscle strength; maintenance or improvement of chest and lumbar mobility **(Troosters T, Casaburi R, Gosselink R,)** and correction of abnormal breathing patterns. Thus, these treatments are used to prevent complications from lung disease **(Sutbeyaz ST, Koseoglu F, Inan L,)**

Non-specific low back pain is the universal term that refers to any type of back pain in the lumbar region that is not related to severe pathology and does not have a specific cause **(Balagué, Federico)** It can either be acute subacute or chronic in nature **(Nachemson AL, Waddell G, NorlundA.)**In the Western industrialised countries, LBP is a major health problem **(Mayer, Tom G)** The annual prevalence of LBP is stated to be 15% to 45% with a point prevalence of approximately 30% **(Merritt, Hiram Houston, Henry L. Moses, and Lucy Moses)**. Sixty percent of individuals who experience acute LBP recover in 6 weeks and up to 80% to 90% recover within 12 weeks **(Sharma, S. C)** The incidence of LBP in India has been reported to be 23.09%. It has a lifetime prevalence of 60% to 85% (**Sharma, S. C,Krismer, M., and M. Van Tulder**.). Among these individuals, 67% have psychological problems, 57% were in blue colour job, 26% had to leave their profession and 38% were not satisfied with their present job (**Sharma, S. C**). Impaired kinematics of diaphragm and pelvic floor muscle and changes in breathing pattern were observed in patient with back pain

undergoing a motor task. Studies have found that diaphragm contributes biomechanically to maintain trunk stability. It has been reported that, diaphragm by activation of the phrenic nerve, resulted in, an increase in intra abdominal pressure which eventually increases spinal stiffness. Diaphragm plays two roles - it is a primary muscle for respiration and also acts as a trunk stabilizer. Along with diaphragm, transversus abdominis, pelvic floor muscle and multifidus also stabilize the trunk. The tonic activities of the transversus abdominis and diaphragm are regulated to meet respiratory demands during both inspiration and expiration and provide spinal stability, when there are monotonous limb movements. It has been found that, inefficient muscular stabilization results in delayed contraction of transverses abdominis causing LBP. Therefore, these changes in kinematics of trunk stabilizers may be responsible for back pain **(Ostwal, Priyanka P., and S. K. Wani)**

Suboptimal breathing patterns and impairments of posture and trunk stability are often associated with low back pain. Treatment with traditional core stabilization exercises has caused recurrence of LBP. Respiration is also affected by poor neuromuscular control of core muscles. Immediate effects of Bridge Ball and Balloon exercise has been studied on chronic pain in athlete population. These exercises provide an optimal zone of apposition (ZOA) of the diaphragm that may help to address LBP. These exercises have been designed in such a way, that all the core muscles get recruited while performing the exercises **(Boyle, Kyndall L., Josh Olinick, and Cynthia Lewis).** Extensive research has been done in the field of physiotherapy on acute LBP. Limited evidence is available for chronic LBP with hemi bridge with ball and balloon exercise in non-athlete population.

1.1 OPERATIONAL DEFINITIONS:

FORCED EXPIRATORY VOLUME (FEV_1)

Forced expiratory volume how much air a person exhale during a force breath. The amount of air exhaled may be measured during the first (FEV_1),second (FEV_2),and/or third second (FEV_3) of the forced breath

- E.GREGORY THOMPSON

FORCED VITAL CAPACITY

Forced vital capacity or FVC is defined as the amount of air that can be forcibly exhaled from the lungs after taking the deepest breathe possible.

- DEBORACH LEADER R N

VISUAL ANALOGUE SCALE

A Visual analogue scale (VAS) is a measurement of instrument that tries measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured.

- D.GOULD

1.2 STATEMENT OF THE STUDY

Effectiveness of 90/90 supported hip shift with hemi bridge ball and balloon exercises along with forced breathing technique on improving pulmonary function and reducing pain in patients with chronic back pain.

1.3 NEED FOR THE STUDY

- The balloon blowing exercise in a bridge position using hip and knee flexion is proposed here as a breathing exercise and preventive method that can be performed daily by patients without professional help.
- Purpose of the study is to apply the present study to the lung function enhancement based on the theory that can improve the contractile motion of the trunk respiratory muscle.
- Need of the study arises to evaluate the effect of 90/90 supported hip shift with ball and balloon exercise on pain ,forced expiratory volume ,forced vital capacity and functional abilities in patients with chronic back pain using visual analogue scale.
- Need of study arises to evaluate the effect of forced breathing technique reduces pain ,forced expiratory volume, forced vital capacity ,and functional abilities in patients with chronic back pain using visual analogue scale.

1.4 AIM OF THE STUDY:

The aim of the study is to "Effectiveness of 90/90 supported hip shift with hemi bridge ball and balloon exercises along with forced breathing technique on improving pulmonary function and reducing pain in patients with chronic back pain"

1.5 OBJECTIVES OF THE STUDY:

To evaluate the effects of hemibridge with ball and balloon exercise on pain, forced expiratory volume and functional abilities in patients with chronic low back pain using Visual Analogue Scale(VAS), Forced Expiratory Volume (FEV_1) forced vital capacity(FVC)

1.5 HYPOTHESIS:

NULL HYPOTHESIS:

- There is no significant difference between "Effectiveness of 90/90 Supported Hip Shift With Hemi bridge Ball And Balloon Exercise and Force Breathing Technique on Improvement of Pulmonary Function And Pain In Patients With Chronic Back Pain"

ALTERNATE HYPOTHESIS:

- There is significant difference "Effectiveness of 90/90 supported hip shift with hemi bridge ball and balloon exercises along with forced breathing technique on improving pulmonary function and reducing pain in patients with chronic back pain"

1.7 VARIABLES OF THE STUDY:

INDEPENDENT VARIABLES:

- ✓ 90/90 Supported Hip Shift With Hemibridge Ball And Balloon Exercise
- ✓ Force Breathing Technique

DEPENDENT VARIABLES:

- ✓ Improvement of Pulmonary Function and (forced expiratory volume and forced vital capacity)
- ✓ Reduces the pain in patients with chronic Back Pain.

CHAPTER- II

2. REVIEW OF LITERATURES

Kyo Chul Seo (2018)

This study investigated the effects of performing a 90/90 bridge position using a ball with a balloon-blowing exercise on pulmonary function in female college students in their twenties. When measurements of pulmonary function before and after the experiment were compared, it as found that the lung capacity of the experimental group was significantly increased in FVC and FEV1 compared to the control group. In addition, MVC increased, although this was not significant. The balloon resistance is most likely increased contraction of the diaphragm muscle, which is active during forced exhalation, and the respiratory cycle, with resistance, required lengthening and contracting of both the internal and external inter costal muscles, which are active during both phases of respiration. Other possible reasons for elevated expiratory flow shown in this study are further expansion of chest wall and enhanced abdominal muscle activities because of the bridged position. Lee et al.13) reported that a balloon-blowing exercise was helpful for increasing VC, ERV, IRV, FVC, FEV1, FEV1/FVC, and PEF. Results of the current study on FVC, PEF and VC were similar to those in previous researches. Jun et al.14) reported that the FVC, FEV1/FVC, and PEF of elderly smokers was significantly increased by performing a feedback breathing exercise and balloon-blowing exercise.

Smita Manjusha Das (2018)

This study is on the basis of findings balloon therapy and bubble therapy is more acceptable among children as it is a part of their normal routine play activity and excitement to explore blowing balloons and bubbles. It is cost effective, convenient, requires less skills so the researcher strongly suggest to approach the hospitalized sick children with acceptable form of innovative therapeutic regimen for their complete participation in their health care.

Jorida Fernandes (2017)

Immediate effect of hemi bridge with ball and balloon exercise on pain, forced expiratory volume and functional ability in patients with chronic LBP.

Kripa A (2017)

The objective was to evaluate the effectiveness of balloon therapy on level of dyspnea among patients with lower respiratory tract disorders during posttest. On conducting post-test to the selected 20 12(60%) was found to be non dyspnea,, 8(40%) were dyspnea. There was no association with most of the demographic variables like educational status, occupational status area of work, type of workers, co-morbid illness, tobacco chewing, alternative therapies, medication intake and life style practices with respiratory status which includes dyspnea scale. Whereas there was an association with age, gender, smoking habit and duration of illness with the level of dyspnea.

Krlstensachs (2017)

As a C4 Quadriplegic from a reg by injury. Balloon blowing technical great way to strengthen his lungs and surrounding muscles after a special cord injury.

Rose Sumi (2017)

90/90 bridge with ball and balloon exercise helps in optimizing breathing in asymptomatic individual with suboptimal breathing. The present study showed that 90/90 BBE exercise is effective and improves the lung volumes in individuals with reduced lung volumes and suboptimal breathing. Individuals who were taught exercise showed significant improvement in FEV_1 and FEV_1/FVC where as in control group no significant improvement was seen.

Ali Rafaqat (2016)

Chest trauma patients of Sheikh Zayed Hospital, Rahim Yar khan reported maximum shortness of breath and breathing difficulties. Results concluded that there is no significant difference between balloon blowing exercises and incentive spirometry and according to previous studies this study support that use of incentive spirometry and balloon blowing exercises should be used by patients after chest trauma .The post treatment differences between two groups are found statistically insignificant. So this study concluded that null hypothesis is accepted and alternative hypothesis is rejected. So conclusion of the study implies that both incentive spirometry and balloon blowing exercise are equally effective so, further studies should be done either one of this method of breathing exercises should be recommended for patient's good recovery.

Arunimasreelatha (2016)

During the data collection process the researcher experienced that balloon therapy was more acceptable among children as it is a part of their normal routine play activity and excitement to explore blowing balloons and few children expressed anxiety and fear towards spirometry. So the researcher strongly suggest to approach the hospitalized sick children with acceptable form of innovative therapeutic regimen for their complete participation in their health care.

Chul Ki (2016)

Clinically, chronic lumbago patients usually make compensatory movements to maintain posture and the balance of the spinal trunk under an external load. These compensatory contractions affect not only the lumbar region, but also the cervical-shoulder and sterno costal areas. Clinically, early on, excessive muscle contraction usually persists in a location where there is joint lability. Subsequently thereafter, patients are unable to maintain a position for a long time and frequently adjust their support posture because of pain. Chronic lumbar pain patients with spinal lability eventually develop joint lability in many areas, which reduces movement through overall physical dysfunction. In turn, this decreases physical muscular endurance including activities of daily living and causes cardiopulmonary problems. A state of local lability in the thoraco lumbar spine is common in chronic lumbago patients. It can be explained by a state of decline and impairment in the neurological and epidemiological capacity of such patients. The stabilization of the trunk requires increased activity of the deep muscles that control various segments as well as motor control for harmonious muscle mobilization of the large muscles and joints that function in the sacral region.

Enhancement of simultaneous contractile ability and muscular power can relieve pain and allow stable functioning in everyday life through abdominal pressure and trunk muscle strength improvements. The stabilization tests revealed there was a significant difference between the experimental and control groups as well as decreased lumbar extension angle at the initial examination after stress even in examinations performed after a considerable amount of time. Regarding the lability of the lumbar segments, the clinical signs of the extension pattern cause excessive contraction of the erector muscle increasing lordosis, impairing the mutual contractility of the spinal multifidus and transversus abdominis, and decreasing the respiratory function of the diaphragm. Regarding lumbar stabilization, the forced breathing exercises decreased the extension angle, eventually improved the breathing pattern, and stimulated the abdominal muscles. Therefore, the lumbar spine became more stable overall in the neutral zone due to hypertonic suppression of the spinal extensor muscles and decreased lordosis. The findings of the lumbar spinal stabilization tests exhibit the same

pattern as those of the lumbar spine. For functional and anatomic reasons, the forced breathing exercises stimulate the abdominal wall and stabilized the intra thoracic pressure. Also, the transverse abdominis muscle and external oblique, and erector spinae muscles played an important role in controlling vertebral shearing forces. Therefore, these exercises helped stabilize the dorsal spine in response to an external load.

This study showed that forced breathing exercises performed by chronic lumbago patients decreased the thoraco lumbar spine sagittal angle and contributed to functional improvement. These results demonstrate the effectiveness of forced breathing exercises as well as the necessity of spinal stabilization and functional enhancement for lumbago patients. These exercise are expected to help alleviate pain in lumbago patients through spinal stabilization. Therefore, the present exercises including forced breathing exercises are a possible kinetic therapeutic approach for the functional improvement of the trunk spine of chronic lumbago patients.

Shakila D (2016)

Asthma is considered an important problem in children and influences on their every day functioning. Pathologically there is mucosal inflammation, production of inflammatory mediators, bronchio constriction with edema and excess mucus production, airway obstruction and air trapping which lead to ventilation perfusion alteration can cause increased work of breathing , hypercapnia and hypoxemia. Presently it is difficult to control all the triggers in a single patients. But it is always possible to improve the respiratory pattern by therapeutic interventions. Therefore, the present study was carried out in the asthmatic children to evaluate the effectiveness of balloon blowing exercise among children with bronchial Asthma.

While assessing the health status of children with bronchial asthma, it was found to be among 30 samples, 25 (83.3%) had severe health deterioration and remaining five (16.7%) had moderately health deterioration in pre test. Improvement was found in post test I, 13 (43.3%) had severely health deterioration, 12(40%) had moderately health deterioration and five (16.7%) had normal or mild health deterioration and post test II, 27 (90.0%) had normal or mild health deterioration and remaining three(10.0%) children had moderately health. deterioration and no one comes under in severe health deterioration.

In the present study the analyzing the effect of balloon blowing exercise on the respiratory patterns among children with bronchial asthma. The result revealed that in pre intervention mean values was 27.0 with standard deviation 4.61 and in post test I the mean value was 22.2 with standard deviation 5.78 and in post test II the mean value was 16.2 with standard deviation is about 0.752. The calculated t value is 6.467 in posttest I and 10.09 in post test II, is more than the critical t value, which is 2.042 at $p<0.05$ level. This indicates

that, the differences between the scores obtained from the pre and post test value intervention are highly significant. So we accept the research hypothesis H1. So there was significant improvement of respiratory pattern among children with bronchial asthma by using balloon blowing exercise. Hence, the post test II score is more comparable rate than post test I score. Breathing exercise in the present study were based on the expiratory phase of respiration.

This is because the expiration in the breathing process is greatly affected and it is also shallow in nature. This exercise work out the intercostals muscle responsible for spreading and elevating of diaphragm and ribcage. This allows lungs to absorb oxygen, alter its chemical composition while still in the lungs and expel carbon dioxide as exhaling is commenced. Balloon blowing while effectively exercising the lungs ability to expand and take in air, does not affect the size or number of alveoli contained in the lungs. Alveoli are air sacs that disperse carbon dioxide during exhalation and oxygen into the blood during inhalation.

The results of present study are well in line with the findings of an experimental study was to determine the lung capacity in balloon blowing exercise used to increase patients lung function. The result showed that pulmonary functions of the balloon blowing training group were significantly improved as compared to those of the non-training groups. While the finding out the association between the demographic variables with improvement of respiratory patterns among children with bronchial asthma by using balloon blowing exercise.

Renuka k (2015)

Regular practice a balloon therapy improves the respiratory status of patients as there was significant improvement in the respiratory status and simple cost effective to improve the lung function among patients with respiratory disorders.

Tc Physiotherapy (2015)

Blowing a balloon activates and shortens our abdominal brings our rib down which allows the spine to bend forward. Most people in pain or suffering from injuries have over active quads, calves and back muscles this is primarily due to over inhalation and not enough exhalation. Balloon blowing increases the exhalation phase of breathing which is what makes hamstrings, oblique, glutes, hip flexors all achieve optimum position.

JIN- SEOP KIM; YEON- SEOP KIM (2012)

This study investigated the effects of balloon-blowing training on the pulmonary functions of 30 smokers in their of 20’s, by dividing them into the a balloon-blowing group and a control group. The results show that the pulmonary function indices significantly increased after eight weeks of exercise in the balloon-blowing group. However, the control group did not show any significant differences after the eight weeks. A comparison of the two

groups showed that the pulmonary function indices were increased significantly more in the balloon-blowing group but not in the control group. Therefore, we conclude that balloon blowing exercise improves the pulmonary functions of healthy smokers. This study had several limitations. First, the subjects were limited to 30 male smokers, and the number of subjects was insufficient for at subjects in each group. Second, the relative resistance of the balloons was not constant during balloon blowing because of individual differences. There for e, future studies need to be conducted with more subjects, measuring the balloon resistance accurately.

Chawan (2012)

Regular lung exercises can help diminish the breathlessness associated with chronic obstructive pulmonary disease (COPD), but they require expensive training and patient support. A group of British physicians hypothesized that blowing up a balloon could be an inexpensive substitute for such exercises. They tested their hypothesis in a randomized trial of 28 patients with spirometrically documented severe COPD (FEV_1 less than 1 liter).

Thirteen patients were told to inflate a rubber balloon 40 times a day for eight weeks, and the other 15 served as controls. At the beginning and end of the study, each subject was assessed on three outcome measures: distance walked in six minutes, overall sense of well-being, and self-assessment of breathlessness. At the end of the study, the balloon group showed a significant improvement in breathlessness and slight but non significant improvements in walking distance and well-being.

The improvement in breathlessness must be taken with a grain of salt because this symptom was assessed subjectively and by the patients. But since the intervention is simple and inexpensive, it deserves further study. In the meantime, clinicians can use balloon-blowing as an aid for improving symptoms in patients for whom there are few alternatives.

Kyndall L Boyle (2010)

Despite the BBE's use for a variety of patient populations, there is little data published on the efficacy of such an exercise. O'Sullivan reported the need for rehabilitation of lumbar-pelvic instability that includes integration of the diaphragm, deep abdominals and pelvic floor.21 However descriptive studies to propose intervention strategies to integrate the diaphragm ,deep abdominals and pelvic floor are lacking. Additionally, studies to investigate the efficacy of strategies are needed.21, 37 The BBE is a specific example of an exercise that could be useful for integrating co-activation of deep abdominal muscles with pelvic floor and diaphragm during neuromuscular training and a wide variety of stabilizing maneuvers Lando conducted a study of 25 subjects with severe chronic obstructive pulmonary disease(COPD) to investigate the influence of lung-volume reduction surgery on breathing.37 Lando reported

that the subject's ZOA of the diaphragm was increased as a result of the surgery which increased their exercise tolerance and breathing efficiency.37 This is one study that supports the value and benefit of obtaining optimal ZOA for breathing ,which in this case was achieved via surgery. The asthma case report also supports the value of obtaining optimal ZOA for breathing which was achieved with conservative physical therapy techniques rather than surgery.49 The BBE is a conservative exercise intended to assist a patient/athlete in obtaining optimal posture and respiration i.e. diaphragm (ZOA) and spinal position and neuro motor control (lumbar-pelvic stability). However, the BBE has not yet been studied or tested experimentally. Future studies of the effects of a single BBE and/or training effects of multiple BBE's could include EMG for abdominal muscle, spirometry for changes inbreathing parameters, real time ultrasound for diaphragm length and/or changes in abdominal muscle thickness. Additionally, future studies designed to describe changes in pain and function attributable to the BBE are needed to investigate the clinical efficacy of this promising therapeutic exercise technique.

CHAPTER – III

MATERIALS AND METHODOLOGY

3.1 MATERIALS:

- Balloon
- Squeeze ball
- Low couch
- Spirometry and it accessories

3.2 METHODOLOGY

a) Research approach:

The quasiresearch approach was used in this study.

b) Research Design:

A pre- experimental research design was used for in this present study.

c) Setting of the study:

The study was conducted in various hospital

study was conducted at Nandha College of Physiotherapy OPD – Erode.

D) Population:

The population included in this study consisted of in the age group of 21 - 55 years.

e) Sample:

In this study the total sample would be 20

f) Sampling technique:

The purposive sampling technique would be adopted for this study, Who fulfilled in the inclusion criteria.

g) Study duration:

The study was conducted three months

h) Treatment duration:

Three sessions over three days in week

3.3. CRITERIA FOR SAMPLE SELECTION

Inclusion criteria

- ✓ Patients with age group 21 to 55 years,
- ✓ Twelve weeks from the first onset of pain (chronic pain),
- ✓ Non-specific LBP.
- ✓ No neurological disorders.
- ✓ No psychiatric and psychological disorders.

Exclusion criteria

Central nervous system dysfunction (hemiparesis , myelopathy, cerebellar ataxia) radiculopathy, acute and sub acute LBP, amputation of lower limb, angina, and other cardiac conditions. Participants were briefed about the nature of the study and the intervention and only those willing to take intervention for 3 days, informed consent was obtained and were recruited for the study.

PARAMETERS:

1. Force expiratory volume
2. Forced vital capacity
3. VAS

TREATMENT PROCEDURE

Protocol

- Participants were given exercise called as hemi bridge with ball and balloon exercise for 3 sessions over 3 days
- Forced breathing techniques for 3 sessions over 3 days

Instructions

- Lie on back with feet on a wall and knees and hips bent at 90° angle.
- Place a 4-6” ball between knees
- Place right arm above head and a balloon in left hand
- Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat.
- Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels
- Shift left knee down so that it is below the level of right without moving feet. should feel left inner thigh engage.
- With left knee shifted down, take right foot off the fall should feel the back of the left thigh engage. Maintain this position for the remainder of the exercise
- Now inhale through nose and slowly blow out into the balloon
- Pause 3 seconds with tongue on the roof of mouth to prevent airflow out of the balloon.
- Without pinching the neck of the balloon and keeping tongue on the roof of the mouth, inhale again through nose.
- Slowly blow out as stabilize the balloon with hand.

- Do not strain neck or cheeks as blow.
- After the fourth breath in, pinch the balloon neck and remove it from mouth. Let the air out of the balloon.
- Relax and repeat the sequence 4 more times.

Fig: 3.1 90 / 90 Supported hemi bridge

Fig: 3.2 90 / 90 Supported hip shift with hemi bridge ball and balloon

FORCED BREATHING TECHNIQUE

A SPIRO TIGER was used for the forced breathing exercises. For respiratory muscle endurance training, the mouthpiece and respirator bag are connected by a pipe. There is a ventilation outlet between the pipe so that inflows and outflows of air pass through the vent during breathing. The tube handle is connected to the machine body by a cable. The main body has a mark and signal tone that gives visual and acoustic feedback for inhalation and exhalation, and can regulate and show the number of breaths per minute (65 – 10 times at maximum) and time (maximum, 99 minutes); it also prevents dizziness following forced respiration by regulating appropriate inflows and outflows of gas.

3.6 STATISTICAL TOOLS:

For the pre and post test experimental study, paired 't' test was used for each parameter in an intra group analysis to find out the significance of improvement achieved through intervention.

PAIRED 't' – TEST

To compare the effect between two groups students 't' test for paired values. Formula for paired t- test

$$S = \sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{n}}{n-1}}$$

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

d = difference between the pre test and post test

$\bar{d}$ = Mean difference

n = Total number of subjects

s = Standard deviation.

CHAPTER – IV

DATA PRESENTATION AND ANALYSIS

TABLE 4.1

Mean difference and standard deviation values of FEV, FVC & VAS

Group	Mean difference	Standard deviation
FEV_1	0.15	0.12
FVC	0.27	0.12
VAS	1.7	0.6

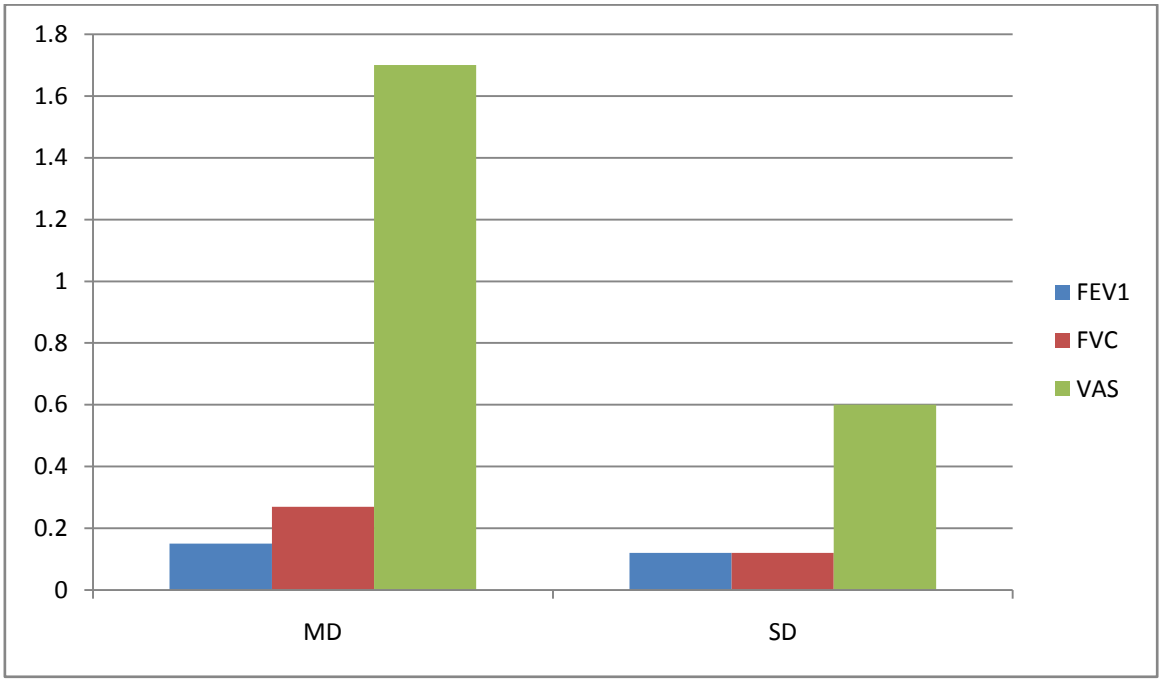

Fig: 4.1 Mean difference and standard deviation values of FEV, FVC & VAS

TABLE 4.2

Paired 't' values of FEV_1, FVC & VAS

Group	Table Value	Paired 't' Value
FEV_1	2.05	5.36
FVC	2.05	9.75
VAS	2.05	12.75

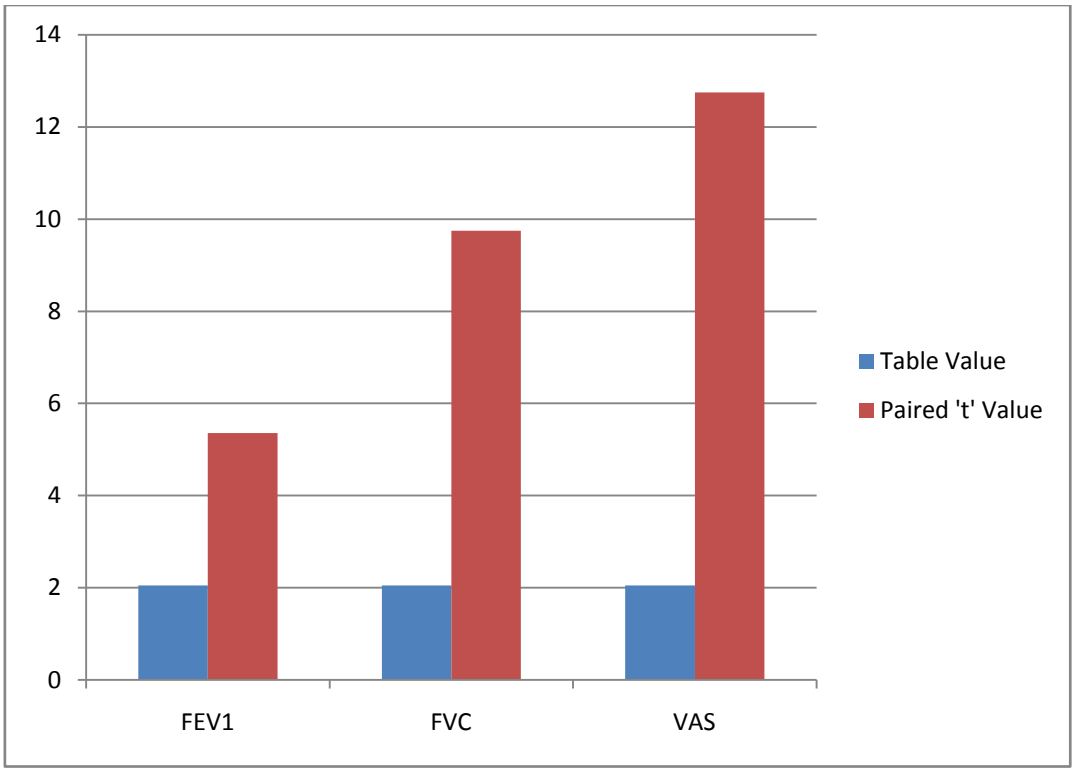

Fig: 4.2 Paired 't' values of FEV_1, FVC & VAS

CHAPTER – V

RESULTS AND DISCUSSION

5.1 RESULTS

The study sample comprised 20 subjects all the subjects underwent performa. The subjects were given 90 / 90 supported hip shift with hemi bridge hall &balloon and forced breathing technique.The pre and post values were assess by forced expiratory volume: The Mean difference value is – 0.15.The standard deviation value is – 0.126. The paired 't' test value is – 5.36. The pre and post values were assessed by forced vital capacity.The Mean difference value is – 0.27. The standard deviation value is – 0.12.The paired 't' test value is – 9.75.The pre and post test values were assessed by visual analogue scale. The Mean difference value is – 1.7.The standard deviation value is – 0.6. The paired 't' test value is – 12.75.

5.2 DISCUSSION

This study used hemibridge with ball and balloon exercises, to correct the postural instability which is a cause to pain. The pain scores on VAS were low when measured prior to the treatment. Even though statistically significant change was noted, clinically very minimum change was seen. The ZOA of the diaphragm is an important element that helps to maintain optimal respiration and trunk stabilization, thereby preventing LBP. The exercise used in the present study targeted the ZOA and spine to a proper position, so that the diaphragm can function effectively to perform respiration and to maintain posture. These exercise cause slow breathing and is considered further to relax the neuromuscular system and decrease the resting muscle tone. Respiratory function has been reported to be related to low back pain. A correlation study done by Mellin indicate that chronic low back pain is associated with the restrictionof the movements in the thoracic spine and this association may affect respiratory function test In the presentstudy, the value of FEV1 showed clinically minimum change. The FVC values were statistically significant. The change in the FVC could be attributed to the component ofblowing the balloon of hemibridge with ball and balloon exercises. During the activity, coordinated activity of transversus abdominis and diaphragm is required to maintain respiration and stability. During inhalation, there isconcentric contraction of diaphragm and eccentric contraction of transversus abdominis and during exhalation thereis concentric contraction of transverses abdominis and eccentric contraction of diaphragm. Blowing the balloonrequires deep inhalation followed by forceful exhalation. The eccentric contraction of both diaphragm and transverses abdominis during

exhalation and inhalation may have developed strength and optimize ZOA and therefore improve the respiratory function .The hemi bridge with ball and balloon exercise is designed to promote optimal posture by utilizing the diaphragmin the most efficient way and correcting the lumbar spine position. It also concentrates on neuromuscular control ofthe deep core muscles. Activation of these muscles may have contributed to correction of lumbar lordosis, therebycorrecting faulty posture causing pain. Blowing the balloon during exhalation helps in the activation of the abdominalmuscles and inhibition of the paraspinal muscles. This also contributes in the correction of the lumbar lordosis therebyincreasing the functional ability of the participant.

CHAPTER – VI

LIMITATIONS AND RECOMMENDATION

6.1 LIMITATIONS:

- Long term follow-up of pain, FEV1, VC could not be assessed. A large majority of participants droppedout of the study after the first session as they were expecting quick relief within one session.
- This study has been conducted on small sized sample only.
- This study has not been extended to people above the age group of 55.
- Subject activities can't be controlled.
- Certain factors like nutrition, testing condition and climate condition are not controlled.
- It is limited by the fact daily activities of the subjects were not monitored which could have influenced.

6.2 RECOMMENDATION

- A Similar Study May Be Extended With Larger Sample.
- Further studies may be extended with subjects above the age group of 55.
- A similar study may be extended to conservatively treated subjects.

CHAPTER – VII

CONCLUSION

The study concludes that there are immediate effects of hemibridge with ball and balloon exercise on pain, FEV_1, FVC and functional ability in patients with chronic low back pain. The traditional notion that the chronic nonspecific LBP can be treated only with the electrotherapeutic should be abandoned and newer and creative methods of exercise therapy should be implemented to correct non-specific low back pain.

Though the results, NULL HYPOTHESIS IS REJECTED AND ALTERNATIVE HYPOTHESIS IS ACCEPTED and the study could be concluded that EFFCTIVENESS OF 90/90 HIP SHIFT WITH HEMIBRIDGE BALL BALLOON EXERCISE ALONG WITH FORCED BREATHING TECHNIQUE on improving pulmonary function and reducing pain in patients with chronic back pain.

Findings

Using hemi bridge ball balloon exercise changes the position of ZOA thus improving the efficacy of the diaphragm toact as a strong trunk stabilizer and therefore reducing LBP.

Implications

These exercises are easy to administer and can be performed at home independently also, results can be attend quicklyand is cost effective. Continuation of these exercise can correct the improper posture.

Caution

Our study examined the immediate effect of hemibridge with ball and balloon exercise on pain, FEV_1, FVC and quality of life. The effects of chronic application of these exercises and its long-term effects is yet to be examined.

BIBLIOGRAPHY

1. Lee SC, Sin SH, Lee HM, et al.: The effects of balloon blow-ups and upper abdominal exercise on respiratory rehabilitation. Korean Acad PhysTherSci, 2011,18: 43–53.
2. Jun HJ, Kim KJ, Nam KW, et al.: Effects of breathing exercises on lung capacity and muscle activities of elderly smokers. J PhysTherSci, 2016, 28: 1681–1685.[Medline] [CrossRef]
3. Jo NO, Park SW, Lee SJ, et al.: The effects of respiratory rehabilitation training on respiratory functions of cervical spinal cord injury patients. Korean JRehabilNurs, 2011, 10, 108–115.
4. Gosselink RA, Wagenaar RC, Rijswijk H, et al.: Diaphragmatic breathing reduces efficiency of breathing in patients with chronic obstructive pulmonary disease. Am J RespirCrit Care Med, 1995, 151: 1136–1142. [Medline]
5. Balagué, Federico, et al. "Non-specific low back pain." *The Lancet* 379.9814 (2012): 482-491
6. Nachemson AL, Waddell G, Norlund A. Epidemiology of neck and low back pain. In: Nachemson AL, JonssonE, editors. Neck and back pain: the scientific evidence of causes, diagnosis and treatment. Philadelphia (PA):Lippincott Williams & Wilkins, USA, 2000.
7. Mayer, Tom G. "Functional restoration for spinal disorders." *The Sports Medicine Approach* (1988).
8. Merritt, Hiram Houston, Henry L. Moses, and Lucy Moses. *A Textbook of Neurology*. Philadelphia: Lea &Febiger, 1979.
9. Sharma, S. C., et al. "Incidence of low back pain in work age adults in rural North India." *Indian Journal ofMedical Sciences* 57.4 (2003): 145-147.
10. Krismer, M., and M. Van Tulder. "Low back pain (non-specific)." *Best Practice & Research ClinicalRheumatology* 21.1 (2007): 77-91.
11. Ostwal, Priyanka P., and S. K. Wani. "Breathing patterns in patients with low back pain." *International Journalof Physiotherapy and Research* 2.1 (2014): 347-353.
12. Boyle, Kyndall L., Josh Olinick, and Cynthia Lewis. "The value of blowing up a balloon." *North AmericanJournal of Sports Physical Therapy: NAJSPT* 5.3 (2010): 179.
13. Represas-Represas, Cristina, et al. "Screening for chronic obstructive pulmonary disease: validity and reliabilityof a portable device in non-specialized healthcare settings." *Plos One* 11.1 (2016): e0145571.

14. Mellin, Guy, and RitvaHarjula. “Lung function in relation to thoracic spinal mobility and kyphosis.” *ScandinavianJournal of Rehabilitation Medicine* 19.2 (1987): 89-92.
15. Renuka *et al*; a study to find out effectiveness of balloontherapy on respiratory status of patients with lowerrespiratory tract disorders. 2016.
16. Ms. Arunimasrilatha, bharathividhyapreeth ; the effectof balloon therapy and incentive spirometry inpromotion of pulmonary function with acute infection,Deemed University college of Nursing, NAVI, Mumbai,India *international journal of nursing research* 2016;vol no 2(1) Pp.123 to 132
17. Kim, Jin-Seop, Lee, Yeon – Seop, A study to assess theeffects of balloon – blowing exercise on lung function ofyoung adult smokers, *journal of physical therapy sciences* 2012, vol 24.
18. Rick Rockwell A study to assess the lung exercises with balloons, Live strong. Com august 16, 2013.
19. Chuahan AJ, John PM, Linda G, Patrick D. Regular balloon blowing for chronic bronchitis.BMJ.1992 ;304:1668-9.
20. Rafaqat A, Mushtaq Z, Tahir A, Shahzad MF. Comparison between Balloon Blowing Exercise and Incentive Spirometry in Patients with Chest Intubation after Trauma. J Nov Physiotherapy.2016; S3: 013.

Website:

1. http://www.livestrong.com/article/154898-the-use-of-bubbles-for-breathing-exercises. Accessed February 18, 2017.
2. http://www.copdcanada.ca/Pursed%20Lip%20Breathing%20Part%202.htm, Accessed February 18, 2017.

APPENDICES

APPENDIX I

ASSESSMENT FORM :

PROFILE :

Name :

Age / Sex :

Occupation :

Body Weight / Height :

Address :

CHIEF COMPLAINTS :

Present History :

Past History :

Personal History :

Family History :

Associate Medical Problem :

VITAL SIGNS :

Blood Pressure :

Heart Rate :

Pulse Rate :

Temperature :

OBJECTIVE EXAMINATION:

On observation :

Swelling : yes / no

Erythema : yes / no

Skin abrasion : yes / no

Deformity : yes / no

Attitude of foot (medial weight bearing, lateral weight bearing or normal)

Type of foot wear (high heel, flat heel, soft heel, hard heel)

On palpation:

Tenderness : yes / no

Warmth : yes / no

Muscle wasting : yes / no

Oedema : yes / no

On examination:

Range Of Motion :

JOINT:	ACTIVE ROM:	PASSIVE ROM:

Muscle power :

MUSCLE:	GRADE:

Muscle Girth:

MUSCLE	GIRTH (cm)

Special test;

FORCED EXPIRATORY VOLUME

GROUP	PRE	POST
FEV1		

FORCED VITAL CAPACITY

GROUP	PRE	POST
FVC		

VISUAL ANALOGUE SCALE

GROUP	PRE	POST
VAS		

Function Impairment

Aim of treatment

PHYSIOTHERAPY MANAGEMENT

Home Advice

APPENDIX -II

INFORMED CONSENT FORM

STATEMENT OF THE PARTICIPANT

I ……. have been explained in details about the procedure to be carried out in the study.

I have been given opportunity to discuss and ask questions with the responsible physiotherapist regarding the study.

I have understood that there is no harm to my health by participating in the study period.

I will undergo any other training methods during this study.

I agree to participate voluntarily in the study described in this form.

Name of the subject Signature Date

Name of the Witness Signature Date(If necessary)

Name of the investigator Signature Date

APPENDIX - III

Written Informed Consent Form

NANDHA COLLEGE OF PHYSIOTHERAPY,

ERODE.

Informed consent form for the volunteers at "Nandha college of Physiotherapy, Erode", who will be participating in the research project entitled : **"EFFECTIVENESS OF 90/90 SUPPORTED HIP SHIFT WITH HEMI BRIDGE BALL AND BALLOON EXERCISES ALONG WITH FORCED BREATHING TECHNIQUE ON IMPROVING PULMONARY FUNCTION AND REDUCING PAIN IN PATIENTS WITH CHRONIC BACK PAIN"**

Name of Principal Investigator	**271730081** Postgraduate student
Name of Organization	Department of Physiotherapy, Nandha college of Physiotherapy, Erode

This Informed Consent Form has two parts:

- **Information Sheet (to share information about the research with you)**
- **Certificate of Consent (for signatures if you agree to take part)**

You will be given a copy of the full Informed Consent Form

PART I: Information Sheet

Introduction

I, undergraduate student in the Department of Physiotherapy, Nandha college of Physiotherapy,Erode, am working on my dissertation titled **"EFFECTIVENESS OF 90/90 SUPPORTED HIP SHIFT WITH HEMI BRIDGE BALL AND BALLOON EXERCISES ALONG WITH FORCED BREATHING TECHNIQUE ON IMPROVING PULMONARY FUNCTION AND REDUCING PAIN IN PATIENTS WITH CHRONIC BACK PAIN".** I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them and get yourself clarified.

PART II: Certificate of Consent

I have read the foregoing information, or it has been read to me. I have been explained the procedure and complications. I am willing to participate in the study. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant_____

Signature of Participant _____

Date _____ Day/month/year

If illiterate a literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb-print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness_____ Thumb print of participant

Signature of witness _____

Date _____

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. 90/90 supported hip shift with hemi bridge ball and balloon exercise
2. Forced expiratory technique

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this informed consent from has been provided to the participant.

Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____ Day/month/year

APPENDIX – IV

S. No	FEV_1		FVC		VAS	
	Pre	Post	Pre	Post	Pre	Post
1	1.7	1.8	3.8	4.0	4	2
2	1.5	1.6	3.6	3.7	4	3
3	1.2	1.5	3.3	3.5	4	3
4	1.3	1.3	3.4	3.7	3	1
5	1.7	1.7	3.8	4.0	4	2
6	1.6	1.6	3.6	3.9	4	2
7	1.5	1.8	3.6	4.0	3	1
8	1.7	1.9	3.8	4.0	3	1
9	1.0	1.2	3.0	3.5	4	3
10	1.7	1.7	3.8	3.9	2	1
11	1.5	1.8	3.4	3.8	4	2
12	1.7	1.9	3.8	4.0	3	1
13	1.5	1.5	3.4	3.7	4	2
14	1.7	1.6	3.8	3.9	4	2
15	1.7	1.7	3.8	4.0	4	3
16	1.5	1.7	3.3	3.6	4	3
17	1.7	1.9	3.8	4.0	3	2
18	1.6	1.8	3.5	3.7	3	1
19	1.0	1.4	2.9	3.1	4	1
20	1.5	1.6	3.5	4.0	4	2