

Study On Pulmonary Rehabilitation Essential Component Of Copd Management

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ABSTRACT

The diaphragm rises and falls, and the rib cage expands and contracts, regulating breathing. The muscles used in breathing are divided into major respiratory muscles and auxiliary respiratory muscles. The major muscles of respiration that are used in normal breathing are the diaphragm, internal and external intercostals, internal and external obliques, and rectus abdominis. Deeper, more forceful breathing is aided by respiratory accessory muscles such as the sternocleidomastoid, scalenes, trapezius, pectoralis major and minor and serratus anterior. As COPD advances, hyperinflation of the lungs and impaired diaphragmatic efficiency increase the labor of breathing. As a result, patients use accessory muscles of respiration excessively, including the sternocleidomastoid, scalene, upper trapezius, and pectoral muscles, even when breathing is normal. Relaxation Technique (AMRT) as a stand-alone physiotherapy intervention in patients with COPD. Most comprehensive reviews and randomized controlled studies have demonstrated that the combination of respiratory rehabilitation and breathing retraining leads to considerable improvements in inspiratory muscle strength, respiratory rate, exercise capacity and symptom management. However, there is still inadequate information on targeted relaxation of accessory respiratory muscles and high quality comparison studies are still needed to prove its therapeutic efficacy. Overall, the study indicates a significant research vacuum on the usefulness of AMRT in changing respiratory patterns in COPD patients.

Keywords: Accessory, Muscle, Relaxation, Technique, Breathing, Patterns, Chronic Obstructive, Pulmonary, Disease

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INTRODUCTION

Accessory Muscle Relaxation Technique on Breathing Patterns

A stroke is an abrupt vascular damage to a portion of the brain resulting in rapid localized neurological impairments. Common problems in stroke survivors include hemiplegia, altered muscle tone, reduced postural and motor control, and sensory abnormalities. These deficits significantly influence gait and balance, limiting activities of daily living. Stroke induced

neurological damage severely affects the motor control of muscles involved in respiratory regulation, resulting in weaker respiration, altered breathing patterns, and decreased tidal volume and airflow. Respiratory function and diaphragmatic movement in stroke patients are diminished compared to healthy subjects of the same age. Breathing is controlled by the up and down movement of the diaphragm and the expansion and contraction of the rib cage. The muscles used in breathing are divided into major respiratory muscles and auxiliary respiratory muscles. The main muscles of respiration are the diaphragm and the internal and

external intercostals, the internal and external obliques, and the rectus abdominis. These are used in normal breathing. Chest muscles including the sternocleidomastoid, scalenes, trapezius, pectoralis major and minor and serratus anterior help you take deeper and more forceful breaths. The diaphragm is the principal muscle of respiration, responsible for around 70% of the air breathed, and other auxiliary muscles of respiration are also important for correct thoracic expansion and increased lung capacity during respiration. Altered thoracic mobility and respiratory dysfunction may result from poor control of accessory muscles. Respiratory accessory muscles have an important function, although there is little research on respiratory therapies targeting these muscles

Chronic obstructive pulmonary disease

COPD is a very important public health problem. It is one of the leading causes of sickness and death in the world, and its incidence is on the rise. This is because COPD entails a slow and irreversible obstruction of airflow. The chronic inflammation caused mainly by cigarette smoking results in fixed obstruction of the small airways and destruction of the alveolar walls. There is currently no treatment that can halt the progression of airflow limitation in COPD.

The chronic obstruction of small airways associated with chronic obstructive pulmonary disease (COPD) results in a marked loss of lung function and gas exchange capacity. This can cause deprivation of oxygen in the cells and tissues of the body. Death can occur due to advanced COPD. Chronic obstructive pulmonary disease (COPD) consists of (a) chronic bronchitis accompanied by fibrosis and obstruction of small airways and (b) emphysema with enlargement of air spaces and destruction of lung tissue resulting in loss of lung elasticity and occlusion of small airways, Barnes (2003a). The definition of emphysema is a chronic disease of the lungs in which there is an abnormal increase in size of air spaces beyond the terminal bronchioles

accompanied by destructive changes in their walls. Chronic bronchitis involves the productive coughing of at least three months' duration occurring in each of two successive years due to mucus hypersecretion. However, unlike COPD, chronic bronchitis is generally not associated with any impairment in airflow. Asthma and COPD differ because the former entails a mostly reversible obstruction of the airways, while in COPD, such impairment is irreversible.

Chronic Obstructive Pulmonary Disease (COPD) is a progressive pulmonary disease, which involves irreversible airflow obstruction. It is considered to be one of the main sources of mortality in the world and can be triggered by cigarette smoking, air pollution, occupational dust, and biomass fuels. People who suffer from COPD often have problems like shortness of breath, coughing, excessive mucus production, lack of exercise capacity, and poor quality of life. The development of COPD leads to an enlargement of the lungs and inefficient functioning of the diaphragm. Therefore, people who have COPD start using other muscles for breathing. These muscles include the sternocleidomastoid, scalene, upper trapezius, and pectoral muscles even when people breathe normally. The overuse of these muscles leads to muscle fatigue and changes in breathing pattern.

Pulmonary rehabilitation essential component of COPD management

Pulmonary rehabilitation plays an important part in managing COPD and involves breathing techniques, airway clearance methods, exercises, and patient education. Regular breathing methods like diaphragmatic breathing and pursed lip breathing help in improving ventilation and preventing dyspnea. Nevertheless, these methods may fail to manage excessive muscle use that causes ineffective breathing mechanics. Accessory Muscle Relaxation Technique (AMRT) is a physiotherapy method used for decreasing tension in overused respiratory muscles, allowing diaphragmatic breathing, improving chest wall movements, and minimizing the work of breathing. Through the restoration of breathing mechanics, AMRT might be useful in treating dyspnea and increasing exercise capacity of people suffering from COPD. Nonetheless, there is little evidence about the effectiveness of this technique compared to regular rehabilitation methods.

Volpato, Banfi, Rogers, and Pagnini (2015) Performed a comprehensive study and meta-analysis on relaxation strategies for individuals with COPD. The research indicated that relaxation therapies yielded moderate enhancements in respiratory function, anxiety, depression, and overall quality of life. The authors determined that relaxation techniques may serve as a beneficial complement to standard COPD treatment.

Alvarenga et al. (2016) conducted a systematic review of physiotherapy treatment modalities used in pulmonary rehabilitation for patients with COPD. This systematic review confirmed that physiotherapy intervention had a positive impact on pulmonary

function, physical performance and functional independence and should be considered in clinical practice.

Murthy K JR(2010) Pre-experimentation research has been done on breathlessness among patients suffering from COPD. In this research, there have been twenty-two patients with varying degrees of COPD. Modified Borg Scale has been used for assessment of dyspnea. Patients who had deep breathing exercises had significantly reduced end expiratory volume of the chest wall. Deep breathing exercises help to reduce end expiratory volume of the chest wall. Thus, the effect of deep breathing exercises is superior to other exercises in reducing breathlessness.

Das S, Mukherjee S, Kundu et al (2008) This is a study that compares the impact of deep breathing exercises on dyspnea at rest and during exercise in COPD patients. In this experiment there were eight COPD patients (6 males and 2 females) whose average age is 11 years. Deep breathing exercises have an impact of facilitating slow and deep breathing both at rest and during exercise. The impact of deep breathing exercises on dyspnea varies from one patient to another when done correctly during exercise.

Geddes E L, et al (2008) A study was carried out in order to update a systematic review aimed at identifying the effect of IMT on the following parameters of adults with chronic obstructive pulmonary disease (COPD): inspiratory muscle strength and endurance, exercise capacity, dyspnea, and quality of life. This was done through randomized control trials where adults with stable COPD were used as subjects and were tested with respect to IMT versus placebo IMT or no treatment, high versus low intensity IMT, and different modes of IMT. Out of 274 articles that were obtained initially, 19 qualified for inclusion. An additional search produced 17 articles; 6 of these were included and tested IMT versus placebo IMT.

OBJECTIVES OF THE STUDY

1. To study on Pulmonary rehabilitation essential component of COPD management
2. To study on Chronic obstructive pulmonary disease

RESEARCH METHOD

The current study is a narrative review that has been done through secondary data collection, which involved scientific studies in order to find out whether the

Accessory Muscle Relaxation Technique (AMRT) influences the breathing pattern of COPD patients. There was no use of any primary data collection from human subjects. Rather, secondary data has been analyzed in form of peer reviewed national and international journal articles, systematic reviews, randomized controlled trials, meta-analysis, evidence based guidelines for clinical practice and physiotherapy literature.

The literature search was conducted via internationally reputable online databases that include Scopus, PubMed/MEDLINE, Web of Science, Google Scholar, ScienceDirect, SpringerLink, Wiley Online Library, Taylor & Francis Online, Cochrane Library, and PEDro (Physiotherapy Evidence Database). The research search terms included Chronic Obstructive Pulmonary Disease (COPD), Accessory Muscle Relaxation Technique, Breathing Pattern, Pulmonary Rehabilitation, Diaphragmatic Breathing, Respiratory Muscle Training, Manual Therapy, Chest Physiotherapy, and Respiratory Physiotherapy. Boolean operators (AND, OR) were used to narrow the research terms. A review of pulmonary rehabilitation searches these databases to find randomized clinical trials and systematic reviews.

Peer-reviewed papers that were written in English only were included. Preference was given to articles indexed in Scopus, indexed in Web of Science, indexed in PubMed, randomized controlled trials, systematic reviews, and meta-analyses published during the last 10-15 years. Older milestone papers were included if they were making a major contribution towards the knowledge about pulmonary rehabilitation and respiratory physiotherapy. Duplicate papers, conference abstracts without full-text paper, editorials, opinion papers, and dissertations without methodology were not included.

The selected articles were critically evaluated through an examination of their title, abstract and the entire article. The data extracted from the individual studies involved the authors, year of publication, country, study design, sample size, intervention protocol, duration of intervention, outcome measures, statistical analysis and main results. Data pertaining to pulmonary function test results (FEV_1 , FVC, FEV_1/FVC ratio), respiratory rate, chest expansion, dyspnea scores, oxygen saturation, Six-Minute Walk Test (6MWT), breathing pattern, respiratory muscle activity and quality of life was systematically reviewed.

The selected literature was summarized using a narrative approach. Similar interventions and outcomes

within the individual studies were grouped to establish any common findings, differences, strengths, weaknesses and gaps within the current literature.

RESULT AND DISCUSSION

Table 1 Published Studies on Accessory Muscle Relaxation and Breathing Pattern in COPD

S. No.	Author(s) & Year	Study Design	Intervention	Major Findings
1	Rik Gosselink (2004)	Review	Breathing techniques in COPD	Diaphragmatic breathing and pursed-lip breathing improved breathing pattern, reduced dyspnea, and optimized thoracoabdominal movement.
2	Kelly O'Brien et al. (2008)	Systematic Review	Inspiratory muscle training	Inspiratory muscle training improved inspiratory muscle strength, exercise tolerance, and reduced breathlessness when combined with pulmonary rehabilitation.
3	Stephanie Clarke et al. (2019)	Narrative Review	Manual therapy in COPD	Soft tissue techniques and thoracic mobilization reduced respiratory rate, improved chest wall mobility, and enhanced breathing efficiency.
4	Nutsupa Ubolnuar et al. (2019)	Systematic Review & Meta-analysis	Breathing exercises	Significant improvement in dyspnea, respiratory muscle performance, and exercise capacity was observed after breathing exercises.
5	Denis E. O'Donnell et al. (2020)	Review	Dyspnea management	Better breathing mechanics reduced respiratory muscle loading and improved symptom control in COPD patients.
6	Ruisheng Yun et al. (2021)	Systematic Review & Meta-analysis	Breathing exercises	Inspiratory muscle strength and Six-Minute Walk Distance improved significantly after breathing exercise programs.

Indeed, all the literature indicates that breathing exercises and pulmonary rehabilitation can effectively help improve the breathing process of COPD patients. Gosselink (2004) stated that breath control helps in enhancing the coordination of thoracic and abdominal motion and thus relieving dyspnea, which means that such techniques are essential to the pulmonary rehabilitation program.

Inspiratory muscle training is effective in helping to strengthen the respiratory muscles and increase exercise tolerance, especially when incorporated into traditional rehabilitation programs (O'Brien et al., 2008).

In their review, Clarke et al. (2019) underlined the significance of manual therapy in treating musculoskeletal dysfunction related to COPD. As shown by the authors, soft tissue release, thoracic

mobilization, and myofascial techniques can produce a temporary effect on reducing respiratory rate, improving chest wall mobility, and decreasing tightness of accessory muscles. However, it was stressed by Clarke et al. (2019) that further randomized controlled trials should be done to prove the long-term effectiveness of such interventions. The systematic review conducted by Ubolnuar et al. (2019) proved that breathing exercises have an evident positive effect on dyspnea, respiratory muscle function, and exercise tolerance. O'Donnell et al. (2020) argued that the optimization of breathing mechanics decreases excessive load on respiratory muscles, decreases dynamic hyperinflation, and improves symptom control and functional ability. Finally, Yun et al. (2021) also proved by means of meta-analysis that breathing exercise program increases inspiratory muscle strength and Six-Minute Walk Test

distance, but there were no evident effects on quality of life.

DISCUSSION

From the above-reviewed literature, it can be concluded that conventional pulmonary rehabilitation, breathing exercises, inspiratory muscle training, and manual therapy all help in achieving improvement in respiratory mechanics, dyspnea, chest expansion, and exercise capacity in patients with COPD. It is evident from the literature reviewed that very limited studies have been conducted with regard to Accessory Muscle Relaxation Technique (AMRT) as a distinct form of treatment. The majority of the studies that have been done till now have focused on the effectiveness of manual therapy as a whole treatment approach rather than specifically focusing on relaxation of sternocleidomastoid, scalene, trapezius, and pectoral muscles. Thus, there is a lack of literature with regard to the topic of study, which serves as a strong scientific basis for conducting a three-arm comparative study.

CONCLUSION

Literature analysis proves that breathing exercises like pursed-lip breathing, diaphragmatic breathing, and inspiratory muscle training enhance ventilatory efficiency through effective chest-abdomen movement and reduce breathing effort. Moreover, manual therapy techniques such as soft tissue mobilization and thoracic mobilization proved effective in enhancing chest wall motion and respiratory muscle activity. But not enough scientific literature studies have analyzed the effect of Accessory Muscle Relaxation Technique (AMRT) as an independent physiotherapy technique on COPD patients. The majority of systematic reviews and randomized controlled trials state that a combination of respiratory rehabilitation and breathing retraining is highly effective in increasing inspiratory muscle strength, respiratory rate, exercise tolerance, and symptom management. Yet, the scientific literature on the issue of targeted relaxation of accessory respiratory muscles is limited. Therefore, more research is required in this area. In summary, the review highlights an important scientific gap related to the effectiveness of AMRT in improving breathing patterns in COPD patients. Consequently, there is sufficient scientific basis for carrying out a three arm comparison study of conventional pulmonary rehabilitation alone, conventional rehabilitation plus AMRT, and conventional rehabilitation plus breathing exercise. The scientific basis for such a study is expected to bring more reliable information concerning the benefits of accessory muscle relaxation on breathing pattern,

dyspnea, pulmonary function, exercise tolerance, and quality of life among COPD patients.

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