**Differences In The Effect Of The Combination Of Home-Based Walking Exercise And Pursed Lip Breathing With Pranayama Exercise On Increasing Lung Capacity In Copd Conditions**

**Nurul Fithriati Haritsah,SST.FT, M.Kes, Yoga Handita Windiastoni, SST.FT, M.Fis, Noerdjannah,M.Pd**

**Health Polytechnic Surakarta Ministry of Health Department of Physiotherapy**

**ABSTRACT**

**Background:** Data from the pulmonary disease polyclinic at Bangil Hospital showed that there was an increase in COPD patient visits. In 2016, it was known that the number of visits was 847 COPD patients. Whereas in 2017 it increased to 969 COPD patient visits. In 2018 the number of COPD patients who visited the pulmonary disease clinic for the last 3 months was 219 COPD patients. This situation indicates a higher demand for self-care in COPD patients. COPD patients experience deficits in caring for themselves due to various symptoms that manifest as a manifestation of the development of COPD disease.

**Subject and Method:** The design of this study is a two-group pre and post-test design. This study compared the effect of Walking Exercises combined with Pursed Lip Breathing and Pranayama Exercise on increasing lung vital capacity in COPD patients. This research was conducted once a week for 12 weeks in May-August 2021 at Dungus Madiun Lung Hospital.

**Result:** In group 1, the combination of home-based walking exercise and pursed lip breathing exercise with a value of p = 0.000 (p <0.05), it can be concluded that the combination of home-based walking exercise and pursed lip breathing exercise affects increasing lung capacity. In group II with pranayama exercise intervention, with the result p = 0.000 (p <0.05), it can be concluded that there was an increase in lung capacity in group II who was given pranayama exercise. Group 1 has the highest different mean 7.225.

**Conclusion:** There is an effect of giving a combination of home-based walking exercises and pursed lip breathing in increasing the lung capacity of COPD patients. There is an effect of giving pranayama exercise in increasing the lung capacity of COPD patients.

**Keywords: home-based** walking exercise, pranayama exercise, pursed lip breathing, lung capacity, COPD

**Correspondence:**

Nurul Fithriati Haritsah, SST.FT, M.Kes, Health Polytechnic Surakarta Ministry of Health Department of Physiotherapy. Jl. Letjend Sutoyo, Mojosongo, Jebres, Surakarta, 57127, Central Java, Indonesia.

**BACKGROUND**

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease (GOLD, 2017). Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease that causes airflow limitation in the lungs resulting in impaired lung function. Decreased lung function occurs due to chronic inflammation of the proximal, peripheral, and pulmonary vascular airways. This condition results in decreased ventilation function in the lungs, and the patient will experience an increase in respiratory rate with prolonged expiration (Black and Hawks, 2014).

The World Health Organization (WHO) in the 2015 Global Status of Non-communicable Diseases explained that COPD is the 4th largest non-communicable disease in the world which has a high mortality rate after ischemic heart disease, stroke, and lung cancer. Globally, it is estimated that around 3 million deaths were caused by this disease in 2015 i.e., 5% of all deaths worldwide in that year. More than 90% of COPD deaths occur in developing countries with weak economies.

Pursed Lips Breathing is used to achieve more controlled and efficient ventilation. This technique can stimulate relaxation and coordination of the respiratory muscles and help maximize the expulsion of air during expiration. Thus, the accumulation of air volume in the lungs can be reduced and ventilation becomes stable. This condition causes the respiration rate to decrease (Hartono, 2015). Supported by the results of research conducted by Surya P. Bhatt et al, (2013) showing that the use of Pursed Lips Breathing (PLB) in patients with stable COPD can increase exercise capacity and reduce respiration rate (RR) (Bhatt et al., 2013).

Walking exercises that are carried out independently at home can gradually increase tolerance in carrying out activities and improve the health status of COPD patients (Matos-Garcia et al., 2017). Home-based walking exercise is easy to implement at home and does not require special costs and equipment. When compared to cycle training, walking exercise is more significant in increasing endurance walking time by 279 seconds (Leung et al., 2010).

Pranayama exercise is the expansion and control of breathing or controlling breathing consciously. Pranayama exercise creates an atmosphere of relaxation of the conscious mind in a deeply relaxed state. When the body begins to relax, breathing will become slow and deep so that the expansion of the thoracic cage can be maximized, the air that is inhaled and exhaled is maximal, the volume in the lungs increases so that there is an increase in vital capacity (Worby, 2007).

**SUBJECT AND METHOD**

1. **Study Design**

The design of this study is a two-group pre and post-test design. The study compared the effect of Walking Exercises combined with Pursed Lip Breathing and Pranayama Exercise on increasing lung vital capacity in COPD patients. This research was conducted once a week for 12 weeks in April-June 2021 at Dungus Madiun Lung Hospital.

1. **Population and Sample**

The research subjects were COPD patients at Dungus Madiun Pulmonary Hospital who met the study criteria.

1. **Study Variable**

The independent variable is lung capacity. The dependent variable is home-based walking exercise and pursed lip breathing.

1. **Operational Definition of Variable**

**Lung Capacity** is the volume of air in the lungs upon the maximum effort of inspiration.

**Home-based walking exercises are** walking exercises performed at

home independently.

**Pursed lip breathing** is a technique that allows people to control their oxygenation and ventilation.

1. **Study Instruments**

The measuring instrument used in this study was a spirometer which was used to measure vital capacity (VC). Spirometry is a pulmonary function test that is useful for differentiating between restrictive lung disease and for determining the degree (mild, moderate, or severe) of obstructive or restrictive lung disease. So far, it has been known that there is a relationship between vital lung capacity values ​​with age, height, and gender.

**RESULT**

The results of the Mann-Whitney test combination of pursed lip breathing and home-based walking exercise with pranayama exercise on the level of lung capacity in 16 respondents showed a sig (2-tailed) value of 0.000 in each intervention, so from the Mann-Whitney test results, it can be interpreted that there is the effect of a combination of pursed lip breathing and home-based walking exercise with pranayama exercise on increasing lung capacity values ​​in mild COPD patients.

**Table 1. Changes In Lung Capacity Pre And Post The Combination Of Pursed Lip Breathing And Home Based Exercises With Pranayama Exercises**

|  |  |  |
| --- | --- | --- |
|  | Combination Of Pursed Lip Breathing And Home Based Exercises | Pranayama Exercises |
|  | Mean | Sdi | Sig (2- tailed) | Mean | Sdi | Sig (2- tailed) |
| Pre | 95.39 | 0.701 | .000 | 95.83 | 0.710 | .000 |
| Post | 98.08 | 1.234 |  | 97.54 | 0.811 |  |

The results of the Mann Whitney oxygen saturation test of post pursed lip breathing and home based walking exercise on pranayama exercise in 16 respondents showed a sig (2-tailed) value of 0.000, which means that there is a difference in lung capacity values ​​between pursed lip breathing and home based walking exercise with pranayama exercise.

**Table 2.** **Difference In Lung Capacity Pre And Post The Combination Of Pursed Lip Breathing And Home Based Exercises With Pranayama Exercises**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Mean | Sdi | SE | N | Sig (2-tailed) |
| Post |  |  |  |  | 0.000 |
| Pursed lip breathing and home based walking exercises | 98.08 | 0.234 | 0.088 | 30 |  |
| Pranayama exercises | 97.54 | 0.811 | 0.148 | 30 |  |

Then, to find out which group is better seen from the different means before and after the pa00da treatment of each group. The group that had a higher mean difference before and after treatment than the other groups was better at increasing lung capacity. In this study, the group that had a higher mean differential was Group 1 or the home-based walking exercise and pursed lip breathing group with a result of 7.225.

**Table 3. Mean Differences Between Group**

|  |  |
| --- | --- |
|  | *Different mean* |
| Groups I | 7,225 |
| Groups II | 2,942 |

**DISCUSSION**

1. **Effect of Pursed Lip Breathing and Home-Based Walking Exercise on Lung Capacity**

From the research that the researchers have done, the results show that there is an effect of pursed lip breathing and home-based walking exercise on lung capacity values. The results of the Mann Whitney pursed lip breathing test and home-based walking exercise on the level of the lung capacity of 8 respondents showed a sig (2-tailed) value of 0.000, so from the Mann-Whitney test results it can be interpreted that there is an influence between pursed lip breathing and home-based actions walking exercise on increasing lung capacity values ​​in mild COPD patients.

The results of this study are supported by research conducted by Budiono & Mustayah (2017) which states that there is a significant effect of pursed lip breathing on increasing lung capacity values. This is also in line with research conducted by Sri, Evita & Yohastuti (2018) which stated that pursed lip breathing is effective in increasing the respiration rate value in COPD patients. Pursed lip breathing is a breathing exercise by compressing the lips which aims to slow expiration, prevent the collapse of the lung units, and help the patient to control the respiratory rate and depth of breathing so that the patient can achieve control of dyspnea. Pursing the breathing lips helps COPD sufferers to empty the lungs and slow down the breathing rate. Pursed Lip Breathing helps to restore the position of the diaphragm which is the breathing muscle that is located under the lungs. Pursed Lip Breathing also causes the stomach muscles to contract during expiration, this forces the diaphragm upwards, and helps to empty the lungs, as a result, COPD sufferers will breathe more slowly and more efficiently (Smeltzer & Bare, 2013)

1. **Effect of Pranayama Exercise on Lung Capacity**

From the research that the researchers have done, the results show that there is an effect of Pranayama Exercise on lung capacity. The results of the Pranayama Exercise test on the oxygen saturation level of 8 respondents showed a sig (2-tailed) value of 0.000, so from the Mann-Whitney test results, it can be interpreted that there is an influence between the pranayama exercise action on increasing the value of lung capacity in COPD patients.

The results of this study are supported by research conducted by Sinambela, Tarigan, & Pandia (2015), based on this study a significant effect was found between pranayama exercise on increasing lung capacity in the group of respondents with mild degrees of COPD. According to the Minister of Health of the Republic of Indonesia in 2009, pulmonary rehabilitation can be in the form of physical exercise and breathing exercises.

The pranayama breathing technique controls the breath and the mind. This exercise can strengthen the respiratory system, calm the nervous system, and can strengthen the immune system. The real benefits that can be felt from this exercise are reduced fatigue, and calm thoughts and emotions (Worby, 2007).

Pranayama is done by regulating and controlling the breath. Breath control consists of setting the length and duration of inhalation (inhalation) length and the duration of exhalation (exhalation), as well as breathing stops. The average respiratory frequency reaches 16-18 times per minute in normal people, by doing yoga breathing exercises the breath speed will become slower and each breath in and out will be longer and fuller. This condition is called deep breathing and will enable existing energy to move to reach the cells. This exercise uses deep breathing relaxation exercises, slow deep breathing, and pursed lip breathing. But this pranayama practice uses another form of practice, namely breathing using one nostril and incorporating elements of spirituality at the end of the exercise (Worby, 2007).

The mechanism of yoga breathing exercises (pranayama) for the physical changes that occur in the body begins with the creation of an atmosphere of conscious relaxation which systematically leads to a deeply relaxed state. The creation of an atmosphere of relaxation will eliminate the voices in the mind so that the body will be able to release muscle tension. When the body begins to relax, the breath becomes slow and deep, so that the respiratory system can rest. Slowing the rhythm of breathing will make the heart beat slower and have a positive effect on the entire circulatory system. The sympathetic nervous system will react to relaxation while the parasympathetic nervous system will respond to relaxation. In addition to the sympathetic nerves, messages for relaxation are also received by the endocrine glands which are responsible for most of the emotional and physical states (Worby, 2007).

During forced respiration exercises, the chest and lungs are maximally contracted and relaxed and the muscles work to their maximum capacity. It is supported that forced respiration exercises without holding phases can also strengthen the respiratory muscles and increase the elasticity of the chest and lungs by increasing some of the ventilation functions of the lungs (Grover et al, 1998).

The position in pranayama is done in padmasana, which is a sitting asana position with legs crossed by placing one foot or two feet on the opposite thigh. Padmasana provides a natural position for the spine and upper body and provides a strong and stable position. In the upright position, the diameter of the main airways increases gradually and the diaphragm is maximally expanded, the anteroposterior dimension of the thorax is greatest and the pressure on the heart and lungs is lowest. In this position, the diaphragm is neutralized by increasing breathing (Unnati et al, 2014).

1. **Differences in Oxygen Saturation Values ​​Between Pursed Lip Breathing and Home Based Walking Exercise with Pranayama Exercise**

From the research that the researchers have done, the results show that there are differences in oxygen saturation values ​​between respondents who have done pursed lip breathing and home-based walking exercises and respondents who have done pranayama exercises. The results of the Mann-Whitney test of post-pursed lip breathing and home-based walking exercise lung capacity on pranayama exercise in 8 respondents showed a sig (2-tailed) value of 0.000, this means that there is a difference in lung capacity values ​​between pursed lip breathing and home-based walking exercise and pranayama exercise. Both interventions had the same effect on increasing oxygen saturation values ​​but there were differences in the range of increase in lung capacity before and after the intervention. In the pursed-lip breathing and home-based walking exercise intervention group, the average lung capacity before the intervention was 95.39% and after the intervention, the average oxygen saturation value was 98.08%, which means there was an increase of 2.69%. Whereas in the pranayama exercise intervention group the average lung capacity value before the intervention was 95.83% and after the intervention, the average lung capacity value became 97.54% which means there was an increase of 1.71%.

The results of this study are supported by research conducted by Suryantoro et al., (2017) entitled Differences in the Effectiveness of Pursed Lips Breathing and home-based walking exercise with Pranayama Exercise on Forced Expiratory which states that both interventions are equally able to increase FEV1 values ​​with results showing that the average FEV1 post-test in the pursed lips breathing group was greater than in the pranayama exercise group. This is because pursed lips breathing is more able to train the respiratory muscles to extend expiration and increase airway resistance during expiration, thereby reducing airway resistance and trapped air, as well as shortness of breath. This is because pranayama exercise does not directly train to breathe such as pursed lips breathing which helps COPD sufferers to exhale more efficiently as shown by prolonged expiration. Pranayama exercise to be able to increase FEV1 must go through several processes, starting from increasing O2 intake obtained from physical activity to the formation of ATP as a material for respiratory muscle contractions to produce forced expiration (Sherwood, 2012). From the theory above, it can be concluded that both pursed lip breathing, home-based walking exercise, and pranayama exercise can increase lung capacity values ​​in mild COPD patients, although the results are not the same. So both pursed lip breathing and home-based walking exercises or pranayama exercises can be applied to patients suffering from mild degrees of COPD to increase lung capacity values.

**CONCLUSION**

The conclusions from the study entitled "Differences in the Effect of the Combination of Home-Based Walking Exercise and Pursed Lip Breathing with Pranayama Exercise on Increasing Lung Capacity in COPD Conditions include: .(1) There is an effect of giving a combination of home-based walking exercise and pursed lip breathing in increasing lung capacity COPD patients with a value of p = 0.000 (p <0.005), (2) There is an effect of giving pranayama exercise in increasing the lung capacity of COPD patients with a value of p = 0.000 (p <0.005), (3)

The combination of home-based walking exercise and pursed lip breathing has more effect on increasing lung capacity than pranayama exercise with the mean difference in group I 7.22 and group II 2.94 (7.22 > 2.94).

**REFERENCES**

Bianchi R, Gigliotti F, Romagnoli I, Lanini B, Castellani C, Binazzi B, et al, 2007; Patterns of chest wall kinematics during volitional pursed-lip breathing in COPD at rest. Respiratory Medicine; Vol. 101, issue 7:1412–8

Departemen Kesehatan RI, 2004; Pedoman Pengendalian Penyakit Obstruktif Kronik[.ht](http://www.depkes.go.id/dowloads/Kemenkes/pengendalian_ppok.pdf)t[p://www.depkes.go.id/dowloads/Kemenkes/pengendalian\_ppok.pdf](http://www.depkes.go.id/dowloads/Kemenkes/pengendalian_ppok.pdf)

Depkes RI, 2008; Pedoman Pengendalian Penyakit Paru Obstruktif Kronik, Jakarta.

Ganderton, G. And McLeod, J., 2000, Mathematics for Australian School Year 7 (Third Edition), Mavmillan Education Australia Pty. Ltd., Victoria, p. 371.

Global Initiative for Chronic Obstructive Lung Disease, 2008; Global strategy for diagnosis, management and prevention of chronic obstructive lung disease; MCR Vision, hal 1-5.

Gosselink R. Controlled pernapasan dan dyspnea pada pasien dengan penyakit paru obstruktif kronik (PPOK), 2003; Jurnal Penelitian dan Pengembangan Rehabilitasi; Vol. 40, masalah 5 Suppl 2: 25-33.

Grover P, Varma VD, Pershad D, Verma SK, 1998; Role of yoga in the treatment of psychoneuron’s bull. PGI: 22(2):68-76.

Guyton, Hall, 2008; Buku Ajar Fisiologi Kedokteran, Ed.11, EGC, Jakarta.

Hodgkin JE, et al, 1975; Chronic obstructive airway disease current concepts in diagnosis and comprehensive care. Journal of the American Medical Association, 232, 1243.

Khumaidah, 2009; Analisis faktor-faktor yang berhubungan dengan gangguan fungsi paru pada pekerja mebel PT Kota Jati Furnindo Desa Suwawal Kecamatan Mlonggo Kabupaten Jepara, Program Pascasarjana Fakultas Kesehatan Lingkungan Universitas Dipenogoro, Semarang.

Mengkidi.D, 2006; Gangguan Fungsi Paru dan Faktor-Faktor Yang Mempengaruhinya pada Karyawan PT. Semen Tonasa Pangkep Sulawesi Selatan. Tesis Pasca Sarjana Universitas Diponegoro Semarang, from: <http://eprint.undip.ac.id/>.

Mueller RE, Petty TL, Filley GF, 1970; Ventilation and arterial blood gas changes induced by pursed lips breathing. Journal of Applied Physiology; Vol. 28, issue 6:784–9.

Mukono.J, 1997; Pencemaran Udara dan Pengaruhnya Terhadap Gangguan Saluran Pernapasan. Airlangga University Press. Jakarta.

PDPI, 2011; PPOK Pedoman Praktis Diagnosis dan Penatalaksanaan di Indonesia. Jakarta : PDPI.

Pearce, Evelyn, 2009; Anatomi dan Fisiologi Untuk Paramedis. PT. Gramedia Pustaka Utama. Jakarta.

Perhimpunan Dokter Paru Indonesia, 2003; PPOK Pedoman Praktis Diagnosis dan Penatalaksanaan di Indonesia, from: <http://www.klikpdpi.com/> konsensus/konsensus-ppok/ppok.pdf.

Price, A dan Wilson, L, 1995; Patofisiologi. Buku 2. Edisi 4. Penebit Buku Kedokteran EGC. Jakarta, hal :1117-1119.

Riduwan, 2003; Dasar-Dasar Statistika; Edisi Ketiga, Penerbit Alfabeta, Bandung, Hal 163.

Riyanto, B.S, Hisyam, B, 2006; Obstruksi Saluran Pernafasan Akut. Dalam: Sudoyo, A.W., ed. Buku Ajar Ilmu Penyakit Dalam Edisi 4. Jakarta: Pusat Penerbitan Departemen IPD FKUI: Jakarta, 978-987.

Sloane, Ethel, 2004; Anatomi Dan Fisiologi Untuk Pemula. Jakarta: EGC.

Tabrani Rab, 1996; Ilmu Penyakit Paru. Penerbit Hipokrates. Jakarta. hal 574 – 579.

Tortora, G.J., Derrickson, B., 2012. Principles of Anatomy and Physiology. 13th ed. USA: John Wiley & Sons

Worby, C, 2007; Memahami segalanya tentang yoga: Tingkatkan kekuatan, kelenturan, dan kesehatan anda (S.C. Simanjuntak, Trans.), In Y.I. Wahyu (Eds). Yoga: The everything yoga book. Jakarta: Karisma Publishing Group