# Effect of Pulmonary Rehabilitation Program with Meditation on Perceived Self-Efficacy, Pulmonary Rehabilitation Behavior, Exercise Tolerance, and Dyspnea in Patients with Chronic Obstructive Pulmonary Disease

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***Objective:*** *This quasi-experimental research using a single-group repeated measure design was conducted to assess the effect of a pulmonary rehabilitation program with meditation on perceived self-efficacy, pulmonary rehabilitation behavior, exercise tolerance, and dyspnea in patients with chronic obstructive pulmonary disease (COPD).*
***Material and Method:*** *Thirty-three COPD patients followed-up at the Outpatient Department at Wangpong District Hospital, Petchaboon Province were included into this study. All participants received the Pulmonary Rehabilitation Program (PRP) adjunct with meditation for eight weeks. The data were collected by using a Perceived Self-efficacy for Pulmonary Rehabilitation Questionnaire, a Pulmonary Rehabilitation Behaviors Questionnaire, an Exercise Tolerance Test, and a Perceived Dyspnea Questionnaire and other cardio-pulmonary parameters (PR, BP, RR, and oxygen saturation) at the baseline, at the fourth week, and at the eighth week of visits. The data were analyzed by using descriptive statistics, a repeated measure ANOVA, and Bonferroni's correction.*
***Results:*** *At the eighth week, the participants had a significant higher average of perceived self-efficacy, pulmonary rehabilitation behaviors and exercise tolerance (p-value <0.001), and lower average perceived of dyspnea than at the baseline and at the fourth week (p-value <0.05). The PR, BP, RR, and oxygen saturation were significantly improved between pre and post pulmonary rehabilitation with adjuncts meditation in baseline, 4 and 8 weeks of visits (p-value <0.001). The most effective improvement was most related to respiratory domain (RR and oxygen saturation). These effects established early in 4 weeks and strongly improved after 8 weeks and showed statistically significant when compared of 8 weeks of visit with baseline (pre-measurement of RR; p-value <0.001, 0.0326, and <0.001, and post-measurement after adjuncts meditation program; p-value = 0.206, 0.0139, and <0.001, respectively). For cardiovascular domain, PR, and SBP were seemed to improve and compensate well when comparing 8-week visit to baseline (p-value = 0.005 and 0.0032, respectively). PR was decreased after continuing adjuncts meditation compared to baseline state (p-value = 0.0004).*
***Conclusion:*** *The mediation adjuncts with routine pulmonary rehabilitation program demonstrated improving of average of perceived self-efficacy meditation, behaviors, exercise tolerance, and cardio-pulmonary parameters (RR and oxygen saturation). It was promising and should be recommended and applied to COPD patients to restore the pulmonary function, reducing perceived of dyspnea symptom, increasing exercise endurance, activity daily life, and quality of life of patients.*

***Keywords:*** *COPD, Pulmonary rehabilitation, Meditation, Perceived self-efficacy, Perceived Dyspnea Questionnaire*

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Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality whose incidence rates tend to increasing all over the world. More than 3 million people died of COPD in 2012, which was equal to 6% of global death rate and most of them occurred in low-and middle-income countries[1]. In Thailand, mortality rate of COPD was in the top five among burden problems of the country; the prevalence rate was 1.37 in 100,000 people in 2005, and increased to 1.47 in 100,000 people in 2007[2]. It burdens the individual physically, the family expense and the mental well-being of individuals, family, society. It also burdens the national budget.

Patients with COPD mostly results from toxins of cigarette damaging pulmonary tissues and reducing pulmonary flexibility resulting in patients' tiredness and dyspnea. Therefore, most of patients tend

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to avoid various activities including activity of daily live resulting in their muscles weakness and low self-esteem, because of family dependency. Consequently, patients experience anxiety, stress, irritability, and depression[3]. Their family members had to change theirs's role to be caregivers, and earn enough to cover all medical expenses[4]. Moreover, they affect the economy of the country as there is less labor available and the medical costs is approximately 7,715 million baht (250 million US$), or 12,358 baht (400 US$) per person per year in 2007[5].

Currently, the aims of treatments were to relieve symptoms, to prevent acute exacerbation, and to increase efficiency of the respiratory system[3]. These included both pharmacological treatment and pulmonary rehabilitation. The latter is crucial to increase the efficiency of the cardio-pulmonary function as well as strength and endurance of muscles, resulting in increase in exercise and daily live activities, hence better quality of life[6,7]. The most usefulness of early pulmonary rehabilitation after acute exacerbation can also reduce relapse, readmission, length of stay in the hospital, and medical costs[8]. However, there are still a huge number of COPD patients avoiding pulmonary rehabilitation because of their tiredness, fatigue, and sense of dyspnea. Evidences demonstrated that most of patients were not in compliance with the rehabilitation program. They usually sit or lie down to avoid exacerbation and cheat the program by adapting their respiratory physiology with shallow breathing. Some patients persisted on smoking, leading to increase severity of the disease[9-11]. Therefore, the concept to apply pulmonary rehabilitation based on the Bandura's self-efficacy[12] by stimulating their perceived self-efficacy is an essential factor to promote their confidence to restore pulmonary physiology of COPD patients.

The pulmonary rehabilitation program with meditation was developed based on the Bandura's self-efficacy[12] to motivate patient's confidence to perform various activities either at home, at the hospital, or in the community at least 30 minutes each, four times a week for eight weeks, or depending on health status and severity of the disease[7,13]. The program consists of health education of COPD to encourage breathing exercise and exercise adjunct with meditation. Breathing exercises mostly used pursed-lips breathing and diaphragmatic or abdominal breathing, increasing flexibility and strength of respiratory muscles, enhancing efficiency of oxygen exchange in the lungs[6,14]. Several studied applied walking meditation as an assistive method to increase capability of the cardiology and pulmonary function, muscle strengths, and exercise tolerance resulting in improving quality of life and reducing dyspnea[9,10,15]. The exercise methods and durations should be applied depending on individuals' ability and severity of the disease[8,13]. However, physical assessment should perform before, during, and after exercise to prevent difficulty[16].

Meditation is a relaxation modality technique assisting to enhance consciousness and peace to self-regulation for coping with stress from their illness by stimulating parasympathetic nervous system (PNS) and inhibiting sympathetic nervous system (SNS), resulting in decrease secretion of many cytokines/ hormones such as cortisol, aldosterone, and catecholamine. Therefore, individuals have lower stress, harmony of respiratory rate and heart rate, and reduced oxygen consumption[17]. However, there are limited studies of adjuncts meditation to pulmonary rehabilitation[6]. Thus, this idea leads to conduct the present study to initiate the program in patients' context leading to participatory practice results in decreasing dyspnea and length of stay in the hospital, increasing quality of life[18]. The integrated meditation with home visits and telephone follow-ups were important to continue care for patients with COPD in order to increase patients' confidence and to solve their problems during pulmonary rehabilitation despite limited of personnel, time, budget, and safety in home visits[6,18-20].

The present study was aimed to examine the effects of a pulmonary rehabilitation program with the Bandura's self-efficacy based meditation on perceived self-efficacy, pulmonary rehabilitation behavior, exercise tolerance, and dyspnea in patients with COPD. The findings could help to develop the program in COPD patients' contexts and lifestyles resulting in reducing dyspnea, increasing ability to perform activity of daily living, and improving quality of life.

## Material and Method

### *Setting and subjects*

A single-group repeated measure design was used for the present study. The population of the study consisted of patients diagnosed as COPD being treated at the Outpatient Department of Wang Pong Hospital, Phetchaboon Province.

The inclusion criteria were consisted of COPD patient aged 20 years up, having COPD stages 1

to 3 according to the criteria of the American Lung Association and the European Respiratory Society[16], able to perform pulmonary rehabilitation, able to communicate in Thai, giving permission for telephone visit or home visit, and signed the informed consent form. The exclusion criteria were being hospitalized during the study, or changing address until unable to continue performing intervention.

The sample size was calculated using power analysis of Cohen[21] based on the findings of another study regarding pulmonary rehabilitative ability having effect size equal 0.67[22]. Finally, we enrolled 33 patients with COPD to obtain sufficient statistical power (80%) in predicting the study outcomes with a statistically significant of $p$-value <0.05.

The evaluation instruments used in the present study consisted of the pulmonary rehabilitation program with the Bandura's self-efficacy based meditation for 8 weeks and instruments for data collection. The intervention program, developed by the researcher based on a review of literature and Bandura's perceived self-efficacy theory[12], consisted of health assessment, health education of COPD and pulmonary rehabilitation including demonstration of pursed-lips breathing exercise, diaphragmatic or abdominal breathing, muscle exercise, and walking meditation; assignments at home for breathing exercise for five minutes, twice a day, and walking meditation for 20 minutes for at least three times a week; group discussions for sharing experience and solving their exercise problems; home visits in the first week, and telephone follow-ups at the second and sixth weeks. The content of the program was validated by three experts in the fields of nursing, general medicine, and pulmonary rehabilitation. The program was also revised according to the recommendations of those experts, and was piloted some of patients with COPD to determine if this program fitted. The other evaluation questionnaires for data collection were divided into six domains group as follow: the Demographic Questionnaire consisted of age, gender, marital status, education, occupation, family income, rights to medical reimbursement, history of cigarette smoking, and the disease and its treatment.

The Perceived Self-efficacy for Pulmonary Rehabilitation Questionnaire was adapted from the perceived self-efficacy in patients with COPD Scale of Saesue[10]. It contained of 15 positive questions. Each item was assessed on a Likert-type scale from 0 to 3, where "0 = not confident" and "3 = very confident" with the total possible score from 0 to 45 points. Higher scores indicated higher perceived self-efficacy for pulmonary rehabilitation, while a lower score meant lower perceived self-efficacy for pulmonary rehabilitation. Three experts in the fields of nursing, a general medicine, and pulmonary rehabilitation were assigned to review the content validity of the scale. The content validity index was demonstrated as 0.86. The explanations and suggestions from experts were taken into attention to revise this instrument. The pre-test reliability for the instrument was tested with 10 patients with COPD who were similar to the participants. Cronbach's alpha demonstrated an acceptable reliability of 0.92, and 0.90 for the main study.

The Pulmonary Rehabilitation Behavior Questionnaire was adopted from the exercise behavior in patients with COPD questionnaire assembled by Saesue[10]. It consisted of 15 positive questions. The scoring for this 4-level measurement ranged from 0 (never) to 3 (always) points with the total possible score from 0 to 45 points. Higher scores indicated higher pulmonary rehabilitation behavior, while a lower score meant lower pulmonary rehabilitation behavior. Three experts were assigned to review the content validity of the scale. The content validity index was demonstrated as 0.80. The pre-test reliability was then tried out with ten patients. Cronbach's alpha demonstrated an acceptable reliability of 0.81, and 0.87 for the main study.

The Exercise Tolerance Test was assigned the participants to perform the six-minute walk test (6MWD), and the distance was measured in meters, based on the guidelines for the 6MWD of the American Thoracic Society[23]. A longer distance referred to a higher level of exercise tolerance.

The Dyspnea Vertical Visual Analog Scale (DVAS) developed by Gift in 1989[24] was employed to assess patients' perceived dyspnea after completing the 6MWD. The instrument was a straight line 100 millimeters in length with "0 meant no dyspnea" and "100 meant severe dyspnea"[24]. Higher scores reflected more dyspnea.

The cardio-pulmonary parameters, which consist of pulse rate (PR), blood pressure (BP), respiratory rate (RR), and oxygenation, were measured to objectively reflect the efficiency of meditation adjuncts with routine pulmonary rehabilitation program at baseline, 4-week, and 8-week.

***Data collection***

After participants signed the informed consent form, data were collected by the researcher in

the following procedures. At baseline assessment in the first week, all participants were asked to provide the demographic characteristics, the perceived self-efficacy for pulmonary rehabilitation, and the pulmonary rehabilitation behavior. The participants were also examined the 6MWD and DVAS. Then, the participants received the program for eight weeks. Data were obtained after finishing the program at the eighth weeks as at the baseline.

***Statistical analysis***

Descriptive statistics were used to explain the demographic data. Baseline of demographic characteristics were used the Chi-square or Fisher's exact test for comparison of categorical variables, while Student's t-test was used for normal distribution data and Mann-Whitney U test was used for non-normal distribution ones. Data were presented as means ± standard deviation (SD), count numbers (n), and percent (%). However, the median (ranges of minimum and maximum value) was shown for non-normal distributed data. Repeated measure analysis of variance (ANOVA) and Bonferroni's correction were used to examine the differences in the mean scores of perceived self-efficacy, pulmonary rehabilitation behavior, exercise tolerance, and DVAS at the baseline, at the fourth week, and at the eight week after receiving the program. This study was approved by the Institutional Review Board, Faculty of Medicine, Ramathibodi Hospital, Mahidol University (ID 10-53-25). All participants received written and verbal explanations, learnt of the objectives, methods, risks, benefits, and the right to withdraw from the study at any time throughout the study before giving written informed consent. Data collected would be kept strictly confidential and reported overall data. All Statistical analysis was performed using STATA Statistical Software Version 14 (College Station, TX, USA).

## Results

Thirty-three COPD patients were enrolled, mean age was 64.8 years old (SD = 10.0). Most of them were male (88%), married (70%), completed elementary school education (79%), and unemployed (64%). The family income was about 3,090 baht per month (SD = 1,720), and all of them used the universal healthcare coverage for their medical expenses. Most participants, approximately 90.9% had history of cigarette smoking, 84.9% already quitted smoking, and patient age between 39 and 80 years old, starting smoking at 15.8 years (SD = 8.2). Besides, average number of years for COPD diagnosis was 5.21 years (SD = 3.23) with average COPD duration was 40.13 years (SD = 15.42), 39% of patients had level of severity in stage 2, and 49% had history of admission in the past year with the mean number of hospitalization of 1.61 times (SD = 2.87) and median and ranges was 0 (0, 12). Most cause of admission was dyspnea symptom. The body mass index (BMI) was lined between 14.0-28.6 kg/m$^2$ (mean ± SD = 19.9±3.2).

Before receiving the pulmonary rehabilitation adjunct with mediation program, the mean score of

**Table 1.** Baseline characteristic of subjects

| Factors | n (%) (total = 33 cases) |
|---|---|
| Age (years), mean ± SD | 64.8±10.0 |
| Male | 29 (87.9) |
| BMI | 19.9±3.2 |
| Status | |
| Single | 2 (6.1) |
| Married | 23 (69.7) |
| Divorced | 8 (24.2) |
| Education | |
| None | 6 (18.2) |
| Primary school | 26 (78.8) |
| Secondary school | 1 (3.0) |
| Occupation | |
| None | 21 (63.6) |
| Agricultural | 10 (30.3) |
| Daily employee | 2 (6.1) |
| Family income (bath), median (range) | 2,000 (1,000.0, 10,000.0) |
| Smoking | |
| Yes | 30 (90.9) |
| No | 3 (9.1) |
| Smoking status | |
| Quit | 28 (84.9) |
| Persistent | 5 (15.1) |
| Age of smoking (years), mean ± SD | 15.8±8.2 |
| Median (ranges) | 15 (7, 35) |
| Duration of smoking (years), mean ± SD | 36.5±18.8 |
| Median (ranges) | 42 (2, 60) |
| Amount of smoking per day, mean ± SD | 13.5±10.1 |
| Median (ranges) | 10 (0, 40) |
| Severity of COPD | |
| Class I | 11 (33.3) |
| Class II | 13 (39.4) |
| Class III | 9 (27.3) |
| Admission history | 17 (51.5) |
| Admission rate (times per year), mean ± SD | 1.6±2.9 |
| Median (ranges) | 0 (0, 12) |

BMI = body mass index; COPD = chronic obstructive pulmonary disease

perceived self-efficacy and pulmonary rehabilitation were at low level (16.15±6.23 and 9.00±7.19, respectively). Mean exercise tolerance (distance from 6MWD) and dyspnea (DVAS) were 328.64 meters (SD = 75.21), and 39.82 (SD = 31.36), respectively. After intervention with adjunct pulmonary rehabilitation program, the mean score of perceived self-efficacy and of pulmonary rehabilitation behaviors were statistical significant improved with at least one interval ($F_{(2, 64)}$ = 241.08, *p*-value <0.001; $F_{(2, 64)}$ = 354.85, *p*-value <0.001, respectively). The mean scores of perceived self-efficacy and pulmonary rehabilitation behaviors at the fourth week and eighth week were significantly higher than at the baseline (*p*-value <0.001), and at the eighth week was significantly higher than at the fourth week (*p*-value <0.001) (Table 1, 2).

In addition, the mean exercise tolerance was improved with at least one interval ($F_{(2, 64)}$ = 40.38, *p*-value <0.001). The means of exercise tolerance at the fourth week and eighth week were significantly higher than at the baseline (*p*-value <0.001), and at the eighth week was significantly higher than at the fourth week (*p*-value <0.001). Besides, the mean dyspnea was also improved with at least one interval ($F_{(2, 64)}$ = 19.78, *p*-value <0.001). The means of dyspnea at the fourth week and eighth week were significantly lower than at the baseline (*p*-value <0.05 vs. *p*-value <0.001, respectively). In addition, the mean score obtained eighth week was significantly lower than at the fourth week (*p*-value <0.05), see Table 1, 2.

The cardio-pulmonary parameters consist of PR, BP, RR, and oxygen saturation were measure at baseline, 4-week, and 8-week. In each visit, we measured pre- and post-measurement of these parameters to compare adjuncts meditation technique with pulmonary rehabilitation with routine pulmonary rehabilitation. From present study, authors found all of each visits showed significant different of changes of PR, BP, RR, and oxygen saturation (*p*-value <0.001). The most effective improvement that benefited from adjuncts meditation program was most related to respiratory domain such as RR and oxygen saturation. The authors found benefits to decrease of RR and improve of oxygenation after continuing meditation adjuncts to routine pulmonary rehabilitation program. The effect began to show in 4 weeks in pre- and post-measurement and strongly changed after 8 weeks and statistically significant when compared of 8 weeks with baseline. Pre-measurement of RR were *p*-value <0.001, 0.0326 and <0.001, respectively. Post-measurement after adjuncts meditation program were *p*-value = 0.0139 and <0.001 at 8-week visit compared to 4-week and baseline respectively. For cardiovascular domain, PR, and systolic blood pressure (SBP) were seemed to improve and compensating well especially when compared between 8-week visit with baseline visit. SBP was seemed to be lower after continuation of adjuncts meditation program, but this showed only in pre-measurement state at 8-week and when we compared to baseline state (*p*-value = 0.005 and *p*-value = 0.0032, respectively), see Table 4 and Fig. 1. Pulse rate was only affected; intent to decrease after continuing adjuncts meditation compared with baseline state (*p*-value = 0.0004).

## Discussion

Quasi-experimental research using a single-group repeated measure design of thirty-three COPD patients (baseline compared with adjuncts meditation) were enrolled from Wangpong Hospital, Phetchaboon Province, Thailand. One of the big general hospital in Northern part of country that had a huge number of COPD patients visited out-patient, in-patient, and emergency services. The amount of COPD patient

**Table 2.** Comparison of mean scores of perceived self-efficacy, pulmonary rehabilitation behavior, exercise tolerance, and dyspnea in patients with COPD at the baseline, 4-week, and 8-week after receiving the pulmonary rehabilitation program with meditation by using a repeated measures analysis of variances (ANOVA)

| Variables | Sources of variances | SS | Df | MS | F | *p*-value* |
|---|---|---|---|---|---|---|
| Perceived self-efficacy | Time | 6,565.83 | 2 | 3,923.92 | 241.08 | <0.001 |
| | Variances | | 64 | | | |
| Pulmonary rehabilitation behaviors | Time | 8,512.99 | 2 | 6,057.54 | 354.85 | <0.001 |
| | Variances | | 64 | | | |
| Exercise tolerance | Time | 57,240.00 | 2 | 41,665.75 | 40.38 | <0.001 |
| | Variances | | 64 | | | |
| Dyspnea | Time | 3,626.60 | 2 | 2,296.21 | 19.78 | <0.001 |
| | Variances | | 64 | | | |

* Statistically significant *p*-value <0.05

**Table 3.** Comparison of mean differences of perceived self-efficacy, pulmonary rehabilitation behaviors, exercise tolerance, and dyspnea in patients with COPD at the baseline, 4th week, and 8th week after receiving the pulmonary rehabilitation program with meditation using Bonferroni's correction

| Time (1) | | Time (2) | Mean differences | SE | *p*-value* |
|---|---|---|---|---|---|
| Perceived self-efficacy | | | | | |
| Baseline | vs. | at the fourth week | 14.33 | 0.90 | <0.001 |
| Baseline | vs. | after the eighth week | 19.18 | 1.07 | <0.001 |
| Fourth week | vs. | after the eighth week | 4.84 | 0.71 | <0.001 |
| Pulmonary rehabilitation behaviors | | | | | |
| Baseline | vs. | at the fourth week | 17.84 | 0.93 | <0.001 |
| Baseline | vs. | after the eighth week | 21.09 | 1.02 | <0.001 |
| Fourth week | vs. | after the eighth week | 3.24 | 0.51 | <0.001 |
| Exercise tolerance | | | | | |
| Baseline | vs. | at the fourth week | 31.54 | 5.22 | <0.001 |
| Baseline | vs. | after the eighth week | 58.84 | 8.48 | <0.001 |
| Fourth week | vs. | after the eighth week | 27.30 | 5.44 | <0.001 |
| Dyspnea | | | | | |
| Baseline | vs. | at the fourth week | 8.60 | 2.24 | 0.002 |
| Baseline | vs. | after the eighth week | 14.75 | 2.87 | <0.001 |
| Fourth week | vs. | after the eighth week | 6.15 | 1.83 | 0.006 |

* Statistically significant level if *p*-value <0.05

increased from 92 in 2008 to 140 in 2010 and trend to increase every year despite that government has launched many campaigns and mass media providing knowledge and disadvantage of cigarette smoking since 1999 by the Thai Health Promotion Foundation. The admission rate due to dyspnea from COPD in our hospital accounted 86 times in 2008 and increased to 133 times in 2010 from previous hospital pilot studied[25]. Similar to other centers and general hospitals in Thailand, this hospital had reversing ratio

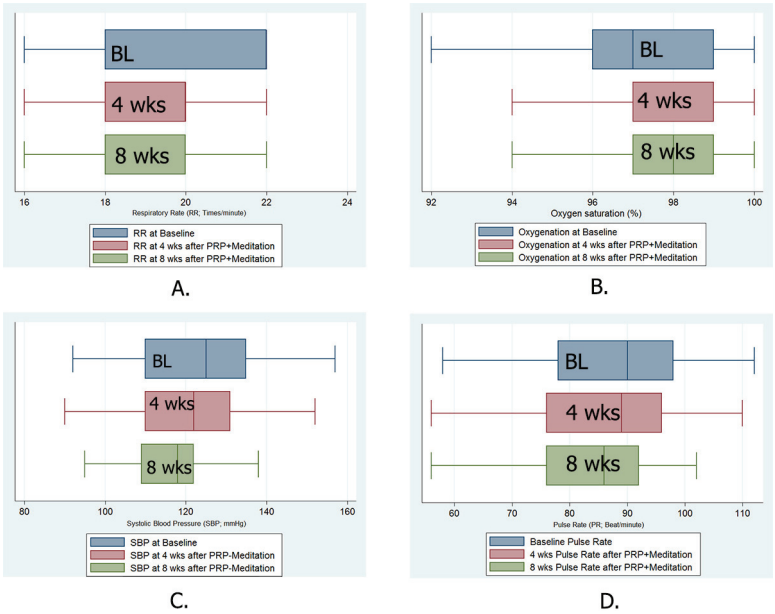


**Fig. 1** Respiratory rate (RR) (A.), oxygenation (B.), systolic blood pressure (SBP) (C.), and pulse rate (PR) (D.) compared among baseline, 4-week, and 8-week after pulmonary rehabilitation program (PRP) with meditation; the results showed the patient's RR, PR, and SBP were effectively reduced but the oxygenation was improve after passed 4 and 8 weeks of meditation adjuncts.

**Table 4.** Comparison of objective health parameters (pulses, respiratory rate, blood pressure, and oxygen saturation) between pre and post pulmonary rehabilitation with/without meditation at baseline (BL), 4-week, and 8-week

| Parameters | Periods | Pre and post meditation | Means | SD | *p*-value (compare between pre- and post-meditation within visit)* | Comparisons | *p*-value (compare among pre-meditation)* | *p*-value (compare among post-meditation)* |
|---|---|---|---|---|---|---|---|---|
| Pulse | BL | Pre | 87.4 | 13.4 | <0.001 | BL | - | - |
| | | Post | 96.0 | 14.4 | | | | |
| | 4-week | Pre | 86.2 | 13.2 | <0.001 | 4-week vs. BL | 0.249 | 0.963 |
| | | Post | 96.1 | 13.7 | | | | |
| | 8-week | Pre | 84.2 | 12.0 | <0.001 | 8-week vs. 4-week | 0.086 | 0.643 |
| | | Post | 95.5 | 12.7 | | | | |
| | | | | | | 8-week vs. BL | 0.0004* | 0.703 |
| Blood pressure | BL | Pre | | | | | | |
| | | - Systolic | 124.0 | 17.9 | <0.001 | BL | - | - |
| | | - Diastolic | 73.4 | 9.8 | <0.001 | | | |
| | | Post | | | | | | |
| | | - Systolic | 129.4 | 16.9 | | | | |
| | | - Diastolic | 77.3 | 10.0 | | | | |
| | 4-week | Pre | | | | | | |
| | | - Systolic | 121.9 | 14.9 | <0.001 | 4-week vs. BL | 0.218 | 0.628 |
| | | - Diastolic | 72.6 | 9.9 | <0.001 | | 0.366 | 0.729 |
| | | Post | | | | | | |
| | | - Systolic | 128.8 | 13.9 | | | | |
| | | - Diastolic | 77.6 | 9.5 | | | | |
| | 8-week | Pre | | | | | | |
| | | - Systolic | 117.8 | 14.5 | <0.001 | 8-week vs. 4-week | 0.005* | 0.122 |
| | | - Diastolic | 72.6 | 11.2 | <0.001 | | 0.974 | 0.930 |
| | | Post | | | | | | |
| | | - Systolic | 126.6 | 13.1 | | 8-week vs. BL | 0.003* | 0.126 |
| | | - Diastolic | 77.7 | 9.9 | | | 0.497 | 0.754 |
| Respiratory rate | BL | Pre | 20.6 | 2.6 | <0.001 | BL | - | - |
| | | Post | 24.1 | 2.4 | | | | |
| | 4-week | Pre | 19.1 | 1.8 | <0.001 | 4-week vs. BL | <0.001* | 0.206 |
| | | Post | 23.8 | 2.5 | | | | |
| | 8-week | Pre | 18.7 | 1.6 | <0.001 | 8-week vs. 4-week | 0.033* | 0.014* |
| | | Post | 23.1 | 2.5 | | | | |
| | | | | | | 8-week vs. BL | <0.001* | <0.001* |
| Oxygen saturation | BL | Pre | 97.1 | 2.2 | <0.001 | BL | - | - |
| | | Post | 92.3 | 3.5 | | | | |
| | 4-week | Pre | 97.6 | 1.9 | <0.001 | 4-week vs. BL | 0.019* | 0.039* |
| | | Post | 93.1 | 3.3 | | | | |
| | 8-week | Pre | 97.8 | 1.9 | <0.001 | 8-week vs. 4-week | 0.133 | 0.891 |
| | | Post | 93.1 | 3.5 | | | | |
| | | | | | | 8-week vs. BL | 0.0001* | 0.038* |

* Statistically significant level if *p*-value <0.05

of patient numbers compared with basic pulmonary care. There was only conventional pulmonary rehabilitation program in the hospital and limited number of home oxygen therapy provided to patient, or supposed to have home visit at least once a month. Therefore, the hospital services could only efficiently provided only 10% of home oxygen therapy to COPD patients, but could not provide immediately after unplanned patient discharge. The adjunct meditation with conventional pulmonary rehabilitation program was interesting among healthcare team, and used them to improve efficiency of old conventional pulmonary rehabilitation method to compensate for the resource limitation.

The COPD patients after complete the pulmonary rehabilitation program with meditation for eight weeks, the mean scores of perceived self-efficacy, pulmonary rehabilitation behavior, and exercise tolerance were higher, and dyspnea was lower when comparing with the baseline, and the fourth week after receiving the program. Our results were being congruent with Bandura's concept[12], describing that if individuals perceive their capability to perform activities to achieve their outcome expectation, they will do such activities. Thus, participants perceiving their efficacy and expecting to be better health would perform activities in the program, including with health education of COPD and pulmonary rehabilitation including pursed-lips breathing exercise, diaphragmatic breathing, muscle exercise, and walking meditation, assignments at home for exercise, group discussions, and home visits and telephone follow-ups.

The advantageous of better physiologic changes such as resulting in decreasing breathing rate, heart rate, use of oxygen, and dyspnea, and increasing exercise tolerance[17]. These findings were consistent with numerous studies increasing perceived self-efficacy[15,22] pulmonary rehabilitation behaviors[9,10], and exercise tolerance[9,10,14,22], and decreasing dyspnea[10,15,18,22,26] hence better quality of life[6,18,26].

Lorenc et al reviewed meditation modalities on cystic fibrosis patients and showed controversial benefits of meditation program with respiratory function[27]. Norweg et al[28] mentioned about meditation program or cognitive-behavioral interventions may relieve dyspnea in COPD by decreasing sympathetic nerve activity, dynamic hyperinflation, and comorbid anxiety, and promoting arterial oxygen saturation, myelinated vagus nerve activity, a greater exercise training effect, and neuroplasticity. They showed a promising effectiveness of psychosocial and self-management interventions in relieving dyspnea and should endorse them in official COPD[28].

The present study found that the cardio-vascular parameters, which consisted of pulse, blood pressure (systolic and diastolic blood pressure), respiratory rate, and oxygen saturation, were studied. These parameters were designed to record at baseline, 4-week, and 8-week of follow-up periods. In each visit, researcher will also record baseline measurements and after pulmonary rehabilitation adjuncts with meditation to see the changes of these parameters in each visit and compare with baseline, 4 weeks and 8 weeks of visits to establish of significant improvement such as lowering blood pressure, increase of oxygenation, and decrease of respiratory rate as effective benefits of adjuncts meditation program to routine pulmonary rehabilitation. The several scientific reasons indicate that the meditation adjunct help to improve many patient's pulmonary physiology and functions such as perception of interoceptive information, reduce respiratory work load, lowering chemosensitivity to $CO_2$, faster recovery rate after exacerbation, reduce an anxiety, and improves ability to detect and monitoring respiratory load and ventilator rescue, improved mental acuity, and their active daily living.

The present study had some limitations due to small number of COPD subjects, which limited on feasibility of study, and budgets. The single group comparison can only compare between pre-meditation adjuncts (baseline) with post-meditation adjuncts at 4- and 8-week of visits to observe changes in perceived self-efficacy, behaviors, exercise tolerance, and cardio-pulmonary parameters (RR and oxygen saturation). There are many strengths in this study such as the observation and completely follow-up of all the patients, the self-education, the home visits, and the phone calls, which cannot be done in larger group of studies.

**Conclusion**

The pulmonary rehabilitation program adjuncts with meditation assisted to decrease tiredness and dyspnea. Thus, the program should be applied to patients with COPD for at least eight weeks to restore the pulmonary function, which will decrease tiredness and dyspnea. It will also increase exercise endurance, activity daily live, and quality of life of patients.

**What is already known on this topic?**

Pulmonary rehabilitation program, breathing exercise using pursed-lips breathing or diaphragmatic or abdominal breathing and walking exercise at least 30 minutes each, four times a week for seven weeks has been used to decrease dyspnea, the results are shown that patients are still tiredness and can be less exercise.

**What this study adds?**

This report showed that a pulmonary rehabilitation program with meditation can increase relaxed resulting in stimulating PNS and inhibiting SNS causing decrease in cortisols, and catecholamines by showing benefits and improvement of these objective cardio-pulmonary parameters (PR, BP, RR, and oxygenation) that measured from studied at

4- and 8-week compared with baseline. The mediation adjuncts with routine pulmonary rehabilitation program demonstrated improving of average of perceived self-efficacy, behaviors, exercise tolerance, and cardio-pulmonary parameters. Therefore, patients can exercise more and less tiredness after this program.

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**Potential conflicts of interest**

None.

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***ผลของโปรแกรมการฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิต่อการรับรู้สมรรถนะแห่งตน พฤติกรรมการฟื้นฟูสมรรถภาพปอด ความทนทานต่อการออกกำลังกาย และอาการหายใจลำบากของผู้ป่วยโรคปอดอุดกั้นเรื้อรัง***

***สมทรง สีที, แสงทอง ธีระทองคำ, วันทนา มณีศรีวงศ์กูล, ศักดา อาจองค์ วัลลิภากร***

***วัตถุประสงค์:*** *การศึกษากึ่งทดลอง แบบศึกษากลุ่มเดียววัดซ้ำ มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมการฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิต่อการรับรู้สมรรถนะแห่งตน พฤติกรรมการฟื้นฟูสมรรถภาพปอด ความทนทานต่อการออกกำลังกาย และอาการหายใจลำบากของผู้ป่วยโรคปอดอุดกั้นเรื้อรัง*

***วัสดุและวิธีการ:*** *กลุ่มตัวอย่าง คือ ผู้ป่วยโรคปอดอุดกั้นเรื้อรังที่รับการรักษาแผนกผู้ป่วยนอกของโรงพยาบาลวังโป่ง อำเภอวังโป่ง จังหวัดเพชรบูรณ์ ถูกเลือกแบบเจาะจงตามเกณฑ์คัดเข้า จำนวน 33 ราย ได้รับโปรแกรมการฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิ เป็นระยะเวลา 8 สัปดาห์ เก็บข้อมูลโดยการใช้แบบสัมภาษณ์ข้อมูลส่วนบุคคล แบบประเมินการรับรู้สมรรถนะแห่งตน แบบสอบถามพฤติกรรมการฟื้นฟูสมรรถภาพปอด การทดสอบความทนต่อการออกกำลังกาย และแบบวัดการรับรู้อาการหายใจลำบาก วิเคราะห์ข้อมูลโดยใช้สถิติเชิงบรรยาย ความแปรปรวนแบบวัดซ้ำ และการเปรียบเทียบพหุคูณ ด้วยวิธี Bonferroni correction*

***ผลการศึกษา:*** *หลังผู้ป่วย COPD ได้รับโปรแกรมการฟื้นฟูสมรรถภาพร่วมกับการปฏิบัติสมาธิ กลุ่มตัวอย่างมีคะแนนเฉลี่ยการรับรู้สมรรถนะแห่งตน คะแนนเฉลี่ยพฤติกรรมการฟื้นฟูสมรรถภาพปอด และค่าเฉลี่ยความทนทานต่อการออกกำลังกาย มากกว่าก่อนได้รับโปรแกรม และระหว่างได้รับโปรแกรมในสัปดาห์ที่ 4 อย่างมีนัยสำคัญทางสถิติ (p-value <0.001) ส่วนค่าเฉลี่ยอาการหายใจลำบากต่ำกว่าก่อนได้รับโปรแกรมและระหว่างได้รับโปรแกรมในสัปดาห์ที่ 4 อย่างมีนัยสำคัญทางสถิติ (p-value <0.05) ชีพจร ความดันโลหิต อัตราการหายใจ และความอิ่มตัวของออกซิเจนในเลือดต่างดีขึ้น เมื่อเทียบก่อนและหลังการฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิ ที่ 4 และ 8 สัปดาห์ ของการติดตามประเมินผล (p-value <0.001) โดยพบว่าส่วนใหญ่การเปลี่ยนแปลงที่ดีขึ้น พบในระบบหายใจ โดยเฉพาะอัตราการหายใจที่ดีขึ้นและความอิ่มตัวของออกซิเจนในเลือด โดยผลที่ดีขึ้นนี้สามารถแสดงให้เห็นได้เร็วสำหรับอัตราการหายใจที่ดีขึ้น ตั้งแต่การติดตามที่แรกรับพื้นฐาน, 4 สัปดาห์ และยิ่งเห็นชัดเจนที่ 8 สัปดาห์ เมื่อเปรียบเทียบกับค่าพื้นฐานที่จุดเริ่มต้น (ก่อนทำ p-value <0.001, 0.033 และ <0.001 หลังทำฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิ p-value = 0.206, 0.0139 และ <0.001 ตามลำดับ) ส่วนระบบหัวใจและหลอดเลือดพบว่าชีพจรและความดันซิสโตลิกมีแนวโน้มที่ดีขึ้นและมีการปรับตัวดีขึ้นตั้งแต่ 8 สัปดาห์ขึ้นไป และดีขึ้นชัดเจนเมื่อเทียบกับความดันซิสโตลิกพื้นฐานของผู้ป่วย โดยชีพจรมีค่า p-value = 0.206, 0.0139 และ <0.001 ที่พื้นฐาน, 4 สัปดาห์ และ 8 สัปดาห์ ตามลำดับ ชีพจรพบว่ามีแนวโน้มที่จะปรับตัวลดลงหลังทำฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิ (p-value = 0.0004)*

***สรุป:*** *โปรแกรมการฟื้นฟูสมรรถภาพปอดร่วมกับการปฏิบัติสมาธิควรนำไปประยุกต์ในการดูแลผู้ป่วยโรคปอดอุดกั้นเรื้อรัง เพื่อช่วยให้เกิดความตระหนักในการปรับเปลี่ยนการรับรู้สมรรถนะแห่งตน ลดอาการหายใจลำบาก เพิ่มระดับความอิ่มตัวของออกซิเจนในเลือด เพิ่มความสามารถในการออกกำลังกาย และปัจจัยต่าง ๆ ที่เกี่ยวกับการหายใจ การปฏิบัติกิจวัตรประจำวัน และคุณภาพชีวิตของผู้ป่วยให้ดีขึ้น ทั้งนี้เพื่อช่วยลดอาการหายใจเหนื่อยหอบและเพิ่มคุณภาพชีวิตของผู้ป่วยให้ดียิ่งขึ้น*