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# The Effects of Self-Management Program on Exercise Tolerance and Dyspnea in Patients With Chronic Obstructive Pulmonary Disease

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**Background:** Chronic obstructive pulmonary disease (COPD) is a progressive process leading to major clinical problems in patients. There is no highly effective treatment for these patients and therapists only try to relieve the symptoms.
**Objectives:** The present study was performed to investigate the effects of self-management program on exercise tolerance and dyspnea in patients with COPD.
**Patients and Methods:** In this clinical trial, 50 patients with moderate and severe grade COPD who met the inclusion criteria were randomly assigned to control and intervention groups. The control group received usual care and the intervention group received usual care plus a self-management program based on the 5A model. Patients were assessed by six-minute walking test and the Borg scale for exercise tolerance and dyspnea at base line and after 12 weeks. SPSS software version 17, independent t-test, and chi-square test were used for data analysis.
**Results:** There was no significant difference between the groups in exercise tolerance at base line; but, they were significantly different at the end of 12 weeks ($P = 0.007$). In addition, a significant reduction was found in patients' dyspnea in the intervention group, compared with the control group after 12 weeks ($P < 0.0001$).
**Conclusions:** In short term, using the self-management program can lead to increased exercise tolerance and decreased dyspnea in patients with COPD; thus, this program is recommended as an effective way to improve the functional statuses of these patients.

*Keywords:* Pulmonary Disease, Chronic Obstructive; Self Care; Exercise Tolerance; Dyspnea

## 1. Background

Increase of chronic diseases has led to challenges in care systems (1). Chronic obstructive pulmonary disease (COPD) is one of the most chronic illnesses (2). COPD is the fourth cause of death and twelfth cause of disability and has estimated to be the third reasons of disability in 2020 (3). Among people over 40 years old, 10-20% have COPD (4) and 24 million have been estimated to have this disease (5). In Iran, 10% of people have moderate COPD, varying based on society and weather conditions (6). COPD is a complex situation induced by various genetic and environmental factors (7). The diagnostic symptoms of COPD are higher residual capacity function and expiratory air way restriction revealed by pulmonary function test (6). Common symptoms of this disease include dyspnea, lack of energy, xerostomia, coughing, anxiety, and lethargic (8), among which, dyspnea is the most common sign (9). These patients experience low physical energy and for majority of them performing daily activities becomes difficult (10). Therefore, 74% of patients with moderate disease severity have difficulty performing daily activities such as shopping or gaiting with their peers (11). Activity intolerance in these patients is related to complex relationships among disease manifestations, including ventilation disorder, respiratory mechanism disorder, gas exchange limitation, and peripheral muscle weakness. From the patients' overview, dyspnea and weakness are the major causes of limited or decreased activities (10).

Condition severity in these patients is a part of the normal disease cycle and in most of the cases there is no available effective treatment. Hence, the goal of therapists is to relieve the symptoms and increase the functioning level (12). For improvement of health level in patients, in addition to medical treatment, there are multiple implementation such as pulmonary rehabilitation plan, action plan, smoking cessation, and self-management (13). A self-management plan is referred to any constructive patient education plan providing disease control skills, behavior change, and adaptation with the disease (14). In the self-management plan, the patient has the important role and all treatment implementations are patient-centered. Furthermore, the goal of this plan is achieving the maximum level of autonomy, self-decision-making, and

improving the health condition according to abilities and life styles (15). Self-management of chronic diseases is necessary to control and minimize the disease effects on personal health (16). However, researches showed that patients with COPD were not fully aware of disease control and management methods (7) and use of self-management plans increased their awareness (17), self-management knowledge (18), self-efficacy, and physical function (19). In a systematic review, researchers represented that self-management education plan and behavior modification can lead to awareness, skill and self-efficacy increase, and health-related behavior modification in patients with COPD. They offered the use of self-management programs to achieve shorter and simpler behavior modification methods in future (20). Traditional educations had shortage in providing active involvement of patients in disease self-management and researchers have paid little attention to the use of self-management plan in Iran.

## 2. Objectives

This research was designed to investigate the use of short-term structural self-management plan to parallelly increase activity tolerance and decrease dyspnea in patients with COPD.

## 3. Patients and Methods

This study was a randomized clinical trial performed on 50 patients with COPD. The inclusion criteria referred to Ahvaz Apadana Pulmonary Sub-Special Clinic in 2013. The sample size was calculated 30 patients in two groups after the pilot study. Considering the probable dropouts during the study, the sample size increased to 50 patients. The inclusion criteria were proved diagnosis of COPD with moderate or severe level by pulmonologist according to the chronic obstructive lung disease (GOLD) criteria, age range of 45-70 years old, having literacy, lack of major psychological disorder, lack of serious and restrictive diseases such as neural disease, musculoskeletal disease, cancer, and cardiac or angina attack in the last month, and being on a constant medicine regime. The exclusion criteria were hospitalization during the study, patients who required oxygen or spray during the six-minute walking test, and absence of patient in personal or group education sessions (even for one session).

At first, informed consents were obtained from the participants and their demographic information forms were completed. Participants were divided to two groups randomly: control and intervention. Afterwards, to assess the patients' exercise tolerance, a six-minute walking test was performed and according to American Thorax Society guidelines with a researcher supervision (21) and the distance that each patient could walk in a standard condition was measured. The patients' dyspnea was measured by modified Borg scale after the six-minutes walking test. Patients in the control group received the routine care (according to the education pamphlet) and the intervention group has participated in study plan plus to routine care. For the intervention group, self-management plan based of 5A model defined by Glasgow (22) was implemented for 12 weeks in five stages:

1) Assessing awareness, behavior and believes: at first, the patients were assessed regarding their past history of contact with risk factors, duration of contact, recurrence history of symptoms, respiratory problems, use of drugs, sleep status, nutrition status, activity, respiratory assess, respiratory technique, and use of spray.

2) Giving advices about health risk factors and benefits of behavior modification: in this stage, according to the results of the past stage, the abnormal cases were diagnosed and the patients were informed about health risk factors. In addition, the importance and benefits of behavior modifications in prevention of disease recurrence were indicated.

3) Reaching to an agreement on setting the realistic goal: in this step, an agreement was written between the patient and the researcher, considering the patient's function. The accepted behavioral goals were defined and the action plan was designed; the patients were asked to document their function statuses in their notebooks and report them daily for 12 weeks.

4) Assisting and developing the action plan: one two-hour educational session was performed in groups of five patients to increase their knowledge about the disease. In addition, respiratory practice and effective coughing technique were performed face to face and the patients were asked to do this practice daily (before meal) and record their actions in their reporting notebooks. Furthermore, one personal educational session was considered for a week after.

5) Arrangements and follow ups: in this stage, the patients' functions were followed for 12 weeks. During this time, phone calls were performed to remind them of using the action plan. In addition, every four weeks, during a half-an-hour session, the patient's status, the agreed action plan, and the patient's self-reported notebook were followed to apply the necessary changes in goals or action plan.

The first three stages were performed in 1.5-hour personal sessions in one day and the patients were asked to refer one week after to participate in group education sessions.

At the end, all the patients were assessed with a six-minute walking test and Borg Scale. The SPSS version 17 was used for data analysis and statistics methods such as descriptive (frequency, percentage, mean, standard deviation) and analytic methods (independent t-test and chi square test) were performed.

### 3.1. The Research Tools

1) Demographic form
2) Behavior goals form
3) Self-report check list

These forms were designed by the researcher and their content validities were certified by 10 members of the Nursing Faculty of Ahvaz University of Medical Sciences.

4) Borg dyspnea scale

It is a standard numerical scale ranging from zero (lack of dyspnea) to ten (maximum dyspnea). This scale was driven from reference books and its validity and reliability were calculated r = 0.7 and r = 0.78, respectively (23).

5) The six-minute walking test

This is the standard test for evaluating the exercise tolerance, represent by the American Thorax Society (21), and is used for evaluating the physical activity in patients with COPD in most researches (13, 24). Its reliability in patients with COPD has been calculated 0.92 (25).

### 3.2. Ethical Considerations

The initial plan of the study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences with code No. U-92015.

## 4. Results

Among 50 participants, 41 were included in the study (control group: 19, intervention group: 22). The mean ages of patients in the control and intervention groups were 60 and 59.5 years old, respectively. The majority of patients were male (85.4%) and the number of smokers was more than nonsmokers (80.5%) in both groups. The level of education in most of the patients was elementary (75.6%). The average of COPD morbidity duration was 2.8 years. The average of smoking according to the pack-year unit was 26.5 years and most of the patients were not passive smokers (85.4%) (Table 1).

**Table 1.** Demographic Characteristics of Participants [a]

| Variable | Control (n = 19) | Intervention (n = 22) | P Value |
|---|---|---|---|
| **Age, y** | 60.05 ± 5.17 | 59.54 ± 7.43 | 0.815 |
| **Sex** | | | 0.84 |
| Male | 16 (84.2) | 19 (86.4) | |
| Female | 3 (15.8) | 3 (13.6) | |
| **Education** | | | 0.64 |
| Primary | 15 (78.9) | 16 (72.2) | |
| Upper | 4 (21.1) | 6 (27.3) | |
| **Disease severity** | | | 0.64 |
| Moderate | 10 (52.6) | 10 (45.5) | |
| Severe | 9 (47.4) | 12 (54.5) | |
| **Disease duration, y** | 2.56 ± 2.02 | 3.18 ± 2.38 | 0.38 |
| **Tobacco usage** | | | 0.81 |
| Yes | 15 (78.9) | 18 (81.8) | |
| No | 4 (21.1) | 4 (18.2) | |
| **Rate of tobacco usage** | 26.6 ± 14.2 | 26.4 ± 15.9 | 0.96 |
| **Tobacco usage in family** | | | 0.489 |
| Yes | 2 (10.5) | 4 (18.2) | |
| No | 17 (89.5) | 18 (81.8) | |

[a] Data are presented as mean ± SD or No. (%).

There was no statically significant difference between the two groups considering exercise tolerance; but, they were significantly different after 12 weeks (P = 0.007). In addition, there was a statically significant decrease in dyspnea score average of the intervention group compared with the control group after 12 weeks (P = 0.0001), while there was no significant difference between the two groups at the beginning of the study (Table 2).

## 5. Discussion

Despite performing multiple studies, the use of self-management plans have attracted few attentions in Iran. Therefore, in this study, the researchers assessed the effects of self-management plan on exercise tolerance and dyspnea level in patients with COPD. The average of patients' age was 59.7 years. In Kheirabadi et al. study, the average of patients' age was 56.4 years (26), while in Rice's study, it was 70.7 and 69.1 years for control and intervention groups, respectively (27). In this study, the range of patients' age was defined 45-70 years; in Kheirabadi et al. study, age range of 40-60 years was the inclusion criteria (26); but in Rice study (27), there was no age limitation. The relationship between pulmonary function and severity of smoking (level and duration) can represent the prevalence, increasing with age. The majority of participants were male in both groups. In Rice's study (27), 98.4% of patients in the control group and 97.6% in the intervention group were male. In Bischoff et al. study (28), 51% of patients in the control group and 67% in both groups (self-management and regular treatment) were male. The high prevalence of COPD in males is related to prevalence of cigarette smoking among them.

The severity of disease was moderate in 48.8% and severe in 52.2% of patients. In this study, the inclusion criteria included moderate to severe COPD, which was similar to

**Table 2.** Comparison of Exercise Tolerance and Dyspnea Means of Control and Intervention Groups Between the Baseline and After-12-Week points [a]

| | Control | Intervention | P Value |
|---|---|---|---|
| **Exercise tolerance** | | | |
| **Baseline** | 391.9 ± 61.9 | 407.4 ± 54.83 | 0.403 |
| **After 12 weeks** | 390.42 ± 62.58 | 442.99 ± 54.75 | 0.007 |
| **Differences between baseline and after-12-week points** | 1.5 ± 5.2 | -35.5 ± 20.9 | 0.0001 |
| **Dyspnea** | | | |
| **Baseline** | 4.63 ± 1.3 | 5.04 ± 1.43 | 0.341 |
| **After 12 weeks** | 5.1 ± 1.1 | 3.5 ± 1.5 | 0.0001 |
| **Differences between baseline and after-12-week points** | -0.4 ± 1.3 | 1.5 ± 1.3 | 0.0001 |

[a] Data are presented as mean ± SD.

findings of the Jiang and He (29) and Bucknall (30). Rice et al. (27) assessed patients with severe COPD only; but Efraimsson (17) study was performed on cases with slight to severe COPD. Patients with slight COPD usually do not present significant signs of the disease; thus, they refer to doctor in progressed stages of the disease, in which there is no diagnosis for the disease in minor cases and the majority of patients are in moderate to severe stages of the disease. On the other hand, the majority of patients in the severe disease stage need oxygen therapy or sprays during the six-minute walking test, which was the exclusion criterion in this study. Therefore, in the present study, patients with moderate to severe COPD were assessed. The mean of disease morbidity was 2.8 years; in Jiang and He study (29), it was reported 1.23 and 1.17 years in control and intervention groups, respectively (29). In Kheirabadi et al. study (26), the disease duration was reported 7.9 and 8.9 years in control and case groups, respectively. The reason for low disease duration in Jiang and He study (29) was the inclusion criteria (disease duration < 2 years); but in this study and Kheirabadi et al. study (26), there was no duration limitation for participants. Probably, delayed doctor visit and thereby late disease diagnosis were the reasons for the low disease duration.

Comparing the exercise tolerance in the two groups, there was no significant relationship in the onset of study; but at the end of 12 weeks, this difference was significant (P = 0.007) and the exercise tolerance had increased from 407.4 to 442.9 meters. In addition, comparing the mean of changes (before and after the study), there was significant difference (P = 0.0001). Nguyen's study represented significant difference in activity tolerance (six-minute walking test) among three group (P = 0.001) (19). Lomundal's study showed that there was no significant difference between exercise tolerance before and after the study in the group receiving self-management plan only; but in the group receiving self-management and rehabilitation plans together, the difference was significant (13). In Lomundal's study, the participants were not randomly divided to two groups; thus, for comparing the groups regarding the mean of self-management effectiveness, there was no control group. While in Nguyen's and this study, random division of participant and use of control group were important points and performing respiratory exercise in patients' action plans in the intervention group was the advantage of our study.

Comparing dyspnea in patients of the two groups, there was no significant difference (P = 0.341) in the beginning, but significant difference was observed after 12 weeks (P < 0.0001). Wood-Baker represented that use of self-management plans did not lead to significant difference in the case group dyspnea level (31); but, Nguyen et al. showed that the dyspnea level significantly decreased after 12 weeks (P = 0.001) as well as three month later in the self-management group compared with the onset of the study, which was in agreement with our findings. However, Nguyen reported no significant difference in dyspnea level among the three groups at the end of the study (P > 0.05) (19). Probably these different findings referred to long duration of follow ups in Nguyen's study against time limitation of our study for follow ups, or variation in self-management methods. This study showed that use of contractual self-management plan can led to activity tolerance increase and dyspnea level decrease in patients with COPD. Therefore, patients' active participations in this plan can lead to control of symptoms as well as increasing the patients' self-efficacy and autonomy.

The research limitation was patients' problems in their lives which could influence their functions towards the defined goals and action plan. However, the phone contacts by researcher resolved this problem partially. The research findings showed that use of self-management led to activity increase and dyspnea decrease in patients with COPD. Since performing the self-management plan according to 5A model was a simple and cost-effective method, it can be used for improvement of patients with COPD. Considering the variety of self-management methods, we suggest performing other self-management methods for COPD and other disease, comparing their results together, and assessing the effects of these plans on patients' self-efficacy and autonomy.

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