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Effect of Whole Body Exercise Program in Chronic Obstructive Pulmonary Disease Patients

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Abstract:

This study was developed to investigate the influence of whole body exercise program in the level of force expiratory volume at the first second and shortness of breath in patients with COPD.
Design: A prospective, cross-sectional study.
Setting: Morjan Hospital.
Patients: Sixteen patients with COPD were estimated.
Measurements and results: Force expiratory volume at the first second (FEV1) and shortness breath were measured, there is a difference not significant between the two tests pre and post in measuring FEV1, whereas the value of calculated T is (2.3). The level of shortness of breath (Borg Scale) shows that the difference is not significant between the two tests pre and post as the value of calculated T (1.91) which is smaller than the value of tabular T (2.57). A significant difference between pre and post tests in the ratio of FEV1 measured in terms of the value of the calculated T (2.91) which is greater than the value of tabular T, the level of shortness of breath shows significant difference between the two tests pre and post as the value of calculated T (3.6) which is greater than the value of tabular T (2.57), this means that the rehabilitation program had an impact on the proportion of FEV1 and the level of shortness of breath in patients with COPD for the experimental group.
Conclusions: The results of this study showed the importance of the whole body exercise program to improve FEV1 and shortness of breath in COPD patients.

Key words: respiratory rehabilitation program; chronic obstructive pulmonary disease.

1. Introduction:

The numerous studies and recent researches in the field of pulmonary rehabilitation are interested in functional, physiological, chemical, and biological aspects because of their importance in improving the functioning of the respiratory system by improving the functional efficiency of the various body systems in accordance to the specific requirements of each type of the disease, for example

(COPD, asthma, chronic bronchitis, swelling of the alveoli), respiratory system is affected by some of effects, including nicotine (smoking). Tobacco smoking is the main aetiological factor for the development of COPD (Fletcher and Peto, 1977). Cigarette smoking is estimated in western societies to account for around 85% of the risk of developing COPD. Moreover, the progressive deterioration in airways obstruction as measured by the rate of decline in the forced expiratory volume in one second (FEV1), relates directly to the amount of tobacco smoked and years that tobacco has been smoked (Fletcher and Peto, 1977). Similarly, Eagan et al. (2004) reported that the risks of dyspnoea, cough, wheezing and mucous production are increased by active cigarette smoking and that these features are directly related to the amount of cigarettes smoked.

The rehabilitation programs for accessory muscles and muscles of the rib cage and stop smoking consider important factors for the treatment of patients with COPD, the rehabilitation programs using depend mainly on the management of examination of scientific and objective evaluation for patients with chronic COPD to oncoming to the optimal function and health that related quality of life for individuals who suffer from weakness and disability due to chronic respiratory disease, pulmonary rehabilitation is also an important factor to guide patients of COPD systematically to use all available treatment options while using the drug or by using training programs.

In order to achieve the desired goal of rehabilitation programs for individuals with COPD must focus on the requirements that result in successful achievement and that occurs by a variety of rehabilitation programs that commensurate with the status of each individual, as well as the comprehensiveness and flexibility range of these programs for performance by patients. The improvement in stress bearing after rehabilitation programs usually contributes to the improved status of the respiratory muscle and improves the mechanical efficiency and adapt that is useful to the breathing pattern, along with the ability of oxidative stress and lack of pulmonary inflation for the patient (Reid., 1995).

To date, The numerous studies have no examined the effect of whole body exercise program in patients with COPD on FEV1 and shortness of breath, as well as increase the number of patients attending private clinics and specialized hospitals in the treatment of COPD, also, most of doctors interested in medication without advised patients following rehabilitation programs especially in Iraq. So the researchers consider all these problems the main reason to study the effect of whole body exercise program in the level of force expiratory volume at the first second and shortness of breath in patients with COPD. Our objective is to understand the influence of the whole body exercise program in FEV1 and shortness of breath in patients with COPD between pre and post efforts. Therefore, the hypothesis of this study was that whole body exercise program may affect FEV1 and shortness of breath in COPD patients and to test our hypothesis, we investigated the effect of whole body exercise program in FEV1 and shortness of breath.

In conclusion, the importance of current research is in the use of whole body exercise and to identify the effect of this exercise in the level of shortness of breath in patients with COPD.

2. Methodology

Researchers used the experimental approach because it relevancies of the nature of the study.

2.1 Participant

The number of participants required for this study was calculated to be (20) based on the prevalence of low to moderate COPD in Babylon-Iraq, 4 patients were excluded due to participating in pilot study. So the number of study sample is 16 patients randomized into two groups, controlling trail and experimental trail. Each group consists of 8 patients table (1) shows the sample specifications.

Table (1) shows the sample specifications

Variables	Mean	standard deviation
Age / year	45	0.71
Weight / kg	67.62	0.69
Length / cm	170.37	1.10
The amount of smoking	2 baguettes 0.2	0.2
How long smoking	5 years smoker	0.7
FEV1% predicted	65	2.3
Shortness of breath	level 5	1.2

2.2 Experimental approach

The researchers have prepared a rehabilitation program for two months and used the special exercises which contribute to reduce shortness of breath and increase the strength of the respiratory muscles of patients as well as improve whole body muscles that are suitable for their age. Moreover, researchers used load, volume and rest periods fit to the sample in order to get good results, and you can see Appendix (1) which demonstrations the training unit for one day and the researchers used low intensity interval training method in this unit.

2.3 Measurements

2.3.1 Measurement of FEV1

Spirometer was performed giving to American Thoracic Society (ATS) standards (American Thoracic Society., 1987) with reference values previously obtained from healthy members of our group (Enright et al., 1993). The smoking status of each contributor at each examination was categorized as never-smoker. Rejections from the 12MWT included the following: regular use of an ambulatory aid (walker); inability to walk due to musculoskeletal problems; chest pain in the previous 2 weeks; a heart attack or heart surgery in the previous 4 months; heart rate _ 55 beats/min at rest (unless a physician or nurse determined that an AV block or conduction problem was not the cause of the bradycardia); heart rate _ 110 beats/min at rest; acute ST-T wave changes on the ECG; participant refusal; or judgment of the clinic staff that the contributor would probably not be able to complete the walk without harm (technician discretion). These exclusions were probably conservative (excluding many participants who would have eagerly and safely performed the test) because physicians could not be present in the clinics during all of the examinations to evaluate and treat symptomatic participants.

2.3.2 Measurement of level of dyspnea

Borg scale is a system for scoring the perception of dyspnea, consisting of a linear scale ranking the degree of difficulty in breathing, ranging from none–0 to maximum–10.

2.3.3 6-minute walking test

The 6MWT was conducted according to a standardized protocol (Butland et al., 1983), using an internal hallway with the 200-foot distance marked by colored tape on the floor. Participants were told that "the purpose of this test is to see how far you can walk in 6 minutes." They were then instructed to "walk from end to end of the hallway at your own pace, in order to cover as much ground as possible." Each minute, technicians encouraged the participants with the standardized statements "You're doing well" or "Keep up the good work," but were asked not to use other phrases. Participants were allowed to stop and rest during the test, but were instructed to resume walking as soon as they were able to do so. The technician used a mechanical lap counter to count the number of laps completed, and an electronic timer with a buzzer that sounded 6 min after the walk started. Before the walk started and at the end of the 6-min walk, participants were shown a modified Borg dyspnea scale printed on a card and asked to "indicate your current degree of shortness of breath" on a scale of "0 _ nothing at all" to "10 _ very, very severe." At the end of the walk, they were asked if they had experienced any of the following specific symptoms: dyspnea.

2.4 Statistical analysis

Researchers used the mean, standard deviation, and T test for correlated samples.

3. Results and discussion

Table (2) shows there is a difference not significant between the two tests pre and post at the error rate (5%) and the degree of freedom (5) in measuring FEV1, whereas the value of calculated T is (2.3) which is smaller than the value of T tabular and this means there is no improvement in the proportion of FEV1 for the control group.

The level of shortness of breath (Borg Scale) shows from the table that the difference is not significant at error rate (5%) and the degree of freedom (5) between the two tests pre and post as the value of calculated T (1.91) which is smaller than the value of tabular T (2.57), This means that there has been no improvement in the level of shortness of breath for the control group.

The researchers attribute these findings to the control group, the lack of participation in the rehabilitation program, which was prepared by the researchers and the meager improvement that happened as a result medication treatment, as well as the researchers believe that the few percentages of FEV1 and the high level of shortness of breath due to the damage of airway and lungs, also the inability of the patient to inhale amounts adequate oxygen to help him in the gas exchange that occurs within the body and thus the patient suffers from COPD, this findings was confirmed by Lancet (1989) that the narrow airway as a result of walls damage is one of the COPD reasons.

Table (2)
Shows means, standard deviations, T test, and the level of significance of the before and after tests for control group.

Tests / Variables	Pre		Post		T test	Significance
	S	A	S	A		
FEV1	65	2.3	67	1.6	2.3	No
Breath of Shortness	5	1.2	5.5	0.95	1.91	No

Tabular T value: 2.57 at the level of significance (5%) and the degree of freedom (5).

Whereas table (3) shows that a significant difference between pre and post tests at the error rate (5%) and the degree of freedom (5) in the ratio of FEV1 measured in terms of the value of the calculated T (2.91) which is greater than the value of tabular T.

The level of shortness of breath shows from the table that the difference significant at error rate (5%) and the degree of freedom (5) between the two tests pre and post as the value of calculated T (3.6) which is greater than the value of tabular T (2.57), this means that the whole body exercise program had an impact on the proportion of FEV1 and the level of shortness breath in patients with COPD for the experimental group, Bannister (1972) has confirmed that rehabilitation program which includes regularly exercises for upper and lower muscles is an important component in the management of COPD, also he confirmed that people who suffer from COPD and healthy people need to regular sport activities to improve the level of health (Bannister, 1972).

The Cochrane, *et al*., (1990) shows that the rehabilitation programs have a clear impact on a tight airways through expanded as a result of increased amounts of oxygen entering and also pointed out that the importance of sports rehabilitation in improving the functioning of the lungs. The researchers believe that the whole body exercise program is impacted in patients with COPD and the researchers felt that the participants had felt better due to rehabilitation program, so they rushed toward the regular sports training strongly and that's what researchers look for in the field of Physical Education and Health Sciences.

Table (3)
Shows means, standard deviations, T test, and the level of significance of the before and after tests for experimental group.

Tests / Variables	Pre		Post		T test	Significance
	S	A	S	A		
FEV1	64	1.7	67	3.1	2.91	S
Breath of Shortness	5	1.2	7	2.6	3.6	S

Tabular T value: 2.57 at the level of significance (5%) and the degree of freedom (5).

4. **Conclusions**

The researchers found that whole body exercise program effect on the level of FEV1 and the level of shortness of breath in COPD patients in the experimental group, and found there was a very slight improvement for the control group because of medication treatment but it was inadequate to reach full recovery, also the researchers concluded that patients had the desire to continue with rehabilitation program because of what they get it from rehabilitation program which was prepared by the researchers.

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Appendix A The formation of training loading by using low interval training intensity.

The program must be applied in intensity 50-60% for a period of 2 months and once a day and can be seen on Friday of each week rest. Note that the intensity is measured for each exercise, and in many ways, the use of a spirometer to measure the amount of inhaled air and the amount of exhaled air, as well as using a special questionnaire to determine the effect of exercise on shortness of breath when implementation, as well as by the extent of the movement of the body during the execution of the exercise.

1- The main part: will include exercises that improve whole body muscles and duration of the program 34.20 minutes and twenty seconds, as shown in the table below and the training was achieved in the morning.

N	Exercise name	Intensity	Repetition	Groups	Rest		the total exercise time	Nots
					Between repetition	Between group		
1	Stretching the muscles of the chest wall	50%	10	3	1m	2m	6m	
2	Opening the chest	60%	6	3	1.5m	2m	5.30m	
3	Sniffles	50%	10	3	1m	2m	6m	
4	Elbow circles	60%	6	3	1.5m	2m	5.30m	
5	Leg rising (right and left)	50%	10	3	1m	2m	6m	
6	Leg extension	55%	8	3	1.20m	2m	5.60m	