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The Effects of Inhaler Training on Self-Efficacy in Chronic Obstructive Pulmonary Disease Patients

Kronik Obstrüktif Akciğer Hastalarına Verilen İnhaler Eğitiminin Öz-Etkililiğe Etkisi

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ABSTRACT

Objective: This study investigated the effects of 3 different inhaler use training methods on the self-efficacy of chronic obstructive pulmonary disease patients.

Methods: Between December 2017 and November 2018, a quasi-experimental study with a pretest and posttest was conducted with 120 patients in a public hospital. The patients were divided into 3 groups according to their training methods. Data were collected using a patient information form, an inhaler use checklist, and the Chronic Obstructive Pulmonary Disease Self-Efficacy Scale. The first group was trained using the show and perform method, the second group watched videos on inhaler use, and the third group was trained using a sample training material. After each training session, the participants were observed using inhalers to evaluate their performance.

Results: The differences between the mean pretest and posttest Chronic Obstructive Pulmonary Disease Self-Efficacy Scale total scores and subscale scores of the groups were statistically significant ($P < .05$). In terms of the types of inhalers, the users of pressurized metered-dose inhalers had the lowest mean scores (group 1: 5.8 ± 1.6, group 2: 5.1 ± 1.1, group 3: 5.0 ± 1.1). There was a significant increase in the use of the pressurized metered-dose inhaler, Aerolizer, HandiHaler, and Diskus ($P < .05$).

Conclusion: Inhalation training given to chronic obstructive pulmonary disease patients using 3 different methods increased their self-efficacy, but there was no significant difference between the training groups.

Keywords: COPD, inhalers, self-efficacy

ÖZ

Amaç: Bu çalışmada, KOAH hastalarına üç farklı yolla verilen inhaler eğitiminin öz-etkililiğe etkisi araştırıldı.

Yöntemler: Çalışma Aralık 2017-Kasım 2018 tarihleri arasında bir devlet hastanesinden 120 hasta ile ön test son test düzeninde yarı deneysel olarak yürütüldü. Hastalar eğitim yöntemlerine göre üç gruba ayrıldı. Veriler hasta tanıtım formu, inhaler kullanım kontrol listesi ve KOAH öz-etkililik ölçeği ile toplandı. Birinci gruba gösterip yaptırma, ikinci gruba video izletilmesi ve üçüncü gruba örnek eğitim materyali ile eğitim verildi. Her eğitim seansı sonrasında katılımcıların inhaler kullanımı gözlendi.

Bulgular: Eğitim öncesi ve sonrası gruplar arası KOAH Öz-etkililik ölçek toplam ve alt boyutları ortalamaları karşılaştırıldığında her üç grupta da eğitim sonrası öz-etkililik toplam puanı ve alt boyut ortalamasındaki artışın istatistiksel olarak anlamlı olduğu saptanmıştır ($P < ,05$). Eğitim öncesi ve sonrası inhaler puan ortalamalarına bakıldığında en düşük puan ortalamasının ölçülü doz inhaler kullanıcılarına ait olduğu bulunmuştur (1.grup: 5,8 ± 1,6, 2.grup: 5,1 ± 1,1, 3.grup: 5,0 ± 1,1) Eğitim sonrasında ölçülü doz inhaler, aerolizer, handihaler ve discus kullanım basamaklarında anlamlı artış olmuştur ($P < ,05$).

Sonuç: KOAH' lı bireylere üç farklı yolla verilen inhaler eğitiminin öz-etkililik ortalamalarını arttırdığı ancak eğitim yolları arasında fark olmadığı saptanmıştır.

Anahtar Kelimeler: KOAH, inhaler, öz-etkililik

The summary of this study was presented as an oral presentation at the 2nd International Internal Medicine Nursing. It was accepted as a master's thesis in the Department of Nursing in 2018.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common and treatable disease characterized by respiratory symptoms and airflow restriction caused by significant exposure to noxious particles or gases. Chronic obstructive pulmonary disease is a disease with high mortality and morbidity rates globally.[1] In Turkey, 35 331 people died from respiratory diseases.[2]

Bronchodilators are the first option for the treatment of COPD, and the use of inhalers is the most common bronchodilator therapy for COPD patients. Inhalers deliver medication directly to the lungs.[3,4] Pressurized metered-dose inhalers (pMDIs), dry powder inhalers, and nebulizers are widely used for the treatment of COPD.[3] However, the pMDI is the most common inhaler.[4] Many patients, especially elderly ones, use inhalers incorrectly, mostly because there are different types of inhalers with different steps and ways of drug delivery that require critical skills.[5,6]

Research has shown that a large number of patients misuse inhalers.[3,4,7,8] Common errors in inhaler use are not breathing out before inhaling, not inhaling at the right speed, and not holding the breath for a certain period after inhaling.[4,9-11] The incorrect use of inhalers might result in the deposition of the medication in the oropharynx, overdose, unresponsiveness to treatment, an increase in symptoms and complications, increased mortality and morbidity rates.[5,7,9] The incorrect use of inhalers also leads to an increase in the frequency of attacks and overcrowding in emergency departments and hospitals, resulting in a rise in healthcare costs.[3] Errors in inhaler use may be reduced by different training methods which take individual differences into account (age, sex, learning speed, education level). According to Edgar Dale's Cone of Experience, people learn 83% of what they see, 11% of what they hear, 3.5% of what they smell, 1.5% of what they touch, and 1% of what they taste.[12,13]

In the general sense, self-efficacy is the individual's self-belief and self-perception.[14] Self-efficacy is one of the perception factors that are effective in the individual's behaviors. Nurses' possession of knowledge related to self-efficacy is important in guiding these perception factors in the positive or negative direction, especially in creating positive behaviors.[15] The COPD-specific symptoms reduce the physical activities of patients, reducing their quality of life, self-belief, and exhaustion. Therefore, the self-efficacy of these patients decreases.[16-18] Individuals with high self-efficacy learn more easily.[14] In this sense, the correct use of inhalers will reduce patients' dyspnea, increase their self-sufficiency, the effectiveness of the treatment, and thus self-efficacy.[19]

The literature review conducted in this study revealed no studies in Turkey in which the effects of inhaler training on self-efficacy were examined in COPD patients. In the international literature, studies were found about self-management interventions in inhaler training and self-efficacy in COPD.[20,21]

Aim

This study was conducted as a quasi-experimental study with a pretest and posttest design to examine the effects of inhaler training provided with 3 different methods on the self-efficacy of COPD patients.

Hypotheses

H0: Inhaler training provided with the *show and perform*, *video*, and *sample training material* methods does not have any effect on the self-efficacy of COPD patients.

H1: Inhaler training given to COPD patients with the *show and perform*, *video*, and *sample training material* methods affects patients' self-efficacy.

METHODS

Design

The study was conducted in a quasi-experimental type because the patients were hospitalized for a short time, it was easier to apply, and blinding and randomization were not appropriate. The quasi-experimental research design is easy to implement, inexpensive, and provides effectiveness in a short time.[22,23] This study was conducted with a quasi-experimental design, a pretest and a posttest in a public hospital's Chest Diseases clinic between December 2017 and November 2018.

Population and Dataset

Considering the 35% difference in the study, the total number of samples to be included in the study was determined as 55 as a result of the power analysis performed with an error level of 0.05 and a power of 80%.[9] Considering the possibility of increasing the effect size and the possibility of loss, 40 people were included in each group and the research was completed with a total of 120 people. A total of 139 patients were reached, and 120 patients who met the criteria constituted the sample of the study (response rate 86.33%).

Patients who were older than 18 years of age, had no communication problems and had no psychiatric disease, had COPD, had used an inhaler for at least 6 months, and agreed to voluntarily participate in the study were included. Asthma patients using inhalers were excluded from the study.

Data Collection Tools

A patient information form, an inhaler use checklist, and the COPD Self-Efficacy Scale were used face-to-face to collect the data.

Patient Information Form

The form consisted of 19 questions to learn about the sociodemographic characteristics of the patients, their use of inhalers, and their educational status.

Inhaler Use Checklist

The checklist included the steps of using a pMDI, Aerolizer, Diskus, and HandiHaler. For each drug use, 10 steps were created based on the literature.[4,9,10,24] The patients were asked to use the inhaler device, and the charts were filled by observation. Correctly performed steps were marked as "Yes," while incomplete, incorrect, or not performed steps were marked as "No."

Chronic Obstructive Pulmonary Disease Self-Efficacy Scale

It consists of 34 items and 5 subscales that determine the ability of COPD patients to cope with respiratory distress during their general activities. A validity and reliability study of the scale was conducted in Turkey by Kara and Mirici[14] , who found the test–retest reliability of the scale as r = 0.89 and its internal consistency as 0.94 in 100 COPD patients. The items that make up the scale start with "How confident are you in this situation to manage or prevent shortness of breath." The Likert-type scale is scored between very safe = 5 and unsafe = 1. Higher scores indicate a higher degree of safety in managing or avoiding breathing difficulties.[14] The Cronbach's alpha coefficient of the current study was found to be 0.82.

The patients were divided into 3 groups according to their training methods. Homogeneity was achieved by matching groups for age, sex, and inhaler types.

The distribution of the patients into the groups is shown in Figure 1. For the content of the training, the purpose and usage steps of the inhalers used by the patients were determined.

Data Collection

The first group was given training by showing the stages of use of the inhaler with a placebo inhaler and then having the patient perform the steps. The second group was given training by having them watch a video showing the stages of use of the inhaler taken by the researcher. The third group was trained with a colored material showing the steps of using the inhaler, which we call the Sample Training Material consisting of a single page. Training was continued until the patient was able to perform the inhaler usage steps completely correctly (in an average of 15 minutes for each patient).

To avoid differences based on the implementer's style between the groups, the training sessions were provided by the same researcher for all 3 groups. The difference between groups in education levels did not affect self-efficacy and inhaler use.

At the end of the study, a training booklet including information on the stages of COPD, COPD symptoms, and inhaler use was given to the patients to utilize after their involvement in the study. Expert opinion was obtained from 4 internal medicine nursing specialists for the Inhaler Use Checklist, inhaler training video, sample training material, and booklet used in the study.

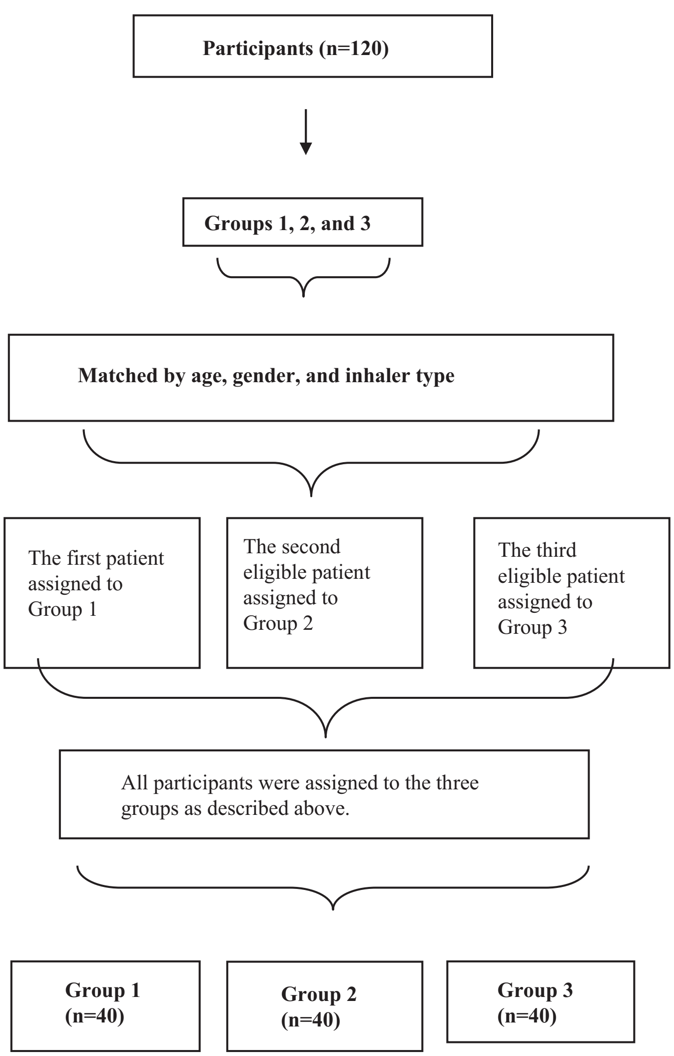

Figure 1. Sample grouping.

Nursing Intervention

The meeting day was considered the first day of work. After obtaining verbal and written consent, the Patient Information Form, Inhaler Use Checklist, and COPD Self-Efficacy Scale were applied.

After applying the forms as the pretest, inhaler training was provided to the patients. The training continued on the third and fifth days. On the sixth day, after the training, the Inhaler Use Checklist and COPD Self-Efficacy scale were applied again as the posttest, and the study was completed. The flow chart of the study is given in Figure 2.

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences 20.0 (IBM SPSS Corp., Armonk, NY, USA) program. All data in the study are presented as descriptive statistics including the mean, standard deviation, frequency, and percentage. Chi-squared test was used for comparisons between the categorical (e.g., sex, level of education) data of the participants in the groups. Kolmogorov–Smirnov test was conducted to test the normality of the distribution of the data, paired samples *t*-test was used for 2 variables that were normally distributed, and one-way analysis of variance was used for more than 2 variables, while the Kruskal–Wallis test was used for more than 2 variables that were not normally distributed. Additionally, Wilcoxon test was used to find the source of the difference between the 2 percentages. In evaluating the critical steps for drug inhalation, the pMDI established 5 common steps regarding the preparation of Aerosolizers, Diskus, HandiHalers, and inhaler use. The evaluation was made through these steps.[6-9,11,25]

Ethical Aspect of the Study

Ethics committee approval, dated 28 June 2017 and numbered 80576354-050-99/135, was obtained from Kafkas University Faculty of Medicine before the study. Written permission was obtained from the hospital where the study was conducted. All patients were informed about the purpose of the study, and their written informed consent was obtained prior to the study.

RESULTS

The mean age of the participants was 66.35 ± 9.4 years, and the mean duration of their disease was 112.1 ± 99.7 months. It was observed that 47.5% of the participants were man, 56.7% were literate without further education degrees, 77% lived in villages, 59.2% had a moderate economic status, and 50.8% had never smoked (Table 1). Regarding the inhaler use status of the participants, it was found that 35% used pMDIs, and 91.7% had received inhaler training previously (Table 1).

When the pre-training and post-training pMDI usage steps were compared, a statistically significant increase was found in the steps of shaking the inhaler tube before use ($P < 0.001$), breathing out before inhalation ($P < 0.001$), inhaling the drug correctly ($P = .014$), and breathing out after drug inhalation ($P < 0.001$).

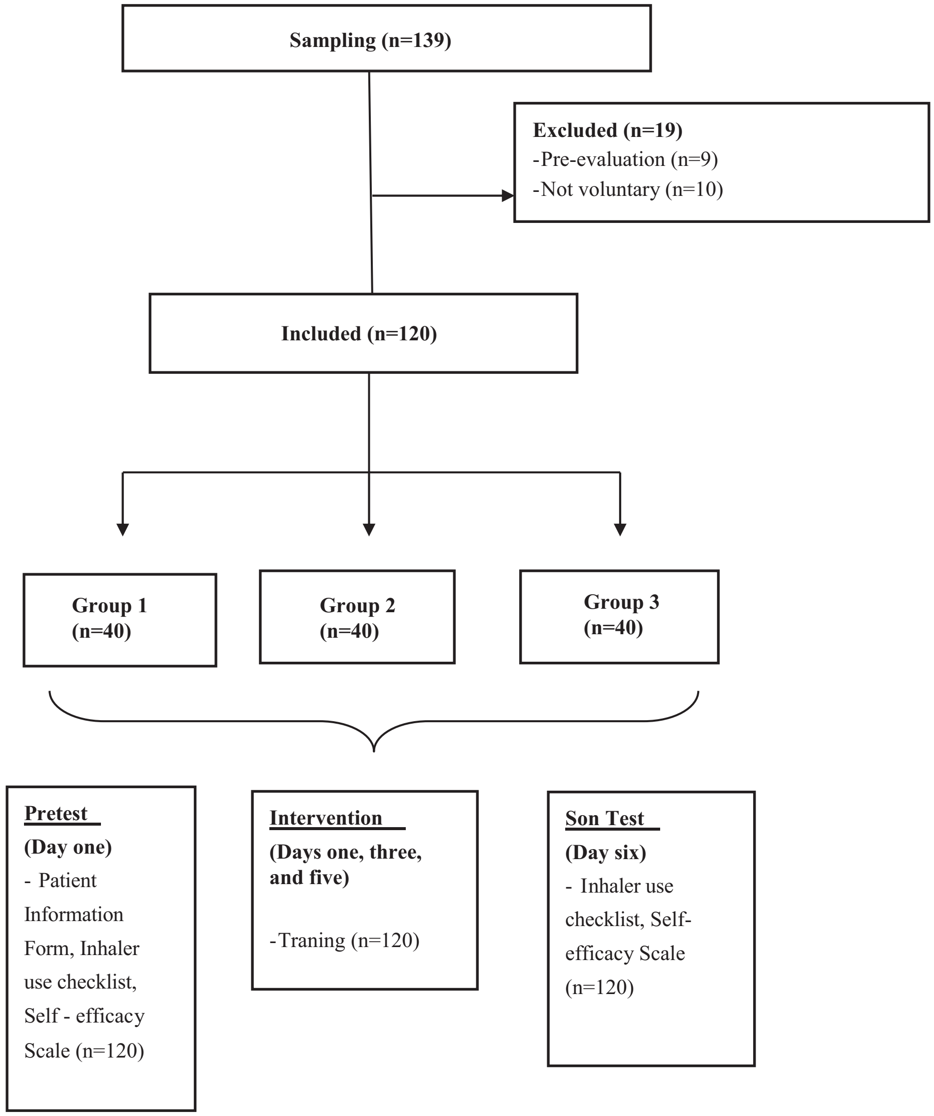

Figure 2. Flowchart.

The COPD-related self-efficacy scores of the patients before and after the training were compared. It was observed that the self-efficacy scores of the participants increased significantly after the training in all three groups ($P < .05$). However, no difference was found between the 3 training groups ($P > .05$) (Table 2).

DISCUSSION

While COPD patients struggle with the negative symptoms caused by the disease, their self-efficacy decreases. In this sense, it may also be difficult for patients to properly take their drugs, which are used to combat their symptoms. It is believed that education given to COPD patients may increase self-efficacy in this regard, and by enabling the patient to use their inhaler appropriately, the patient will be able to cope with their symptoms.

In our study, the pre-training mean COPD Self-Efficacy Scale score of the patients was 2.14 ± 0.3. This mean score increased to 2.83 ± 0.3 after the training. In a study in which the self-efficacy levels of individuals with different chronic diseases (COPD, diabetes mellitus, arthritis, chronic heart failure, chronic renal failure) were compared, Ceyhan and Unsal[26] found that the self-efficacy perceptions of the individuals with a chronic disease, especially COPD, were low. In the same study, it was found that the COPD patients had the lowest mean self-efficacy score, while the arthritis patients had the highest mean self-efficacy score. In this sense, the low self-efficacy of COPD patients identified in Ceyhan's study was similar to the results of our study.

When Abedi et al[27] compared the pre-intervention and post-intervention scores of patients in a quasi-experimental study in which the effects of a self-efficacy improvement program in COPD on self-care behaviors were examined, the difference in the self-efficacy scores of the intervention group was found significant.

In a study conducted by Bourbeau et al[21] which included self-management training with inhaler use technique, treatment compliance, COPD knowledge, drug use training, and attack management with a case manager for a year, a decrease was found in the frequencies of hospital admission, hospitalization and antibiotic (except oral corticosteroids) use rates, while an increase was found in self-management skills, treatment compliance, and rates of correct inhaler use. In a randomized controlled study by Poureslami et al[20] on the effects of training provided

Table 1. Participants' Sociodemographic Characteristics, Inhaler Form, and Inhaler Training Status

Characteristics	G 1 (n = 40) n (%)	G 2 (n = 40) n (%)	G 3 (n = 40) n (%)	Total (n = 120) n (%)	Significance	
Gender						
Woman	19 (47.5)	19 (47.5)	19 (47.5)	57 (47.5)	0.00	1.0
Man	21 (52.5)	21 (52.5)	21 (52.5)	63 (52.5)		
Education level						
Literate	12 (30.0)	16 (40)	0	68 (56.7)	**	-
Illiterate	28 (70)	24 (60)	40 (100)	52 (43.3)		
Place of residence						
City	10 (25)	11 (27.5)	16 (40)	37 (30.8)	3.95***	.41
District	2 (5)	1 (2.5)	3 (7.5)	6 (5.0)		
Village	28 (70)	28 (70)	21 (52.5)	77 (64.2)		
Economic status						
Good	11 (27.5)	5 (12.5)	10 (25)	26 (21.7)	4.23***	.37
Neither good nor bad	24 (60)	25 (62.5)	22 (55)	71 (59.2)		
Bad	5 (12.5)	10 (25)	8 (20)	23 (19.2)		
Smoking						
Yes	1 (2.5)	5 (12.5)	2 (5)	8 (6.7)	4.73***	.31
Quit	15 (37.5)	17 (42.5)	19 (47.5)	51 (42.5)		
Never	24 (60)	18 (45)	19 (47.5)	61 (50.8)		
Type of inhaler used						
pMDI	14 (35)	14 (35)	14 (35)	42 (35)	0.00***	1.0
Aerolizer	10 (25)	10 (25)	10 (25)	30 (25)		
Diskus	8 (20)	8 (20)	8 (20)	24 (20)		
HandiHaler	8 (20)	8 (20)	8 (20)	24 (20)		
Inhaler training						
Yes	35 (87.5)	38 (95)	37 (92.5)	110 (91.7)	1.53***	.47
No	5 (12.5)	2 (5)	3 (7.5)	10 (8.3)		
Age ($\bar{x} \pm$ SD)	67.13 ± 10.29	66.40 ± 9.78	65.59 ± 8.12	66.35 ± 9.4	0.29*	.75
Duration of disease (months)						
Median	119.71	110.65	106.00	112.12	0.29****	.86
25-75.percentiles	36-180	39-175	36-138	36-175		

G 1, show and perform; G 2, video; G 3, sample material training method; $\bar{x} \pm$ SD, mean ± standard deviation.
*One-way analysis of variance.
**No statistical analysis.
***Chi-square.
****Kruskal–Wallis.

with visual and auditory materials on self-management, in comparison to the control group, a post-training improvement was found in inhaler use technique, and an increase was found in the ability to understand pulmonary rehabilitation in the intervention group.

In their study evaluating the effects of nursing care provided to COPD patients according to the self-care model on self-efficacy, Özkaptan and Kapacu[19] found a significant increase in the last visit general score and mood and physical effort sub-group scores. In a case study conducted by Kaşikçi[28] with a COPD patient every 12 months with a structured training program, a statistically significant difference of 0.7 points was found between the general scores of the patient before and after the training. The results of our study were in parallel with these studies in terms of the increase we identified in the post-training scores of the patients.

In a randomized controlled study by Topçu and Oğuz[29] in which self-efficacy and quality of life were evaluated in stroke patients, both the self-efficacy and quality of life levels of the patients in the experimental group were found to be higher than those of the control group after the experimental group was trained.

The fact that a similar study had not been conducted before in the region where our study was conducted is the strongest aspect of our study. Patient compliance and the correct use of inhalation devices are important for the inhaler treatment to be effective. Considering that only 15%-20% of inhaler aerosol particles used even under the most suitable conditions reach the lungs and the amount of drug stored in the lungs can increase to 22.8% from 7.2% when used with the appropriate technique, the importance of the correct use of inhalation devices increases.[30]

Table 2. Comparison of COPD Self-Efficacy Scores Before and After Training Between Groups

COPD Self-Efficacy Scale Sub-Dimensions	G 1 (n = 40)			G 2 (n = 40)			G 3 (n = 40)				
	x̄ ± SD	Minimum	Maximum	x̄ ± SD	Minimum	Maximum	x̄ ± SD	Minimum	Maximum	F*	P
Negative affect											
Pre-education	2.0 ± 0.4	1.4	3.4	2.1 ± 0.3	1.6	3.0	2.2 ± 0.3	1.8	2.9	2.997	.054
Post-education	2.6 ± 0.3	2.1	3.6	2.7 ± 0.3	1.5	3.1	2.7 ± 0.3	2.3	3.3	1.445	.240
Difference	0.5 ± 0.2	0.0	0.9	0.6 ± 0.4	−0.8	1.3	0.4 ± 0.3	0.0	1.1	0.766	.467
Test	**−16.598**, *P* < .001**			**−8.682**, *P* < .001**			**−11.140**, *P* < .001**				
Intense emotional arousal											
Pre-education	2.2 ± 0.4	1.6	3.2	2.1 ± 0.5	1.6	3.8	2.4 ± 0.4	1.5	3.3	0.206	.814
Post-education	2.8 ± 0.3	2.1	3.5	2.9 ± 0.3	1.8	3.5	2.9 ± 0.3	2.38	3.63	0.939	.394
Difference	0.6 ± 0.3	−0.1	1.1	0.7 ± 0.5	−0.5	1.8	0.6 ± 0.3	0.1	1.3	1.272	.284
Test	**−12.250**, *P* < .001**			**−9.424**, *P* < .001**			**−13.266**, *P* < .001**				
Physical exertion											
Pre-education	1.9 ± 0.4	1.2	3.2	1.8 ± 0.5	1.0	3.2	1.8 ± 0.3	1.4	2.6	0.016	.984
Post-education	2.6 ± 0.3	1.8	3.4	2.7 ± 0.3	1.8	3.2	2.7 ± 0.3	2.0	3.2	0.920	.401
Difference	0.7 ± 0.6	0.0	1.4	0.8 ± 0.5	−0.8	2.0	0.8 ± 0.4	0.0	1.6	0.825	.441
Test	**−12.787**, *P* < .001**			**−9.693**, *P* < .001**			**−14.364**, *P* < .001**				
Weather/environmental impact											
Pre-education	1.8 ± 0.4	1.1	2.8	1.7 ± 1.6	1.1	3.0	1.7 ± 0.3	1.0	2.8	1.390	.253
Post-education	2.7 ± 0.4	2.0	3.7	2.7 ± 0.3	2.0	3.7	2.7 ± 0.3	1.5	3.5	1.488	.230
Difference	0.9 ± 0.3	0.3	1.5	0.7 ± 0.7	−1.0	2.7	0.5 ± 0.5	−0.3	1.3	0.158	.854
Test	**−19.034**, *P* < .001**			**−12.031**, *P* < .001**			**−16.855**, *P* < .001**				
Behavioral risk factors											
Pre-education	2.7 ± 0.8	1.0	4.0	3.0 ± 0.6	1.0	4.0	2.7 ± 0.6	1.3	3.7	0.304	.739
Post-education	3.1 ± 0.6	2.0	4.3	3.4 ± 0.5	2.0	4.7	3.2 ± 0.5	2.0	4.3	2.432	.092
Difference	0.4 ± 0.5	−0.6	1.3	0.9 ± 0.5	−1.0	1.7	1.0 ± 0.4	0.2	1.8	0.828	.439
Test	**−6.142**, *P* < .001**			**−6.053**, *P* < .001**			**−7.115**, *P* < .001**				
General before training	2.13 ± 0.3	1.6	2.9	2.14 ± 0.3	1.7	3.2	2.15 ± 0.3	1.6	2.9	0.052	.949
General after training	2.79 ± 0.2	2.3	3.4	2.87 ± 0.3	1.8	3.3	2.84 ± 0.2	2.3	3.3	0.872	.421
General difference	0.66 ± 0.2	0.2	1.2	0.73 ± 0.4	−0.8	1.3	0.70 ± 0.2	0.3	1.6	0.559	.573
General test	**−18.324**, *P* < .001**			**−11.619**, *P* < .001**			**−18.542**, *P* < .001**				

COPD, chronic obstructive pulmonary disease; G 1, show and perform; G 2, video; G 3, sample material training method; x̄ ± SD, mean ± standard deviation.
*One-way analysis of variance.
**Paired Samples *t*-test.Discussion

Using more than 1 inhaler device requiring different usage methods and skills and the fact that a great majority of patients are elderly are factors that increase the rate of inhaler use errors. Errors in the use of an inhaler device lead to inadequate dose intake. This in turn reduces the patient's level of symptom control and the efficiency of the treatment, as well as increases the frequency of COPD attacks and consequently hospitalization and emergency service admissions.[3,7,25,31-33]

In this study, it was found that 35% of all patients used pMDIs, while 20% used Diskus or HandiHaler devices. In other studies, similarly, the pMDI was found to be used more than other inhaler device types.[6,25,30]

It was determined in this study that, in the 3 groups, the pMDI was the inhaler which was used with the highest rate of error. The inhalers used with the lowest rate of error were Diskus in the first group and HandiHaler in the second and third groups. Similar to the results of this study, it has been observed in other studies that more errors were made in pMDI use in comparison to other types of inhalers.[6,9,31,34] It may be thought that the causes of this situation are associated with old age and low level of education.[35,36]

When the steps of pMDI use were considered in the analysis, it was found that more than 70% of the patients in the first, second, and third groups made errors in preparing the pMDI (shaking pMDI), breathing out before inhalation, and they did not hold their breaths for 8-10 seconds after drug inhalation. In the literature review, similar to the results of this study, it was found that the most frequent errors in pMDI use have been reported as using the pMDI without shaking, not breathing out deeply before inhalation, and not holding one's breath for a specific amount of time after drug inhalation.[4,6,25,34,37] In previous studies, it has been seen that patients using pMDIs had difficulty, especially in their coordination between pressing and breathing in.[25,31] The reasons for this were thought to be the fact that patients are not sufficiently trained, the mean age of the patients in these studies was 66.35, and their duration of disease was 112 months.

Like the results of our study, in their study conducted in Turkey, Özel et al[6] stated that more than half of the patients made a mistake in the "appropriate breathing and then holding step of 20-30 seconds." This causes the active substance particles to go to parts of the respiratory system other than the lungs, leading to a decrease in the effect of the drug. More than half of the patients in the study by Özel et al[6] study and 81.4% of the patients in the study by Ramadan and Sarkis[31] were found to have difficulty in the coordination between pressing the pMDI and breathing in. This situation may have been associated with the possibilities that the patients are not adequately trained on the issue, the patients have a low level of education, or they do not care about the correct use of the drug.

Previous studies have argued that there are critical steps that should be followed without errors to increase the effect of the drug and reduce complications.[8,11,25] There was no statistically significant difference between the 3 training groups in terms of their self-efficacy levels after the training ($P < .05$). This situation may have occurred due to the short duration of the training that was provided, the previous training of the patients, and the age group that was trained in this study. However, although there was no statistically significant difference, looking at the steps where errors were made between the groups, it was seen that the highest increase after the training was in the third group. The group with the second highest increase was the second group which was trained with video material. It was found that the video training method was more effective in patients with a low level of education and in patients living in rural areas.[38,39] In a study conducted on COPD patients living in rural areas, Locke et al[40] found that providing video telehealth training caused an improvement in inhaler technique and stated that it was a promising program in teaching the correct inhaler technique to COPD patients living in rural areas.[40] In a study by Yan et al[41] which aimed to increase the quality of life of COPD patients living in rural areas, an internet-based web consultancy room was created, and after a 1-year follow-up, the expected FEV1% and FEV1/FVC ratio were found to increase significantly in comparison to the control group. In line with the results of our study, these results showed that visual-auditory training is effective in the context of inhaler training.

Frequent errors in dry powder inhaler use are related to failures in breathing out before drug inhalation, inhaling the drug quickly and with a deep breath, and holding the breath for a specific amount of time after inhalation. These errors are critical since the drug fails to reach the lungs at the desired dose, and this prevents the expected effect of the drug from occurring.[8,11,25]

Similar to our study, it has been found in the literature that errors were made in the steps of breathing out before drug inhalation, inhaling the drug in an appropriate way and at an appropriate speed, and holding one's breath for a specific amount of time after inhalation.[10,11]

In this study, a significant decrease was found in the rates of errors made by the patients after they were provided with training. The reason for the high error percentage in the pre-training Aerolizer, HandiHaler, and Diskus use steps may have been the patients' low levels of education or decreased hand–mouth coordination depending on their age.[6,9]

This study aimed to minimize inhaler use errors by providing training for the visual, auditory, and both visual and auditory senses of individuals with different training methods and by considering their individual differences. As a result of the study, it was determined that the lowest skill scores belonged to the pMDI users in all 3 groups before the training and that there was a statistically significant increase in these scores after the training. The steps that involved the highest rates of mistakes in all 3 groups among the steps of using metered-dose inhalers before the training were determined as shaking the inhaler, giving a deep breath and evacuating the lung, holding the breath for a sufficient time after drug inhalation and waiting a certain time for the second dose, and the increase in the patients' success rates in these steps after the training was determined to be statistically significant. It was observed that the self-efficacy scores were low in all 3 groups before the inhaler use training, and the mean self-efficacy total score and dimension scores of the patients increased significantly after the training. Consequently, using the show and perform, video, and sample material training methods, it was observed that the inhaler use skill scores and self-efficacy levels of the patients increased, but there was no significant difference between the groups.

For this reason, it is recommended to use different training methods in COPD patient training, provide a longer training period, follow the patients at home through telephone, and evaluate the efficiency of the show and perform, video, and sample material methods in different chronic diseases.

Limitations

This study has several limitations. These are as follows:

- Single center study.
- That 70% of patients living in rural areas and cities where the study was conducted is limited to a 6-day study period due to climatic conditions.
- Self-efficacy assessment before and after the training was made once.
- The study does not have a control group.

Ethics Committee Approval: Ethics from Kafkas University Faculty of Medicine Ethics Committee committee approval was obtained before the study (Decision No: 80576354-050-99/135, Date: June 28, 2017).

Informed Consent: Written permission was obtained from the hospital was the study was conducted.

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REFERENCES

1. Global Initiative for Chronic Obstructive Lung Disease. *Pocket guide to COPD diagnosis, management, and prevention. A guide for health care professionals*. Global Initiative for Chronic Obstructive Lung Disease; Accessed December 19, 2020. https://goldcopd.org/wp-content/uploads/2020/12/GOLD-2020-FINAL-ver1.2-03Dec19_WMV.pdf
2. Turkish Statistical Institute: 2009-2018 cause of death statistics. Accessed December 19, 2020. https://data.tuik.gov.tr/Bulten/Index?p=Olum-ve-Olum-Nedeni-Istatistikleri-2019-33710
3. Klijn SL, Hiligsmann M, Evers SMAA, Román-Rodríguez M, Van Der Molen T, Van Boven JFM. Effectiveness and success factors of educational inhaler technique interventions in asthma & COPD patients: A systematic review. *NPJ Prim Care Respir Med*. 2017;27(1):24. [CrossRef]
4. Özkan ÇG, Kaşıkçı Kara M. Metered dose inhaler using and the role of the nurse in managing of the patient training process. *Arch Heal Sci Res*. 2015;2(3):355-362.
5. Ilic AD, Zugic V, Zvezdin B, et al. Influence of inhaler technique on asthma and COPD control: a multicenter experience. *Int J COPD*. 2016;11(1):2509-2517.
6. Özel F, Çıray Gündüzoğlu N, Durmaz Akyol A. COPD and asthma patients' skills of using inhaler devices and satisfaction situations. *Acıbadem Univ J Heal Sci*. 2018;9(3):266-271.
7. Hashmi A, Soomro JA, Memon A, Soomro TK. Incorrect inhaler technique compromising quality of life of asthmatic patients. *J Medicine*. 2012;13(1):16-21. [CrossRef]
8. Leiva-Fernández F, Leiva-Fernández J, Zubeldia-Santoyo F, García-Ruiz A, Prados-Torres D, Barnestein-Fonseca P. Efficacy of two educational interventions about inhalation techniques in patients with chronic obstructive pulmonary disease (COPD). TECEPOC: study protocol for a partially randomized controlled trial (preference trial). *Trials*. 2012;13(1):1-8. [CrossRef]
9. Aydemir Y. Misuse of inhalation devices-effective parameters and the role of education. *Solunum*. 2013;15(1):32-38. [CrossRef]
10. Luczak-Wozniak K, Dabrowska M, Domagala I, et al. Mishandling of pMDI and DPI inhalers in asthma and COPD – repetitive and non-repetitive errors. *Pulm Pharmacol Ther*. 2018;51:65-72. [CrossRef]
11. Madkour A, Galal I. Do Egyptian patients use their inhalers correctly? A checklist auditing for inhalation devices usage techniques. *Egypt J Chest Dis Tuberc*. 2015;64(2):497-504. [CrossRef]
12. Ata A, Atik A. Video-sharing websites as an alternative educational environment: YouTube practices in universites. *Soc Sci*. 2016;11(4):312-325.
13. Tomisa G, Horváth A, Dombai B, Tamási L. Characteristics of an optimized patient information material for elderly patients with obstructive pulmonary diseases based on patients' and experts' assessment. *Multidisciplinary Resp Medi*. 2017;12(1):1-8.
14. Kara M, Mirici A. The validity and reliability of Turkish form of the COPD self-efficacy scale. *Atatürk Univ Tıp Derg*. 2002;34(3):61-66.
15. Vatansever Ö, Ünsar S. Determination of medical treatment adherence, self-efficacy levels of patients with essential hypertension and affecting factors. *J Cardiovasc Nurs*. 2014;5(8):66-74.
16. Selzler AM, Moore V, Habash R, et al. The relationship between self-efficacy, functional exercise capacity and physical activity in people with COPD: A systematic review and meta-analyses. *COPD J Chronic Obstr Pulm Dis*. 2020;0(0):1-10. [CrossRef]
17. Kar S, Zengin N. The relation between self-efficacy in patients with chronic obstructive pulmonary disease and caregiver burden. *Scand J Caring Sci*. 2020;34(3):754-761. [CrossRef]
18. Ng WI, Smith GD. Effects of a self-management education program on self-efficacy in patients with COPD: A mixed-methods sequential explanatory designed study. *Int J Chron Obstruct Pulmon Dis*. 2017;12:2129-2139. [CrossRef]
19. Bal Özkaptan B, Kapucu S. Home nursing care with the self-care model improves self-efficacy of patients with chronic obstructive pulmonary disease. *Jpn J Nurs Sci*. 2016;13(3):365-377. [CrossRef]
20. Poureslami I, Kwan S, Lam S, Khan NA, FitzGerald JM. Assessing the effect of culturally specific audiovisual educational interventions on attaining self-management skills for chronic obstructive pulmonary disease in Mandarin- and Cantonese- speaking patients: A randomized controlled trial. *Int J Chron Obstruct Pulmon Dis*. 2016;11:1811-1822.
21. Bourbeau J, Farias R, Li PZ, et al. The Quebec Respiratory Health Education Network: Integrating a model of self-management education in COPD primary care. *Chron Respir Dis*. 2018;15(2):103-113. [CrossRef]
22. Price PC, Jhangiani RS, Chiang ICA. Quasi-experimental research. *Resaearch Methods in Psychology*; Accessed February 2, 2022. https://ecampusontario.pressbooks.pub/researchmethods/chapter/quasi-experimental-research/.
23. Siedlecki SL. Quasi-experimental research designs. *Clin Nurse Spec*. 2020;34(5):198-202. [CrossRef]
24. Kocabaş A, Atış S, Çöplü L, et al. Chronic obstructive pulmonary disease (COPD) prevention, diagnosis and treatment report. *Turk Thorac Soc*. 2014;15:1-76.
25. Chrystyn H, Van Der Palen J, Sharma R, et al. Device errors in asthma and COPD: Systematic literature review and meta-analysis. *npj Prim Care Respir Med*. 2017;27(1):22. [CrossRef]
26. Ceyhan YS, Unsal A. Comparison of the self-efficacy level of the people with different chronic diseases. *Dokuz Eylul Univ e-Journal Nurs Fac*. 2018;11(4):263-273.
27. Abedi H, Salimi SJ, Feizi A, Safari S. Effect of self-efficacy enhancement program on self-care behaviors in chronic obstructive pulmonary disease. *Iran J Nurs Midwifery Res*. 2013;18(5):421-424.
28. Kaşıkçı Kara M. Using self-efficacy theory to educate a patient with chronic obstructive pulmonary disease: a case study of 1-year follow-up. *Int J Nurs Pract*. 2011;17(1):1-8. [CrossRef]
29. Topçu S, Oğuz S. Self-efficacy and quality of life after stroke. *J Hum Sci*. 2017;14(2):1388-1396.
30. Tanriverdi E, Özmen Süner K, Süner H, Iliaz S, Annakkaya AN. The evaluation of family physicians' knowledge on the use of inhalation devices. *Eurasian J Pulmonol*. 2015;17(2):98-102. [CrossRef]
31. Ramadan WH, Sarkis AT. Patterns of use of dry powder inhalers versus pressurized metered-dose inhalers devices in adult patients with chronic obstructive pulmonary disease or asthma: an observational comparative study. *Chron Respir Dis*. 2017;14(3):309-320. [CrossRef]
32. Braido F, Chrystyn H, Baiardini I, et al. "Trying, But Failing" — the role of inhaler technique and mode of delivery in respiratory medication adherence. *J Allergy Clin Immunol Pract*. 2016;4(5):823-832. [CrossRef]
33. Ozoglu Aytac S, Kilic Parlar S, Ovayolu N. Effect of inhaler drug education on fatigue, dyspnea severity, and respiratory function tests in patients with COPD. *Patient Educ Couns*. 2020;103(4):709-716. [CrossRef]

34. Başlılar Ş, Şaylan B. Erratum: inhaler device usage skills in patients at pulmonology clinics. *Turk J Fam Pract*. 2018;22(4):66-77.
35. Melani AS, Bonavia M, Cilenti V, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med*. 2011;105(6):930-938. [CrossRef]
36. Arora P, Kumar L, Vohra V, et al. Evaluating the technique of using inhalation device in COPD and bronchial asthma patients. *Respir Med*. 2014;108(7):992-998. [CrossRef]
37. Bol P, Gül G, Işık O, Uslu Ö, Erbaycu AE. The assessment of the changes on inhalation drugs: Form, active ingredient, period and causes. *Izmir J Chest Dis*. 2017;2:73-78.
38. Banbury A, Parkinson L, Nancarrow S, Dart J, Gray L, Buckley J. Multisite videoconferencing for home-based education of older people with chronic conditions: The Telehealth Literacy Project. *J Telemed Telecare*. 2014;20(7):353-359. [CrossRef]
39. Stellefson M, Chaney B, Ochipa K, et al. YouTube as a source of chronic obstructive pulmonary disease patient education: A social media content analysis. *Chron Respir Dis*. 2014;11(2):61-71. [CrossRef]
40. Locke ER, Thomas RM, Woo DM, et al. Using video telehealth to facilitate inhaler training in rural patients with obstructive lung disease. *Telemed J E Health*. 2019;25(3):230-236. [CrossRef]
41. Yan Y, Liu L, Zeng J, Zhang L. Evaluation and exploration on the effect of the management of chronic obstructive pulmonary disease in rural areas through an internet-based network consulting room. *Med Princ Pract*. 2018;27(3):222-226. [CrossRef]