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Application of Breathing Exercises Based on Self-efficacy Theory in Patients with Chronic Heart Failure

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Abstract: *Objective*: Based on the breathing exercise derived from the self-efficacy theory, this study aims to construct a breathing exercise intervention program according to the conditions of patients with chronic heart failure, to improve their cardiac function, relieve dyspnea, enhance their quality of life, and further enrich the research on the efficacy of respiratory rehabilitation exercises for patients with chronic heart failure. *Method:* A total of 98 inpatients with chronic heart failure admitted to the hospital from April 2024 to April 2025 were selected and randomly divided into an intervention group and a control group, with 49 patients in each group. The patients in the control group received conventional nursing, while the patients in the intervention group received the breathing exercise intervention program based on the self-efficacy theory in addition to the conventional nursing of the control group, with interventions conducted through guidance, psychological support, health education, and other methods. The conditions of patients in both groups before and after the intervention were observed. *Results:* After 1 month and 3 months of intervention, in terms of improving the degree of dyspnea in patients of both groups, the main effect of intervention and the time effect on the degree of dyspnea were statistically significant ($F = 13.948$, $P < 0.001$; $F = 38.423$, $P < 0.001$). Moreover, there was an interaction between the time factor and the intervention factor in both groups ($F = 113.763$, $P < 0.001$). In terms of increasing the 6-minute walking distance, the main effect and time effect in both groups were statistically significant ($F = 7.371$, $P = 0.008$; $F = 459.405$, $P < 0.001$), and there was an interaction effect between the time factor and intervention factor in both groups ($F = 177.180$, $P < 0.001$). After 1 month and 3 months of intervention, in terms of improving the level of exercise self-efficacy, the main effect of intervention and the time effect in both groups were statistically significant ($F = 6.860$, $P = 0.01$; $F = 25.133$, $P < 0.001$), and there was an interaction between the time factor and the intervention factor ($F = 159.576$, $P < 0.05$). *Conclusion*: Breathing exercise based on the self-efficacy theory is helpful to improve the sense of efficacy of patients with chronic heart failure, enable them to persist in breathing exercise for a long time, further alleviate their dyspnea, promote the recovery of cardiopulmonary function, and enhance their quality of life. Breathing exercise based on the self-efficacy theory can be used as a simple, home-based intervention method to provide corresponding help for patients with chronic heart failure during the rehabilitation period.

Keywords: Self-efficacy theory; Breathing exercise; Patients with chronic heart failure; Psychological support

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1. Introduction

In the context of the new era, people's living standards have improved, and changes have also taken place in their daily dietary structure and lifestyle. The probability of suffering from cardiovascular diseases is increasing, and the issue of patients' cardiac function rehabilitation in the later stage has attracted widespread attention. Chronic heart failure is the end stage of various cardiovascular diseases. It is caused by problems such as myocardial cell damage, ventricular remodeling, and hemodynamic changes, and is characterized by dyspnea, limited activity, and decreased exercise tolerance. At this stage, China's medical facilities are constantly improving, and medical and health care methods are also increasing, so the incidence rate of heart failure has improved compared with the past. However, with the continuous improvement of people's health concept, quality of life has become an important factor for people to consider. Most patients with chronic heart failure are not satisfied with their quality of life, and they are hospitalized repeatedly at a relatively high frequency. On the one hand, this brings a heavy economic burden to their families. On the other hand, it has a great negative impact on the patients' mental and psychological state, and even leads to anxiety and depression. Therefore, how to improve the quality of life of patients with chronic heart failure and reduce the hospitalization rate has become an important issue in the current research process.

2. Materials and methods

2.1. General information

The data of 98 inpatients with chronic heart failure admitted to the hospital from April 2024 to April 2025 were selected as the research basis. The patients met the diagnostic criteria specified in 2018 Chinese Guidelines for the Diagnosis and Treatment of Heart Failure, and they were over 18 years old with normal intelligence and cognitive ability, able to communicate normally, and voluntarily participated in the study [1]. The patients were divided into two groups randomly: 49 cases in the intervention group and 49 cases in the control group. Among them, the intervention group included 24 males and 25 females, with an average age of (54.93 ± 14.76) years; the control group included 23 males and 26 females, with an average age of (55.20 ± 12.32) years. In the intervention group, 23 patients had cardiac function at grade I-II, and 22 at grade III; in the control group, 19 patients had cardiac function at grade I-II, and 26 at grade III. There were no statistically significant differences in age, gender, cardiac function classification, and other aspects between the two groups ($P > 0.05$).

2.2. Methods

The control group was given general intervention methods, including routine education and nursing care. For patients with chronic heart failure in the intervention group, a comprehensive assessment was conducted after hospitalization to understand their understanding of breathing exercises. They were educated on the pathogenesis of chronic heart failure and the benefits of breathing exercises for the disease. Active persuasion and encouragement were provided to help them engage in breathing exercises, and individualized breathing exercise technical guidance was offered to assist them in mastering the exercise methods and heart rate measurement. They were also instructed on how to respond to emergencies to enhance their self-rescue experience, enabling them to perform self-first aid immediately when problems arise [2]. After discharge, a breathing exercise intervention manual based on self-efficacy theory was distributed. Timely communication with patients was maintained via WeChat, evaluating their breathing exercise methods, providing appropriate guidance and supervision, and offering psychological support and technical assistance [3].

During the study, the measurement indicators included three aspects: the baseline dyspnea index, walking

distance, and exercise self-efficacy. The baseline dyspnea index assesses the degree of dyspnea caused by daily activities in patients, evaluated from three perspectives: physical function in daily life, task completion at work, and labor performance. The walking distance refers to the assessment of the patient's walking distance and the degree of respiratory effort within 6 minutes; the longer the distance a patient walks within 6 minutes, the better their cardiac function and activity endurance. The exercise self-efficacy scale can measure an individual's confidence in achieving exercise goals after encountering difficulties, involving 18 items, with higher scores indicating a higher level of self-efficacy [4].

3. Results

3.1. Dyspnea index

The two independent samples t-test was used to compare the degree of dyspnea between the two groups of patients before and after intervention, and it was found that there was no statistically significant difference in the degree of dyspnea between the two groups after intervention ($P > 0.05$). After 3 months of intervention, an analysis was conducted on the degree of dyspnea in patients of the intervention group, and the following results were obtained, as shown in **Table 1**.

Table 1. Comparison of dyspnea degree between the two groups of patients before and after intervention (n=90, $\overline{x} \pm s$, score)

Group (49 cases)	Dyspnea			Time effect	Intergroup effect *F*(*P*)	Interaction effect
	Admission	1 month after intervention	3 months after intervention			
Intervention group	5.78 ± 2.402	6.80 ± 2.292	8.80 ± 2.052			
Control group	5.47 ± 1.902	5.42 ± 1.913	5.84 ± 2.142	13.948	38.423	113.763
t	0.681	5.343	11.207	(< 0.001)	(< 0.001)	(< 0.001)
P	0.498	< 0.001	< 0.001			

3.2. 6-Minute walk distance

An independent two-sample t-test was used to compare the changes in 6-minute walk distance between the two groups of patients before and after intervention. There was no statistical significance before the intervention ($P > 0.05$). After the intervention, the 6-minute walk distance of the patients improved, and the data of the two groups showed statistical significance ($P < 0.05$). Details are shown in **Table 2**.

Table 2. Comparison of 6-minute walking distance between the two groups of patients before and after intervention (n=90, $\overline{x} \pm s$, points)

Group (49 cases)	6-minute walk distance (m)			Time effect	Intergroup effect *F*(*P*)	Interaction effect
	Admission	1 month after intervention	3 months after intervention			
Intervention group	325.07 ± 46.065	353.07 ± 48.421	386.89 ± 45.733			
Control group	324.93 ± 24.937	334.84 ± 23.486	342.13 ± 25.106	459.405 (< 0.001)	7.371 (0.008)	177.180 (< 0.001)
t	0.017	2.271	5.755			
p	0.986	0.26	< 0.001			

3.3. Total score of exercise self-efficacy

The independent samples t-test was used to compare the scores of exercise self-efficacy between the two groups of patients before and after the intervention. The results showed that there was no statistically significant difference in the total score of exercise self-efficacy between the two groups before the intervention. After 3 months of intervention, the score of exercise self-efficacy in the intervention group was higher than that in the control group, which fully indicated that the level of exercise self-efficacy in the intervention group was higher, and respiratory training had a good effect [5]. The difference was statistically significant ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of total scores of exercise self-efficacy between the two groups of patients before and after intervention (n=90, $\overline{x} \pm s$, points)

Group (49 cases)	6-minute walk distance (m)			Time effect	Intergroup effect *F*(*P*)	Interaction effect
	Admission	1 month after intervention	3 months after intervention			
Intervention group	45 ± 12.660	51.27 ± 12.518	54.51 ± 12.172			
Control group	45.73 ± 11.955	43.62 ± 12.018	41.44 ± 12.142	25.133 (< 0.001)	6.890 (0.008)	159.576 (< 0.001)
t	-2.83	2.955	5.089			
p	0.778	0.04	< 0.001			

4. Discussion

4.1. Breathing exercises based on self-efficacy theory help alleviate dyspnea in patients

Dyspnea is one of the symptoms in patients with chronic heart failure. They often feel short of breath and have insufficient tidal volume, which affects their daily life, leads to negative emotions, and further reduces their quality of life. For the patients in the intervention group who received intervention, it can be seen from the data after 3 months that there is an interaction between time and group in the degree of dyspnea between the two groups. It can also be concluded through analysis that the patients' dyspnea will be alleviated over time. The breathing exercise therapy significantly improves the patients' dyspnea. The main reasons are as follows: on the one hand, the slow breathing mode changes the patients' shallow and rapid breathing pattern, reduces the respiratory rate, and increases the tidal volume. This is conducive to increasing pulmonary ventilation and the time for oxygen exchange on the alveolar surface, thereby maintaining the balance of ventilation-perfusion ratio. It also helps alleviate muscle fatigue, promotes the recovery of respiratory muscle contraction, and improves the patients' dyspnea [6–10].

4.2. Breathing exercises based on self-efficacy theory help improve patients' 6-minute walking distance

On one hand, heart failure patients experience dyspnea, increased heart rate, and a gradual decline in cardiac function due to the deterioration of the heart's motor function. Studies have shown that the 6-minute walking distances of patients in both groups indicate moderate heart failure, with their exercise endurance and independent living ability being limited. After introducing the breathing exercise intervention method based on self-efficacy theory during treatment, it was found that the 6-minute walking distances of patients in both groups increased after

1 month and 3 months. The increase in the intervention group was significantly greater than that in the control group, which was statistically significant. Moreover, there was an interaction effect between time and group, indicating that with the passage of time, the difference in 6-minute walking distance between the two groups was statistically significant. Using active breathing cycle technology to intervene in patients during hospitalization helps improve their exercise endurance, promotes their recovery, and enhances their quality of life [11–13].

4.3. Breathing exercises based on self-efficacy theory help improve patients' compliance with breathing exercises

The level of exercise self-efficacy in patients with chronic heart failure is lower than that in other people. This is because heart failure patients have relatively poor cardiac function and experience difficulty in breathing, which leads to a continuous decrease in their activity ability and exercise needs. In addition, traditional treatment plans generally believe that patients should stay in bed to avoid heart failure symptoms caused by activities. At the beginning of the study, it was found that the exercise self-efficacy scores of patients in both groups were around 45 points, indicating a relatively low level of exercise self-efficacy. However, introducing the breathing exercise intervention plan based on self-efficacy theory during rehabilitation treatment can improve patients' self-efficacy and enhance their compliance with exercises. The breathing exercise intervention plan based on self-efficacy theory is conducive to face-to-face guidance for patients to perform correct breathing exercises, supervise the accuracy of their breathing exercise movements, enable them to master correct breathing methods, control breathing frequency, and accumulate more experience in breathing exercises. Furthermore, helping patients solve various psychological problems during rehabilitation treatment, addressing their concerns about the complexity of exercise movements and unknown situations encountered during exercise, and providing timely explanations and handling can reduce patients' fear of exercise, improve compliance, and make them realize the important significance of breathing exercises in the treatment of chronic heart failure [14, 15].

5. Conclusion

The results of this study show that after intervention, the patients in the intervention group were significantly better than those in the control group in terms of dyspnea, 6-minute walking distance and exercise self-efficacy ($P < 0.05$). It can be seen that respiratory exercise based on the self-efficacy theory can be regarded as an effective home-based rehabilitation training for patients with chronic heart failure, which can effectively relieve dyspnea, improve the quality of life and reduce the hospitalization rate. On the one hand, respiratory exercise based on the self-efficacy theory can help understand the understanding and needs of patients with chronic heart failure for respiratory exercise; on the other hand, according to individual differences, targeted intervention training can be adopted for heart failure patients with different cardiac function grades, so that patients can benefit more from it. In addition, it is also particularly important to carry out health education on respiratory exercise based on the self-efficacy theory to improve patients' enthusiasm and compliance in participation.

Disclosure statement

The author declares no conflict of interest.

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