

Effects of progressive muscle relaxation training on negative emotions and sleep quality in COVID-19 patients

A clinical observational study

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Abstract

This study investigates the effect of progressive muscle relaxation training on negative mood and sleep quality in Coronavirus Pneumonia (COVID-19) patients.

COVID-19 is an emerging infectious disease, and there is still uncertainty about when the outbreak will be contained and the effectiveness of treatments. Considering that this disease is highly contagious, patients need to be treated in isolation. This may lead to psychological symptoms such as anxiety and depression, and even sleep problems.

This study is a clinical observation study.

Participants included 79 COVID-19 patients admitted to a designated hospital for COVID-19 patients in Wuhan from February to March, 2020. Patients were selected and assigned to the control group and the observation group according to their wishes, with 40 and 39 cases in each group, respectively. The control group received routine treatment and nursing, and the observation group received progressive muscle relaxation training, in addition to the routine treatment and nursing. We compared scores of the Pittsburgh Sleep Quality Index Scale (PSQI), the Generalized Anxiety Disorder (GAD-7), and the Patient Health Questionnaire (PHQ-9) before and after the intervention.

There was no significant difference in PSQI, GAD-7, and PHQ-9 scores between the control group and the observation group before the intervention ($P > .05$). After the intervention, the difference in scores of PSQI, GAD-7, and PHQ-9 in the 2 groups were statistically significant ($P < .05$).

Progressive muscle relaxation training can significantly reduce anxiety and depression and improve sleep quality in COVID-19 patients during isolation treatment.

Progressive muscle relaxation training was shown to improve the treatment effect of patients and is worthy of clinical promotion.

Abbreviations: COVID-19 = coronavirus pneumonia, GAD-7 = the generalized anxiety disorder, PHQ-9 = the patient health questionnaire, PSQI = the Pittsburgh sleeps quality index scale.

Keywords: COVID-19 patients, negative emotions, progressive muscle relaxation training, sleep quality

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Key Points

- Progressive muscle relaxation training interventions in isolated COVID-19 patients significantly improved sleep quality.
- Progressive muscle relaxation training interventions in isolated COVID-19 patients significantly improved negative mood and reduced anxiety and depression.
- Our findings can be used to improve both sleep and psychological care through nursing staff action and sleep and psychological conditions in COVID-19 patients.

1. Introduction

In December 2019, a new coronavirus pneumonia (COVID-19) outbreak started in Wuhan, Hubei Province, quickly spreading to other parts of China and countries around the world.^[1] COVID-19 is a new infectious disease that can be transmitted from person to person by means of varying transmission routes, high morbidity, strong infectivity, and a considerable mortality rate.^[2] In China, when practicing isolation treatment, patients need to perform a nucleic acid test for efficacy. However, since various factors affect the accuracy of the test and the results are repetitive, multiple examinations are required. This uncertainty can cause the patient to have sleep issues and such uncertainty worsens since some witness the death of other patients in the same ward due to ineffective treatment. In addition, due to the particularity of the disease, patients are separated from relatives and friends.

There is still uncertainty about how the disease will be treated and when the outbreak will be contained. Patients suffer both physically and mentally, as fear, anxiety and other psychological reactions are common. From our experience in nursing COVID-19 patients, we observed their difficulties in falling asleep, waking up easily, along with other sleep problems. Sleep quality is especially important for the human body. It is fundamental for the physiological activity and the system of organs. Poor sleep affects memory, learning, emotions, behavior, immune response, metabolism, hormone levels, digestive processes, and many other physiological functions.^[3] Thus, sleep eventually affects the prognosis and outcome of COVID-19 patients.^[4] Therefore, the problem of improving sleep quality in COVID-19 patients needs to be solved urgently.

2. Background

Progressive muscle relaxation training is a type of therapy that involves gradually relaxing muscles in a sequence. It was originally a self-management relaxation technique developed by Jacobson.^[5] Progressive muscle relaxation techniques have now become an independent training method, which has been used in various fields of psychology.^[6,7] Related studies have shown that progressive muscle relaxation training as a non-pharmacological intervention, through the use of systematically tension and relaxation of the muscles to reduce muscle strain, ensure mental relaxation, increases exercise tolerance, functional capacity, and quality of life in patients.^[8] Further, some studies have pointed out that progressive muscle relaxation training can improve sleep.^[9] Therefore, this study aims to investigate the effects of an intervention on negative emotions and sleep quality

of COVID-19 patients through progressive muscle relaxation training, so as to promote recovery.

3. Materials and methods

Participants were 79 COVID-19 patients admitted to a designated hospital in Wuhan from February to March, 2020. The patients were divided into an observation group (39 cases) and a control group (40 cases) according to their wishes.

Inclusion criteria included:

- (1) patients diagnosed with COVID-19 according to the standard of prevention and control plan of COVID-19, released by the National Health Commission^[10];
- (2) conscious patients with at least a minimum ability of communication and understanding, able to complete the training according to a verbal guide;
- (3) patients who informed consent;
- (4) and those hospitalized for more than 7 days.

On the other hand, exclusion criteria were:

- (1) patients suffering from mental illness, or those taking anti-anxiety, sedation, and other drugs before admission to the hospital; and those
- (2) patients with severe cardiovascular disease or malignant tumors.

All 79 patients not required additional ventilator or hemodynamic support thereby. And no patients drop out of the study due to decline in their COVID status.

3.1. Ethical approval

This study has been approved by the Ethics Committee of Fujian Medical University Union Hospital. All enrolled patients or their family members provided written and signed informed consent to participate in the study.

3.2. Study design

Patients in both groups received clinical treatment and nursing care in accordance to the coronavirus pneumonia diagnosis and treatment plan issued by the National Health Commission.^[11]

Patients in the observation group received the further treatment of progressive muscle relaxation training for 1 week. At the same time, nurses instruct patients in the control group to perform body movements in bed. The 4 researchers in the observation group were all support nurses in the designated hospital, with the qualification of nurse in charge. Before the study, participants were trained in progressive muscle relaxation techniques and assessment tools.

3.2.1. Progressive muscle relaxation training. Patients in the observation group received progressive muscle relaxation training in bed 30 minutes before getting up early and 30 minutes before going to bed. The researchers recorded a video beforehand. The 15-minute video, produced by team members themselves, details each step of the training and is accompanied by audio. Along with the video, team members taught patients the relaxation training method. The details were given as follows: first, force tension with the muscles, and concentrate on the feeling of tension; try to hold this feeling of tension for 3 to 5 seconds, and then relax for 10 to 15 seconds. Afterward, the patient should experience the sensation of muscle relaxation.

Next, patients were taught the order of relaxation: foot, leg, hip and waist, chest, arm, shoulder, and face. The foot relaxation training had the following instructions: “focus on your feet, tense the muscles in the feet and ankle, bend your toes toward your head, and slowly tighten the muscles; then relax and imagine your feet getting heavier and more relaxed.”

The leg relaxation training was instructed as follows: “focus on the calf and push your feet forward as hard as you can, tension the calf muscle group, and then relax; concentrate on your thighs and pull them as close together as possible, tensing those muscles, and then letting them relax and go back to their position.”

The hip relaxation training was as follows: “try to align your hips, tense the hip and waist muscles, and hold this position for a while; then relax your muscles in the hips and waist letting them go back to their original state.”

The chest relaxation training was instructed as follows: “take a deep breath, hold it, and feel the tension; feel your chest muscles become tense and rigid, maintain this feeling for a while, then slowly exhale and relax your muscles.”

As for the arm relaxation training, instructions were: “extend your hand, clench your fist, force the forearm muscle group to tension, then relax; do it once on each hand; straighten your arms, clench your fists in both hands, tense your hands and arm muscles, then relax.”

Shoulders and rear relaxation training: “hunching your shoulders, feeling it from the neck to the ear, with the back slightly inclined, tension neck muscles, holding it for a while; then begin to relax your shoulders, hanging your head down forward, letting your shoulders go down, feeling your muscles become consciously relaxed and heavier, while the neck feels weak, the shoulder should feel heavy.”

Finally, there was also a facial relaxation training: “wrinkle your forehead muscles, then relax; frown, then relax; pucker your nose and cheeks, keeping your teeth clenched, so that the corners of your mouth are turned as far to the sides as possible.”

Each session lasted 15 minutes for 1 week. The patients followed a recorded audio to carry out the training. In the training process, if the patient felt discomfort, or if their condition was not fit to continue the training, researchers immediately stopped, and handled the issue accordingly. Anyhow, all patients in this study cooperated well in the training process, no special intervention was necessary.

3.3. Instruments

3.3.1. General demographic questionnaire. The general demographic questionnaire was designed by the research group after consulting the experts. It was used to evaluate the demographic and disease-related data of the patients, including age, education level, marital status, occupation, family residence, family economic status, and whether family members had been infected.

3.3.2. The Pittsburgh sleep quality index scale (PSQI)^[12]. The PSQI was used to evaluate sleep quality before and after the intervention. There were 19 self-report problems and 5 sleep partner rating problems in the PSQI scale. In this study, only 19 self-assessment scores were included, and the scores ranged from 0 to 3: “0” referring to no difficulty, and “3” to very difficult. The sum of all factor scores consisted of the total score of the scale ranging from 0 to 21. According to the total score, a global PSQI score of 8 or greater is indicative of poor sleep quality.^[13]

3.3.3. The generalized anxiety disorder (GAD-7). The GAD-7, prepared by Spitzer et al,^[14] was used to assess the anxiety status of patients. There are 7 items in the scale. Each item is scored from 0 to 3 points, and the total score is 21 points. High scores indicate the frequency of symptoms is high. Having a GAD-7 score ≥ 5 indicates anxiety.

3.3.4. The patient health questionnaire (PHQ-9). The PHQ-9 prepared by Kroenke et al^[15] was used to assess the depression status of patients. The content consists of 9 items, each of which is rated from 0 to 3 points, summing up a total of 27 points. High scores indicate the frequency of symptoms is high. A PHQ-9 score ≥ 5 indicates depression.

3.4. Data collection

Subjects were instructed to complete the general information questionnaire and PSQI before the intervention. After the intervention, GAD-7, PHQ-9, and PSQI scales were distributed once again. After receiving the scales, the completeness and key information was checked timely, and participants were instructed to fill in missing items. For those unable to fill in the form, the investigators read and filled in the form on their behalf, with their consent.

3.5. Data analysis

SPSS21.0 was used for the statistical analysis. Count data use case, percentage description, and X^2 test were used for comparison. The measurement data conforming to the normal distribution were expressed as mean \pm standard deviation, and the t -test was used for comparison. The rank data were tested by the rank sum test. $P < .05$ was considered statistically significant.

4. Results

No significant difference between the 2 groups was found in gender, age, and other general information ($P > .05$). The specific content is shown in Table 1.

Before the intervention, there was no statistically significant difference in GAD-7, PHQ-9, and PSQI scores between the 2 groups ($P > .05$). After the intervention, the scores of GAD-7, PHQ-9, and PSQI in the observation group were all lower than those in the control group ($P < .05$), with statistically significant differences. See Table 2 for details.

5. Discussion

COVID-19 is a newly emerging infectious disease with strong infectivity. At the moment, although symptomatic treatments are used and results are obtained, there is no definitive treatment. Patients still have doubts about whether they can truly recover, whether there would be sequelae, whether they would relapse or infect others. This can cause physical and mental damage to hospitalized patients.

During the SARS epidemic in 2003, patients also had serious psychological problems in the face of the sudden outbreak.^[16,17] In this study, GAD-7 and PHQ-9 were greater than 5 points before the intervention. This indicated COVID-19 patients had anxiety and depression.

Previous studies have also confirmed that patients' emotional stress state is related to individual immune function, and good psychological nursing can improve patients' immune injury to a

Table 1**Comparison of general demographic data between the 2 groups ($\bar{X} \pm S$).**

Variables	Experimental(n=39)	Control (n=40)	Statistical value	P-value
Age (yr, $\bar{X} \pm S$)	58.45 ± 11.08	59.33 ± 12.19	-0.573*	.568
Sex [n (%)]				
Male	21 (53.85)	23 (57.50)	0.107†	.744
Female	18 (46.15)	17 (42.50)		
Marital status [n (%)]				
Married	30 (61.22)	33 (82.50)	0.380†	.537
Divorced or widowed	9 (38.78)	7 (17.50)		
Education background [n (%)]				
Primary school	4 (10.26)	3 (7.50)	766.000†	.885
Junior high school	15 (38.46)	16 (40.00)		
High school	10 (25.64)	11 (27.50)		
College	10 (25.64)	10 (25.00)		
Occupation [n (%)]				
Farmer	3 (7.69)	4 (10.00)	773.000†	.944
Worker	12 (30.77)	11 (27.50)		
Independent professional	10 (25.65)	11 (27.50)		
Public institution	8 (20.51)	6 (15.00)		
Retired	6 (15.38)	8 (20.00)		
Family residence [n (%)]				
Countryside	9 (23.08)	8 (20.00)	0.111†	.739
City	30 (76.92)	32 (80.00)		
Financial state [N (%)]				
No difficulty at all	9 (23.08)	7 (17.50)	736.500†	.638
A little difficult	20 (51.28)	22 (55.00)		
Difficult	10 (25.664)	11 (27.50)		
Family members infected [N (%)]				
Yes	25 (64.10)	30 (75.00)	1.109†	.292
No	14 (35.90)	10 (25.00)		

* *t*-value.† χ^2 -value.

certain extent and promote recovery.^[18] In addition, with the increase of patients' anxiety and depression, and affected by factors such as medical environment and treatment, patients were prone to stress insomnia symptoms such as difficulty in falling asleep, tossing and turning, and sometimes not sleeping through the night.^[19] In this study, the PSQI score before intervention in both groups was greater than 8 points, indicating poor sleep quality. Therefore, in assistance to conventional treatment, relevant interventions can be carried out in patients with negative emotions and sleep quality.

Progressive relaxation exercises allow patients to experience 2 different states of feeling by tensing and relaxing muscles in a sequence. This can promote muscle relaxation and leave the whole body in a relaxed state, which can effectively relieve negative emotions such as tension, fear, and anxiety.^[20]

Park et al conducted progressive muscle relaxation therapy for 4 weeks in 35 dental patients, and evaluated them after

intervention, and then again 3 months after intervention, and found that progressive muscle relaxation therapy can effectively regulate the peripheral and central nervous system, thus reducing the tension and anxiety of dental patients.^[21] In addition, other studies have pointed out that progressive relaxation training could improve mood by relieving pain in patients, which is considered an effective adjuvant to relieve pain in patients with advanced cancer,^[22] and can also reduce the frequency of migraine patients.^[23]

The results of this study showed that there was no statistically significant difference in the scores of GAD-7 and PHQ-9 between the 2 groups before the intervention ($P > .05$). After the implementation of progressive muscle relaxation training, the GAD-7 and PHQ-9 of the observation group decreased, and the scores were lower than those of the control group. The differences between the 2 groups were statistically significant ($P < .05$). This suggests that progressive muscle relaxation training can improve

Table 2**Comparison of GAD-7, PHQ-9, and PSQI data between the 2 groups.**

Variables	Control (n=40)	Experimental (n=39)	<i>t</i> -value	P-value
GAD-7				
Before the intervention	5.72 ± 3.71	5.38 ± 5.25	-0.333	.740
After the intervention	5.77 ± 3.72	3.69 ± 2.99	-2.736	.008
PHQ-9				
Before the intervention	5.20 ± 2.88	5.05 ± 4.86	-0.166	.869
After the intervention	6.02 ± 3.74	3.69 ± 3.93	-3.040	.003
PSQI				
Before the intervention	10.08 ± 5.43	10.25 ± 2.75	-0.177	.860
After the intervention	9.72 ± 5.08	7.41 ± 2.42	-2.570	.012

the negative emotions of COVID-19 patients. However, the effect of progressive relaxation training on pain and blood oxygen saturation in patients has not been studied in this study, which needs to be further discussed.

Progressive relaxation exercises help to balance the sympathetic nervous system by relaxing the body, lowering blood pressure, stimulating blood circulation, and ensuring muscle relaxation. Although the function of sleep is not fully understood, it is a basic human need, functioning to maintain body energy and help regulate this process.^[8] In this study, no statistically significant difference in PSQI scores between the 2 groups were found before the intervention ($P > .05$), and the PSQI of the observation group was lower than that of the control group after the implementation of progressive muscle relaxation training ($P < .05$). This suggests that progressive muscle relaxation training can help patients fall asleep and improve the sleep quality of COVID-19 patients.

Aksu^[8] conducted a single blind prospective randomized controlled trial on 26 patients undergoing open-heart surgery, and their results showed that progressive muscle relaxation training could improve the sleep and quality of life of patients after pneumonectomy. A study conducted a progressive relaxation training intervention in 45 patients with chronic obstructive pulmonary disease, and the results of their study showed that progressive relaxation training is an effective intervention to relieve related fatigue and sleep quality.^[9] In this study, the patients pointed out that during the training, they concentrated on the contraction and relaxation of skeletal muscle group, temporarily reducing their attention to the disease and the stress level of the body. Further through relaxing their bodies they also reached psychological relaxation, successfully calming down and falling asleep. Therefore, progressive relaxation training can effectively improve the sleep quality of COVID-19 patients.

6. Limitations

Results of this study are limited by the small sample and short evaluation period. Results may thus not apply to all COVID-19 patients in different areas of China or other populations. Patients were also from a single institution, which may cause a location bias. Although our results suggest the effectiveness of this progressive muscle relaxation training in improving negative emotions such as anxiety and depression and sleep quality in Covid-19 patients, further multicentered studies with longer application of the intervention are needed to confirm our results.

7. Conclusions

In summary, with the change of medical model from the biomedical to the biopsychosocial, increasing attention has been paid to the importance of patients' psychological problems in the treatment and prognosis of diseases. As a non-drug intervention therapy, progressive muscle relaxation training has the advantages of being economical, easy to operate, safe, and comfortable. The results of this study showed that progressive muscle relaxation training significantly improved negative emotions such as anxiety and depression and sleep quality in COVID-19 patients during isolation treatment, which has positive significance in improving the treatment effect of patients, being worthy of clinical attention.

8. Relevance to clinical practice

The significant improvement in sleep quality and psychological condition suggest that progressive muscle relaxation training could be developed as an intervention to improve both sleeping and psychological care by nursing staff and sleep and psychological conditions in patients with covid-19.

Author contributions

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