Influences of Psychological Intervention on Negative Emotion, Cancer-Related Fatigue and Level of Hope in Lung Cancer Chemotherapy Patients Based on the PERMA Framework

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Abstract

Background: Psychological status is a decisive factor for regulating the lung cancer chemotherapy patients' levels of fatigue and hope. Using the PERMA (Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment) framework. We aimed to explore the influences of the psychological intervention on the patients' negative emotion, cancer-related fatigue, and level of hope.

Method: A total of 100 lung cancer chemotherapy patients admitted in Wuhan No.4 Hospital, China, from Jan 2018 to Aug 2019 were enrolled as research objects divided into the control group and observation group. Positive psychological intervention using the PERMA framework was given to the observation group. The scores of Post-Traumatic Growth Inventory (PTGI), Self-rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS), Cancer Fatigue Scale (CFS), and Herth Hope Index (HHI) were evaluated and compared in the two groups.

Results: After the intervention, PTGI score in the observation group is higher than that in the control group, whereas the SAS and SDS scores are lower in the observation group than in the control group, and the differences are statistically significant ($P<0.05$). Score of each CFS dimension and total CFS score in the observation group are all lower than those in the control group, with statistically significant differences ($P<0.05$). Score of each HHI dimension and total HHI score are higher than those in the control group, and the differences are statistically significant ($P<0.05$).

Conclusion: Positive psychological intervention using the PERMA framework can improve the emotional and fatigue state of lung cancer chemotherapy patients and elevate their level of hope.

Keywords: Positive psychology; Framework; Lung cancer; Cancer fatigue; Level of hope

Introduction

Lung cancer is a malignant tumor with the highest morbidity and mortality (1). Chemotherapy is

the main therapeutic method for lung cancer at present, but from the discovery, diagnosis and

chemotherapy of the disease, the patients have to tolerate the disease itself and treatment-related adverse reactions and bear multiple pressures caused by the weakened family role functions and social functions. The interweaved physical pain and psychological factors can lead to patients' functional changes in emotion, cognition and behaviors, generate a series of negative emotions such as anxiety and depression, further induce or aggravate the cancer-related fatigue (CRF), and impose adverse effects on their quality of life (2). Hope is a reasonable reaction of individuals when faced with stimulation, and a positive yearn for the future. According to a related study (3), the level of hope is a key factor for the psychological self-adjustment of patients when defeating the cancer and the increasing level of hope can facilitate the treatment of patients with cancer. As the medical model is transformed into the biological-psychological-social multi-level multi-dimension model, patients' psychological health problem has become a hot social issue. The psychological status, a decisive factor for regulating patients' levels of fatigue and hope, will directly influence their quality of life, so it is significant to effectively regulate the psychological status of lung cancer chemotherapy patients.

Many scholars have explored the psychological health problems of patients with lung cancer from the angle of traditional psychology. Psychological intervention can effectively relieve the anxiety and depression of lung cancer chemotherapy patients and improve their nutritional status and quality of life (4). The cognitive behavioral therapy were used (CBT) to effectively remit the psychological pain and negative emotions of lung cancer chemotherapy patients, and improve their quality of life (5). Yang et al (6) adopted empathic nursing to improve the psychological status of patients with lung cancer, alleviate their fatigue, elevate their level of hope, and enhance their immunologic functions. However, the intervention used in the past studies aimed to remit the negative emotions caused by diseases, whereas few strategies have mined the patients' positive emotions and potential strengths. The application of positive psychology among patients with can-

cer has recently become a clinical development direction, and it aimed to generate satisfactory clinical effect and public health outcome for the long term. Therefore, the psychological studies of lung cancer chemotherapy patients should not be restricted to the diagnosis and treatment of psychological illnesses, but emphasis should be given on transforming "negative psychology" to "positive psychology".

Positive psychology is a psychological research field that emerged in America in the 1990s (7). Positive psychology pays close attention to positive qualities and advocates the use of scientific principles and methods to mine positive qualities. It also involves using potential strengths to facilitate the development of man and society, thus reaching the optimal function and happiness of man. With the development of positive psychology, the father of positive psychology, the framework of positive emotion, engagement, relationships, meaning, and accomplishment (PERMA) was put forward, which transforms the subjective feeling-centered happiness into multi-angle concrete definition and measurement of happiness (8-9). According to the PERMA framework, a life of vibrant happiness has five elements, namely, positive emotion, input, interpersonal relationship, meaning, and sense of achievement. The correct use of the theory of positive psychology to guide patients to improve their positive emotions, relieve negative emotions, and further improve their CRF, level of hope, and happiness will be of great significance to patients, their families, and the whole society.

Based on the above statement, the positive psychological intervention based on the PERMA framework was applied to lung cancer chemotherapy patients with the objective of investigating its effects on patients' negative emotions, CRF, and level of hope and to provide a certain reference for facilitating the physical and psychological health of patients with cancer.

Materials and Methods

A total of 100 lung cancer chemotherapy patients admitted in Wuhan No.4 Hospital, China, from

Jan 2018 to Aug 2019 were enrolled through the convenience sampling method as the research objects. All patients signed the informed consent. Inclusion criteria were as follows: 1) definitively diagnosed with lung cancer through pathological examination; 2) aged 18–70 yr old; 3) received chemotherapy for the first time; and 4) had clear consciousness and normal communication ability and could cooperate to complete this study.
Exclusion criteria were as follows: 1) had concurrent serious cardiovascular and cerebrovascular diseases; 2) had a history of other tumors; 3) serious mental disorder or cognitive disorder; 4) had concurrent serious somatic illnesses; 5) estimated

survival time was less than three months; and 6) had participated in similar interventions or currently participating in other psychological interventions. The random number table was used to simply and randomly divide the patients into the control group (n=50) and observation group (n=50). Meanwhile, to avoid infection, the patients in the observation group were arranged in the inpatient area A, and those in the control group were arranged in the inpatient area B. The information of the two groups were in equilibrium and comparable (P>0.05, Table 1). This study was approved by the Ethics Committee of Wuhan No.4 Hospital, China.

Table 1: Comparison of general information between the two groups

Group	Gender (male/female, cases)	Age (x±s , years old)	TNM staging (Stage II/III/IV, cases)	Pathological type (squamous cell carcinoma/adenocarcinoma/ other, cases)	Educational level (middle school/high school/college, cases)	Monthly family income (<2000/2000-4000/>4000 RMB, cases)	Marital status (married/divorced or widowed, cases)
Observation group (n=50)	29/21	56.41± 8.14	15/24 /11	23/19/8	15/23/12	8/24/18	44/6
Control group (n=50)	27/23	57.32± 7.89	13/27 /10	21/20/9	14/26/10	9/22/19	42/8
t/χ2 value	0.162	0.568	0.367	0.175	0.400	0.173	0.332
P value	0.687	0.572	0.832	0.916	0.819	0.917	0.564

Methods
1) Form a positive psychological intervention team
An intervention team was formed by three clinical nurse specialists with nurse-in-charge titles and four nursing interns. Before the intervention, all team members could correctly master the application and skills required to implement a PERMA framework-based psychological intervention. During the research process, two clinical nurse specialists were responsible for the implementation of the intervention plan. Three nursing

interns assisted in the implementation of the intervention plan, and undertook data collection, processing, and analysis work.

2) Formulate a positive psychological intervention plan
By looking up the literatures related to positive psychology, PERMA framework, and mental nursing after cancer chemotherapy, the expected goals of intervention were combined, and the team members formulated the initial draft of positive psychological intervention through discus-

sion. They invited psychologists to review and modify the initial draft. In addition, a trial test was conducted by selecting 10 patients according to the inclusion and exclusion criteria, and feedback was collected from the patients. The problems that might have arisen during the intervention were summarized. A final intervention plan was obtained after being revised eight times, as follows.

The 1st time: with the theme "positive cognition of illness and self", the aim was to establish a sense of trust with the patients and construct a companion support system to encourage the patients to positively recognize the illness and themselves.

The 2nd time: the theme was "positive correction of non-rational beliefs", which aimed to correct the patients' non-rational beliefs that influence the establishment of positive thought and to use rational beliefs to rethink and explain problems.

The 3rd time: the theme was "cultivate grateful and positive qualities," which aimed to guide the patients' grateful quality and help them find beautiful emotions, such as kinship and friendship in life.

The 4th time: the theme was "positive emotion," which aimed to cultivate the patients' positive emotions and optimistic attitudes by learning positive words.

The 5th time: the theme was "input," which aimed to distract the patients from the illness through the experience of the "flow of happiness."

The 6th time: the themed was "positive interpersonal relationship," which aimed to help patients perceive positive ways of communication and their advantages through interview and role play.

The 7th time: the theme was "meaning," which aimed to help the patients establish positive outlooks on the meaning of life.

The 8th time: the theme was "achievement," which aimed to help the patients obtain a sense of achievement.

3) Implementation of intervention

The PERMA framework-based psychological intervention was implemented in the observation group on the basis of usual care. The interview was combined with exercise to realize one-to-one intervention (twice per week, 30–40 min each time) in the inpatient wards. Only usual care was given to the control group, including illness and health education, chemotherapy-related knowledge guidance, management of drug administration, diet and nutritional care, disease observation, and adverse reaction nursing along with psychological counseling and social support, etc.

4) Quality control

Research design phase: A one-month preliminary experiment was carried out to observe the patients' receptivity to the intervening measures, evaluate the experimental reasonability and lay a foundation for the formal experiment. After the preliminary experiment, the experimental contents were re-determined according to the results, and the intervention plan was finalized by inquiring related literatures, reading books, and consulting experts.

Implementation phase of the intervention: The patients were included in strict accordance with the inclusion and exclusion criteria, and all members of the intervention team participated in related training; to avoid pollution, the two groups of patients were arranged in different inpatient wards under the precondition that the informed consent was obtained from the patients.

Data collection and analysis phase: Uniform filling instructions were used, and the questionnaire was filled by the patients themselves. The collectors answered the doubts of the patients over questionnaires by staying beside them during the whole process. They timely checked the filing quality after the questionnaire was completed. They inquired the patients' accurate intentions when any multiple choice or omission was encountered to guarantee the integrity and validity of the questionnaire. The data typing, rechecking, and analysis were all undertaken by two persons.

5) Evaluation indexes

Posttraumatic growth inventory (PTGI) (10), which included the five dimensions, namely, re-

flections on life, personal strength, new possibility, relationship with others, and self-transformation, for a total of 20 items. Likert 6-grade scoring was used for each item, i.e., 0–5 scores from completely no to very much, and the total scores ranged from 0 to 100. A high score represented high PTGI level. The Cronbach's α coefficient and construct validity of this scale were 0.87 and 0.86, respectively.

Self-rating anxiety scale (SAS) (11) and self-rating depression scale (SDS) (12) contained 20 items and were compiled by Zung. Likert 4-grade scoring was adopted, where an SAS score of <50 meant normal, and 50–59, 60–69, and ≥70 represented mild, moderate, and severe anxiety, respectively. An SDS score of <53 meant normal, and 53–62, 63–72, and ≥73 represented mild, moderate, and severe depression, respectively. The Cronbach's α coefficients of the scales were 0.87 and 0.85, and the retest coefficients were 0.81 and 0.80, respectively.

Cancer fatigue scale (CFS) (13), which was designed by Okuyama et al to evaluate individual fatigue, included three dimensions, namely, physical, emotional, and cognitive fatigue. It had 15 items. The scores of each item ranged from 1 to 5, and the total score was 5–75. A high score represented more serious fatigue. The Cronbach's α

coefficient and retest reliability of this scale were 0.85 and 0.75, respectively.

Herth hope index (HII) (14) was compiled by American scholar Herth to evaluate patients' level of hope and included three dimensions, namely, positive attitudes toward reality and the future, taking positive action, and keeping intimate relationship with others. It had 12 items. A 4-grade scoring method was used for each item, and the total score was 12–48. A high score represented a higher level of hope. The Cronbach's α coefficient and validity coefficient of this scale was 0.85 and 0.81, respectively.

Results

Comparison of PTFI, SAS, and SDS scores between the two groups before and after the intervention

Before the intervention, the comparative differences between the two groups in PTGI, SAS, and SDS scores were not statistically significant. After the intervention, the PTGI scores in the two groups were elevated ($P<0.05$), their SAS and SDS scores were reduced ($P<0.05$), the PTGI score in the observation group was higher than that in the control group ($P<0.05$), and both SAS and SDS scores were lower than those in the control group ($P<0.05$), as shown in Table 2.

Table 2: Comparison of PTGI, SAS, and SDS scores between the two groups before and after the intervention ($\bar{x}\pm s$, scores)

Group	Time point	PTGI score	SAS score	SDS score
Observation group (n=50)	Before intervention	48.25±6.21	58.24±9.33	59.68±9.84
	After intervention	64.32±5.65ab	44.65±6.39ab	46.72±6.71ab
Control group (n=50)	Before intervention	49.11±6.59	57.71±8.82	58.78±10.11
	After intervention	53.12±5.86a	48.19±6.27a	52.21±7.25a

Note: [a] *P<0.05* in comparison with the same group before the intervention; [b] *P<0.05* in comparison with the control group after the intervention

Comparison of CFS score between the two groups before and after the intervention

The comparative differences between the two groups in CFS score before the intervention did not have statistical significance ($P>0.05$). After

the intervention, the CFS scores in both groups were reduced (*P*<0.05), and the CFS score in the observation group was lower than that in the control group (*P*<0.05), as shown in Table 3.

Table 3: Comparison of CFS score between the two groups before and after the intervention ($\bar{x}\pm s$, scores)

Group	Time point	Physical fatigue	Emotional fatigue	Cognitive fatigue	Total CFS score
Observation group (n=50)	Before intervention	21.85±6.84	11.27±3.56	11.51±3.42	44.63±8.86
	After intervention	18.21±5.71a	8.84±2.26a	8.98±2.65a	36.03±7.15ab
Control group (n=50)	Before intervention	22.14±6.71	10.97±3.68	11.42±3.21	44.53±8.21
	After intervention	20.45±6.13	10.21±2.67	10.51±2.82	41.17±7.68a

Note: [a] *P*<0.05 in comparison with the same group before the intervention; [b] *P*<0.05 in comparison with the control group after the intervention

Comparison of HHI score between the two groups before and after the intervention

The comparative differences between the two groups in the score of each HHI dimension and the total HHI score were not statistically signifi-cant. After the intervention, the score of each HHI dimension and total score were elevated in both groups (*P*<0.05), and the HHI score in the observation group was higher than that in the control group (*P*<0.05), as shown in Table 4.

Table 4: Comparison of HHI score between the two groups before and after the intervention ($\bar{x}\pm s$, scores)

Group	Time point	Positive attitudes toward reality and future	Take positive action	Keep intimate relationship with others	Total HHI score
Observation group (n=50)	Before intervention	9.75±1.45	9.89±1.51	10.24±1.36	29.88±2.51
	After intervention	12.21±1.23ab	12.51±1.39ab	12.23±1.22ab	36.95±2.47ab
Control group (n=50)	Before intervention	9.91±1.52	10.11±1.42	10.31±1.42	30.33±2.45
	After intervention	11.36±1.18a	11.41±1.31a	11.12±1.15a	33.89±2.48a

Note: [a] *P*<0.05 in comparison with the same group before the intervention; [b] *P*<0.05 in comparison with the control group after the intervention

Discussion

Table 2 showed that after the intervention, the PTGI score in the observation group was higher than that in the control group, the SAS and SDS scores were lower than those in the control group, and the differences were statistically sig-nificant. These results indicated that the positive psychological intervention based on PERMA framework could help improve the PTGI level of lung cancer chemotherapy patients and relieve

the patients' anxiety and depression. This finding was identical with that obtained in the report of Breitbart et al (15). On the one hand, the grateful and positive qualities were cultivated by mining good feelings through interview over non-rational beliefs and exercise of "three good things," which enriched the patients' reflections on life to a certain extent, thus helping elevate their PTGI level. On the other hand, the patients were facilitated to set up confidence in combating the illness by exercising companion support and exchange and role play. Meanwhile, the scope of interpersonal communication was expanded, thus enhancing their sense of social support and improving their PTGI levels. The exercise of positive words could transform the patients' negative emotions into positive ones and boost the development of their posttraumatic positive qualities (16). The cultivation of positive emotions and improvement of PTGI level could break through the inherent thoughts, emotions, and behaviors, implant positive beliefs deep in their heart, help them rediscover themselves, change unhealthy emotions and cognitions, enhance their confidence in coping with diseases, reshape their hope towards life, and further effectively relieve the anxiety and depression. Mining patients' good feelings and enriching their reflections on life through the intervention pattern based on story theory can help cultivate their positive qualities, elevate their PTGI level, remove their negative emotions, and improve their quality of life (17).

The results in Table 3 showed that after the intervention, the score of each CFS dimension and total CFS score in the observation group were lower than in the control group, thereby indicating that the patients' physical, cognitive, and emotional fatigue were all relieved and that PERMA framework-based positive psychological intervention could improve the CRF of lung cancer chemotherapy patients. These results were similar to those of a previous report (18). CRF, a persistent subjective fatigue caused by the cancer itself and related treatments, is manifested by weakness and activity intolerance. It cannot be relieved through rest or sleeping. For instance,

Lengacher et al (19) used the Mindfulness-Based Stress Reduction to conduct positive psychological intervention with patients with breast cancer, aroused their innermost mindfulness by means of mindfulness meditation and yoga exercises, let them concentrate on the present, effectively relieved their pressure, and improved their psychological symptoms and fatigue symptoms. Rosenfeld et al (20) used the meaning-centered psychotherapy to effectively alleviate the psychological pain of patients with cancer and improve their CRF and quality of life by enhancing the meaning of their life. All of these results coincided with the results obtained in this research, thereby indicating that the positive psychological intervention could improve the patients' CRF. The PERMA framework-based positive psychological intervention was implemented in this research. Eight intervention plans with themes of "cultivate grateful and positive quality," "input," "meaning," "achievement," and others were formulated to perform positive psychological intervention with lung cancer chemotherapy patients. Obvious effects were obtained. The usual care was given to the control group. The psychological interventions aim at removing negative emotions caused by the illness. However, little attention is given to mining the patients' positive emotions and potential strengths. Although their psychological symptoms and fatigue symptoms improved, they were not as good as those in the observation group, suggesting that the emphasis should be on the application of positive psychology among patients with cancer. More comprehensive psychological support should be provided to better improve their physical and psychological symptoms. As shown in Table 4, after the intervention, the scores of HHI dimensions (positive attitudes towards the reality and life, taking positive action, and keeping intimate relationship with others) and the total HHI score in the observation group were all higher than those in the control group, thereby indicating that the PERMA framework-based positive psychological intervention could improve the level of hope of the lung cancer chemotherapy patients. This finding agreed with the study of Jia et al (21). Hope is an individual's

firm belief in life and is a key factor for psychological self-adjustment of patients with cancer. A high level of hope can improve the patients' initiative during treatment and can generate positive influences on their quality of life. In this study, the patients in the observation group showed an improved level of hope after receiving the PERMA framework-based psychological intervention. The patients were guided through the interview to correct their negative cognition and to cultivate positive qualities, such as self-confidence, optimism, and gratitude. On the one hand, the patients' conscious level was transformed from evading and dependence to facing everything, which improved their level of hope. On the other hand, forming the companion support pattern, as well as participating in multiple exercises like companion exchange, role play, and experience of "flow of happiness," helped the patients find pleasure in life and discover progress and hope of recovery, which allowed them to find the value of life; this was an important means of improving their level of hope. All of the abovementioned findings are consistent with the results acquired in this paper. Therefore, the positive psychological intervention can relieve the negative emotions and CRF of patients with cancer' and facilitate the improvement of their level of hope. Moreover, the intervention significantly improved their quality of life.

Conclusion

The PERMA framework-based positive psychological intervention can improve the psychological status and fatigue status of lung cancer chemotherapy patients and elevate their level of hope. Thus, it is significant to reinforce psychological intervention among lung cancer chemotherapy patients. Implementing positive psychological intervention based on the theory of positive psychology, focusing on positive qualities of people, and mining their potential strengths will facilitate the healthy development of an individual's physical and mental states. This intervention pattern is worthy of clinical promotion among patients with cancer.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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