Effect of Resourcefulness Training on Symptoms Distress of Patients with Nasopharyngeal Carcinoma

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Background:
Symptom distress is very common in patients with nasopharyngeal carcinoma (NPC) during radiotherapy, seriously affecting their quality of life and impeding the process of rehabilitation. Resourcefulness training can enhance the level of resourcefulness and benefit-finding, palliate symptom distress, and promote disease rehabilitation. However, the effects of resourcefulness training on local complications and benefit-finding in NPC patients during radiotherapy remains poorly understood.

Material/Methods:
Questionnaires and resourcefulness training intervention were used in this study. The relationships among resourcefulness, benefit-finding, and symptom distress of 304 NPC patients were analyzed and the effects of resourcefulness training on NPC patients (N=80) were evaluated during radiotherapy.

Results:
Among the 304 NPC patients, age, educational level, occupation, family monthly income, method of payment of medical expenses, and histological types were significant factors influencing resourcefulness and benefit-finding. The patients' resourcefulness was positively correlated to their benefit-finding; and their distress was negatively correlated to their resourcefulness. After resourcefulness training for 2 months, average scores of the resourcefulness and benefit-finding were significantly increased in the intervention group (N=40) compared to those in the control group (N=40). Average scores of symptom distress were significantly reduced in the 2 groups, but they were reduced more significantly in the intervention group than in the control group.

Conclusions:
The patients' benefit-finding and symptom distress were correlated with their resourcefulness. Resourcefulness training could enhance the level of resourcefulness and benefit-finding, palliate symptom distress, and promote disease rehabilitation in NPC patients during radiotherapy.

MeSH Keywords:
Affective Symptoms • Cost-Benefit Analysis • Nasopharyngeal Neoplasms

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Background

Nasopharyngeal cancer (NPC) is a common malignant tumor in Southern China and Southeast Asia. Radiotherapy is the preferred treatment for NPC. It causes symptom distress (SD), including dry mouth, syrigmus, difficulty swallowing or chewing, and difficulty opening the mouth [1]; it seriously affects their quality of life and impedes the process of rehabilitation. Because the local radiotherapy field is directly exposed to radiation, local complications of radiotherapy are the main symptoms in NPC patients during radiotherapy [1,2]. It was reported that SD was significantly correlated with age, gender, coping style, mental health status, and quality of life [3]. SD in cancer patients can be alleviated by positive coping styles and can be aggravated by negative coping styles [4]. Cognitive-behavioral intervention can effectively alleviate SD and improve the quality of life in NPC patients during radiotherapy [5,6]. Moreover, the patient's mood, somatic symptoms, and ability to cope with the disease and treatment are seriously affected by the complications caused by radiotherapy, which can be effectively alleviated by strengthening symptom management and using positive coping styles [7]. In the 1980s, it was considered that cancer was associated with disease-related stressors and negative psychological sequelae. Then, it was found that people would find positive and beneficial effects in adverse situations such as diseases, researchers named the positive psychological experience "benefit-finding" (BF) [8,9]. BF, as a positively stimulating factor, can help cancer patients to overcome disease and optimistically face life's challenges. Promoting BF is beneficial for recovery of physical and mental health and improves the quality of life [10]. Resourcefulness (RS), including learned resourcefulness (LRS) (namely, personal resourcefulness) and social resourcefulness (SRS), is a comprehensive ability to perform routine duties alone and acquire support from the external world when needed [11]. RS was applied in patients with different diseases, including elderly patients with chronic diseases [12] and intestinal cancer survivors [13]. The results showed that the elderly patients with chronic diseases changed their behaviors, and finally improved their quality of life after 6 weeks of training. Gonzalez et al. [14] reported that the RS levels of patients with dementia were improved, anxiety levels were reduced, and behavioral problems were reduced after 6 weeks of RS training. Most of the research teams in China focused on the Taiwan area, including healthy people [9,15] and type 2 diabetes patients. The findings of Huang [16] and others showed that nurses could better control blood glucose and improve quality of life in patients with type 2 diabetes. However, the effects of RS training on local complications and BF in NPC patients remains poorly understood. In this study, we investigated the RS, BF, and SD in NPC patients during radiotherapy and analyzed the relationship among them. We also evaluated the effects of RS training on RS, BF, and SD. Our results suggest that RS training can increase RS level, enhance BF, reduce local complications, improve ability to cope with disease, and promote the rehabilitation process.

Material and Methods

Participants

A total of 304 NPC patients undergoing radiotherapy were recruited from 1 October 2015 to 30 March 2016 at the Department of Internal Medicine-Oncology, the First Affiliated Hospital of the University of South China, the Second Affiliated Hospital of the University of South China, and Hunan Provincial Tumor Hospital. Inclusion criteria were: (a) age 25–70 years; (b) diagnosed by histopathology as NPC; (c) scheduled to receive radiotherapy; (d) being able to respond to the questionnaires independently; and (e) not having psychiatric disorders or other malignancy. Exclusion criteria were: (a) refused participation; (b) having not been given radiotherapy; (c) recurrent NPC; and (d) serious medical conditions such as severe hypertension, diabetes, or cardiovascular disease. The eligible participants were informed of the research purpose and procedures. The average time for administering the full questionnaire was 30–40 min. Every patient signed an informed consent form approved by the local Ethics Committee. All investigations were conducted in accordance with the principles expressed in the Declaration of Helsinki.

The questionnaire included 12 general information. There were 2 dimensions of the resourcefulness scale, 6 dimensions of the benefit-finding scale, and 2 dimensions of the M.D. Anderson Symptom Inventory-Head & Neck (MDASI-H&N) Scale. According to Kendan's sample estimation method, the sample content was 10 to 20 times the maximum number of variables, and the sample size was $10×(12+2+6+2)$~$20×(12+2+6+2)$, yielding 220~440 patients. In order to reduce error, the sample size was increased by 20%, finally reaching 264~528 patients.

Socio-demographic information and clinical characteristics in patients with NPC

A standardized proforma questionnaire was used to collect socio-demographic information including gender, age, level of education, marital status, occupation, monthly family income, home address, and medical insurance. The clinical characteristics, including TNM clinical stages, histological types, total radiation dose, and total number of radiation treatments, were collected from hospital medical records.

Measurement scales

We used 3 measurement scales. (a) The Resourcefulness Scale was used to measure LRS and SRS. The items were rated on

the scale ranging from 1 to 5. Scores ranged from 0 to140. The higher the score was, the higher the level of RS was [17]. The Chinese version of the scale was translated by Wan Shu-mi [9]. The RS scale consisted of 28 items. The items were rated on the scale ranging from 1 to 5. Scores range from 0 to 140. The higher the score was, the higher the level of RS was. (b) The Benefit-Finding Scale for Adults (BFS-A) was used to measure BF [18], which consisted of 6 subscales (Acceptance, Family Relations, Personal Growth, World View, Social Relations, and Health Behaviors) (its Chinese version was translated by Liu Zhun-zhun) [19]. Each item was rated on a 5-point scale, and responded the options ranging from 1 (not at all) to 5 (extremely). Higher scores indicated greater BF status. (c) The M.D. Anderson Symptom Inventory-Head & Neck (MDASI-H&N) Scale was specifically developed for patients with head and neck cancer [2], which included symptom severity items (22 items) and symptom interference (6 items) assessing the severity of effects on daily life. The symptom items were measured on a 11-point scale, and the options ranged from 0 (not present) to 10 (as bad as you could imagine in severity of the symptom). The interference items were also rated on a 0–10 scale range from 0 (not interfering) to 10 (interfering completely). Among them, 0 was classified as asymptomatic or unaffected, <5 was mild, 5–7 was moderate, and 7–10 was severe.

Resourcefulness training intervention

Another 88 NPC patients who were not included in the 304 baseline survey patients were selected for intervention in 1 of the 3 Grade A Class-3 hospitals. Eighty-eight patients with NPC undergoing radiotherapy at the First Affiliated Hospital of the University of South China were selected and randomly and evenly divided into the control group (N=44) and the intervention group (N=44). Four patients in each group failed to complete the study because of quitting or other reasons. The demographic details, RS, BF, and SD in the 2 groups were compared. On the basis of RS theory, patients in both groups were given with routine health education, but the patients in the intervention group were also given with RS training for 2 months. Routine health education included oral education of NPC-related knowledge, psychological nursing, and diet nursing. Corresponding knowledge of treatment and nursing care were provided for the patients with radiotherapy adverse reactions. Compared with routine health education, RS training cultivated the subjective initiative of patients, such as "using self-regulation (one term of personal RS) for NPC patients to extend relevant information", "the patients himself/herself master opening-mouth training, neck training, and emotion control skills", and "correcting the patient's bad cognition". Problem-solving strategies, complications, and other solutions were included in the teaching of patients. The belief in coping effectiveness could be used to persuade patients using skills such as persuasion, behavioral contract, substitute experience, and negative stimulus avoidance. Patients were encouraged to use formal and informal self-support, such as using communication skills to apply for help, learning to adjust the interpersonal relationship and family relationship, and receiving help from professional relationships and family relations. The scores of RS, BF, and SD were assessed before and after RS training. RS training intervention was carried out for 30–45 min twice a week. The intervention included 4 stages.

The first stage: Introduce the brochures for the patients

At the beginning of the stage, we handed out and actively introduced NPC health education brochures to the patients. The brochures included NPC etiology, pathogenesis, and prognosis, the basic principle of radiation, the necessity of NPC radiotherapy, complications and nursing of patients after radiotherapy, and emotion management. Moreover, we recommended rehabilitation books and a professional website, and encouraged them to actively seek help. We taught the patients to make a list of problems encountered during radiotherapy, and to solve problems one by one in order of priority. The patients were instructed in relaxation training and self-image cognitive-behavioral skills depending on their psychological status during radiotherapy. Relaxation training [20] was performed in a quiet environment in which the patients lay on their backs comfortably, naturally, and relaxed, with arms flat on both sides of the legs, 2 legs slightly apart, and eyes lightly closed. The patients were guided, using slow and soothing language, to contract and relax their muscles from top to bottom in a. The step of muscle contraction last for 5–10 s. The patients were guided to take a deep inspiration and feel the tension of muscles and then, relax 30–40 s and take a deep breath and feel their muscles relaxed. The frequency of contractions and relaxations was 3~4 times per day, 15 min each time, so that the muscles could be fully relaxed. During self-image cognitive-behavioral skills training [6], the patients was taught to get rid of negative thinking and form a rational way of thinking and way of life, establish healthy behavior in favor of disease and treatment, improve self-care ability, promote the smooth implementation of the treatment by increasing the patient's perception of his/her condition, treatment, rehabilitation, and adjust his/her erroneous and distorted thinking and beliefs. After mastering the basic knowledge of NPC, the patients were guided to manage the emotion and side effects after radiotherapy in the formation of their self-cognitive behavior and were encouraged actively to participate in the process of self-management and to reshape the attitude and concept of life. After radiotherapy, the early muscle-relaxation were performed to prevent the temporomandibular joint dysfunction and difficulty in opening the mouth. The patients were encouraged to chew gums and do more chewing exercise after radiotherapy, as well as to massage the head and neck to promote blood circulation. Daily tapping, smiling, tongue movement,

and masticatory muscles and temporomandibular joint exercises were applied to prevent muscle atrophy and joint sclerosis, and to improve the muscle strength of the face and neck. The neck muscles exercise was combined with head and neck side bending, rotation, and massage [21,22], which could increase the bite force. They were reminded of exercising slowly and gently to prevent accidental injury. In addition, relaxation training was also an early form of muscle training that relaxed the muscles of the body, helped sleep, and reduced negative emotions. Furthermore, they were directed in using formal (e.g., to seek help from doctors and nurses) or informal aid skills (e.g., to seek help from family and friends) when they could not solve the problems.

The second stage: Make a weekly care plan and guide its implementation

After radiotherapy, the patients were asked to make nursing plans by themselves and obtain guidance based on their symptoms and SD. We then supplemented and corrected the plan and explained the changes in physical symptoms during radiotherapy so as to make them perform self-care based on understanding changes in the body and to improve compliance. We guided their strategies of self-care and formulated a nursing plan with the Plan-Do-Check-Acting (PDCA) cycle model and tried to encourage them to participate in the process of plan-making. We also used the correct concepts and modified the incorrect concepts shown by the patients in the plan, so as to instill confidence in the treatment and recovery. Furthermore, we taught them the mechanisms of nursing measures, such as relaxation exercises, self-recognition, and early muscle-relaxation methods.

The third stage: Establish and use the PDCA cycle

The plan made in the previous week was evaluated and feedback was provided. The good parts which conformed to the standard of care were encouraged, while the poor parts which violated the standard of care were abandoned, and the reasons for poor compliance were analyzed. In this stage, there were 3 parts. Firstly, the process of intervention returned to the PDCA cycle. We guided the positive self-talk. The patients were instructed to relieve symptoms distress by self-care and were directed to approach the target by their efforts to enhance confidence about overcoming the disease in the face of worsening symptoms. Secondly, we directed the patients with the RS training intervention using verbal narrative, nurse demonstration, playing video games, and patient role-play to improve the effectiveness, so that they could conduct self-regulation correctly during RS training. Finally, we asked the patients to make lists of their symptoms and nursing goals in priority order, and to explain the priorities after we made plans for the patients and told them the purpose of each plan.

We recorded, collected, collated, and fed-back the data so that they could better manage the symptoms by themselves during radiotherapy.

The fourth stage: Establish nursing paths and provide information services

After finishing the PDCA cycles, the nursing paths, namely the nursing care plan for symptom management of the patients, were established during radiotherapy. We established qq or WeChat groups so that the patients could get further informational support.

Data analysis

Statistical analysis was done using SPSS (version 18.0). The means, standard deviations, and percentages were used as the statistical description; chi-square test, t test, analysis of variance, multiple linear regression, and linear correlation were performed for statistical analysis. A P-value <0.05 was considered to be statistically significant.

Results

Socio-demographic information and clinical characteristics in the patients with NPC during radiotherapy

Of 304 patients with NPC, ages ranged from 25 to 70 years with a mean age of 47.41±9.52 years. There were 142 (46.71%) patients with stage III NPC and 146 (48.03%) patients with stage IV NPC. Their other socio-demographic information and clinical characteristics are shown in Table 1.

The scores and the factors influencing RS, BF, and SD in the patients with NPC during radiotherapy

To assess the status of RS, BF, and SD in the patients with NPC during radiotherapy, 304 patients with NPC during radiotherapy were randomly selected and asked to complete a questionnaire survey using the Resourcefulness Scale, BFS-A, and MDASI-H&N. The average total score of RS was 2.68±0.64, and the average score of LRS was 2.73±0.72, which was higher than that of SRS (2.62±0.71). The average score of BF was 2.69±0.81. The scores of the 6 dimensions on BF from higher to lower were followed by social relations, family relations, health behaviors, acceptance, personal growth, and world view. According to the independent-samples t test or one-way ANOVA, occupation, age, method of payment of medical expenses, monthly family income, education level, and histological types were factors influencing RS and BF level of the patients (Table 1). The statistically significant differences were not found when comparing gender, marital status, home source,

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Tabel 1. The scores of RS and BF in NPC patients during radiotherapy.

Independent variable	N	%	RS			BF		
			Score ($\overline{\chi}\pm S$)	t/F	p	Score ($\overline{\chi}\pm S$)	t/F	p
Age								
≥25, <40	60	20.07	3.21±0.45	38.012[b]	0.000**	3.20±0.72	28.274[a]	0.000**
≥40, <65	230	75.33	2.58±0.60			2.60±0.78		
≥65	14	4.60	2.03±0.58			1.98±0.53		
Education level								
Primary school or under	67	22.04	2.20±0.68	23.534[a]	0.000**	2.45±0.92	12.157[a]	0.000**
Junior high school or under	118	38.82	2.67±0.60			2.56±0.70		
Senior high school	69	22.70	2.88±0.44			2.71±0.70		
College level or above	50	16.44	3.07±0.53			3.27±0.77		
Occupation								
Retirement	35	11.51	2.31±0.79	9.196[a]	0.000**	2.63±0.81	5.363[b]	0.000**
Unemployed or farmed	149	49.02	2.58±0.64			2.53±0.79		
Workmen	47	15.46	2.84±0.54			2.72±0.74		
Servant or staff	61	20.07	2.94±0.46			2.93±0.76		
Business	12	3.94	3.12±0.57			3.40±0.98		
Family monthly income								
<1000	60	19.74	2.29±0.68	8.743[b]	0.000**	2.30±0.69	6.046[a]	0.000**
≥1000, <3000	72	23.68	2.71±0.69			2.82±0.84		
≥3000, <5000	96	31.58	2.86±0.53			2.83±0.80		
≥5000, <10000	58	19.08	2.69±0.58			2.64±0.82		
≥10000	18	5.92	2.88±0.52			2.87±0.78		
Method of payment of medical expenses								
At one's own expense	8	2.63	2.71±0.75	52.852[a]	0.000**	2.51±0.96	15.391[a]	0.000**
New cooperative medical insurance	180	59.22	2.61±0.69			2.60±0.86		
Provincial/City medical insurance	110	36.18	2.77±0.54			2.82±0.71		
Public medical insurance	6	1.97	3.21±0.05			3.01±0.02		
Clinical stages								
I, II	16	5.26	2.27±0.53	3.866[b]	0.022*	2.42±0.76	1.105[b]	0.332
III	142	46.71	2.73±0.68			2.67±0.87		
IV	146	48.03	2.68±0.60			2.73±0.75		
Histological types								
Undifferentiated cell carcinoma	224	73.68	2.71±0.64	37.740[a]	0.000**	2.75±0.82	16.811[a]	0.000**
Poorly differentiated carcinoma	71	23.36	2.66±0.65			2.54±0.80		
Moderately differentiated carcinoma	9	2.96	2.13±0.16			2.21±0.23		

[a] Heterogeneity of variance – Welch's t-test; [b] variance – ANOVA; Means, SDs, and statistical significance are denoted (* P<0.05; ** P<0.001).

Tabel 2. Multiple linear stepwise regression analysis of RS and BF.

Dependent variable	Predictors	B	β	t	P	ΔR2	F
RS	Constant	3.025	–	15.678	0.000**	0.273	56.470
	Age	−0.429	−0.315	−5.729	0.000**	–	–
	Educational level	0.192	0.299	5.447	0.000**	–	–
BF	Constant	3.408	–	12.114	0.000**	0.166	19.899
	Age	−0.445	−0.258	−4.375	0.000**	–	–
	Educational level	0.151	0.186	3.157	0.002*	–	–
	Histological types	−0.194	−0.124	−2.339	0.020*	–	–

BF – benefit finding; RS – resourcefulness; * P<0.05; ** P<0.001 by Multiple linear stepwise regression analysis.

Table 3. Pearson correlation between RS and BF (N=304).

RS	BF						
	Total score	Acceptance	Family relations	World view	Personal growth	Social relations	Health behaviors
Total score	0.492**	0.188**	0.383**	0.537**	0.418**	0.373**	0.451**
LRS	0.482**	0.200**	0.386**	0.458**	0.454**	0.365**	0.415**
SRS	0.381**	0.124*	0.282**	0.509**	0.264**	0.289**	0.385**

BF – benefit finding; LRS – learned resourcefulness; SRS – social resourcefulness. * P<0.05; ** P<0.001 by Pearson correlation analysis.

total radiation dose, and total number of radiations (data not shown). Moreover, age and education level were 2 significant factors affecting RS level of the patients, and patient age, education level, and histological types were the significant factors affecting the level of BF (Table 2).

The average score of symptom severity in the patients was 3.96±1.47, which is at a mild level. All patients had symptom severity. The 5 most frequent symptoms were fatigue, poor appetite, dry mouth, abnormal taste, and sore throat and excess mucus. The average score of symptom interference was 3.62±1.81 and the incidence rate was 98%. The scores of symptom interference from highest to lowest were enjoyment of life, mood, work (including work around the house), relations with other people, general activity, and walking.

The relationship between RS and BF

Pearson correlation analysis was conducted for the average total score of BF and RS, as well as the score of BF and RS subscales. As shown in Table 3, there was a significantly positive correlation between RS and BF (r=0.492, P<0.01), and among various dimensions of BF and RS (r=0.124~0.537, P<0.01) in the 304 patients. BF was used as a dependent variable and RS was used as an independent variable in multivariate regression

analysis. LRS and SRS were important predictors of BF. Higher levels of LRS and SRS were associated with greater BF.

The relationship between RS and SD

Pearson correlation analysis was conducted to identify relationship between RS and SD in the 304 patients. RS was negatively related to symptom interference (r=0.218, P<0.01), but was not related to symptom severity in the patients (r=0.059, P>0.05). LRS was negatively related to symptom severity (*r*=0.134, *P*<0.01) and symptom interference (*r*=0.270, *P*<0.01). SRS was not related to symptom severity or symptom interference (P>0.05).

Demographic and clinical characteristics in the 2 groups in the intervention study

Eighty patients with NPC undergoing radiotherapy at the First Affiliated Hospital of the University of South China were selected and randomly and evenly divided into the control group (N=40) and the intervention group (N=40). The average ages of patients in the control group and in the intervention group were 47.94±6.93 and 46.36±6.46, respectively. The differences of demographic and clinical data between 2 groups, including age, gender, educational level, occupation, marital status,

family monthly income (RMB), home source, histological type, and clinical stages, were not statistically significant (P>0.05).
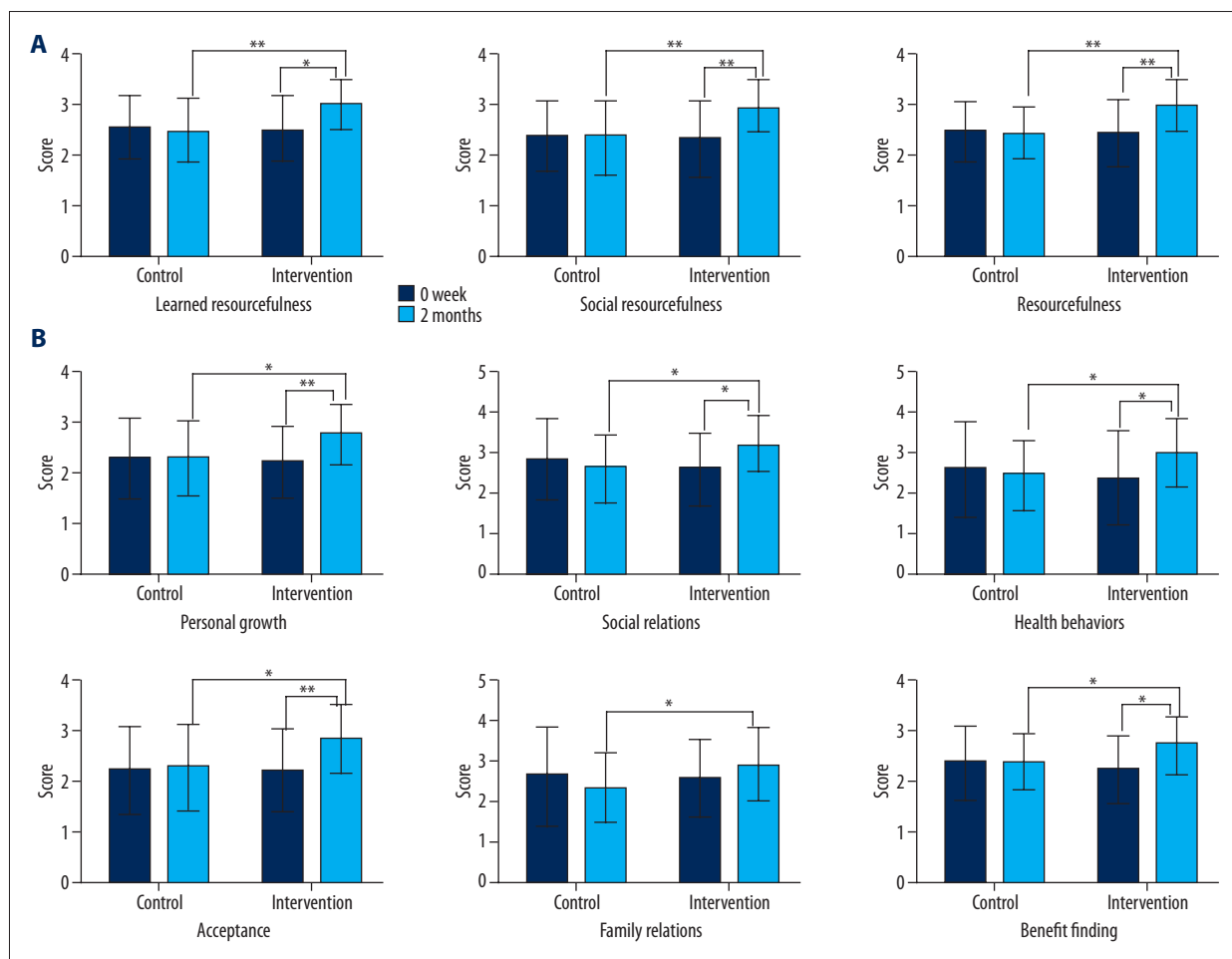
Effects of RS training on RS, BF, and SD in patients with NPC during radiotherapy

Before RS training, average scores of RS, LRS, SRS, various dimensions of benefit-finding, SD, symptom severity, and symptom interference between the 2 groups were not significant (P>0.05). Average scores of NPC patients' RS, LRS, SRS, and various dimensions of benefit finding in the control group compared between before and after intervention were not statistically significant (P>0.05) (Figure 1). After RS training for 2 months, the average levels of RS, LRS, and SRS in the intervention group were significantly higher than in the control group and in the intervention group before RS training (Figure 1A, P<0.05). The average levels of personal growth, social relations, health behaviors, acceptance, and BF in the intervention group were markedly higher than in the control group and before RS training (Figure 1B, P<0.05). The average level of family relations in the intervention group was obviously higher than in the control group (Figure 1B, P<0.05). RS training had no

effect on world view of patients with NPC during radiotherapy (P>0.05, data not shown). After RS training for 2 months, the average level of SD, symptom severity, and symptom interference in the intervention group were remarkably lower than in the control group (Figure 1C, P<0.05). Average scores of symptom severity including problems with tasting food, problems with mucus, having a dry mouth, lack of appetite, and fatigue in the intervention group were significantly less than those in the control group (Figure 1D, *P*<0.05).

Discussion

Resourcefulness is a cognitive-behavioral skill that is important in assisting individuals in coping with stressful events and reducing the incidence of negative emotions such as anxiety and depression [23,24]. RS consists of LRS and SRS. LRS includes self-control, coping skills, and adaptive behavior. SRS is involved in teaching patients when and how to seek help from formal and informal sources [25]. We found that the total mean RS score in patients with NPC during radiotherapy was at a moderate level, the mean score of SRS was at a
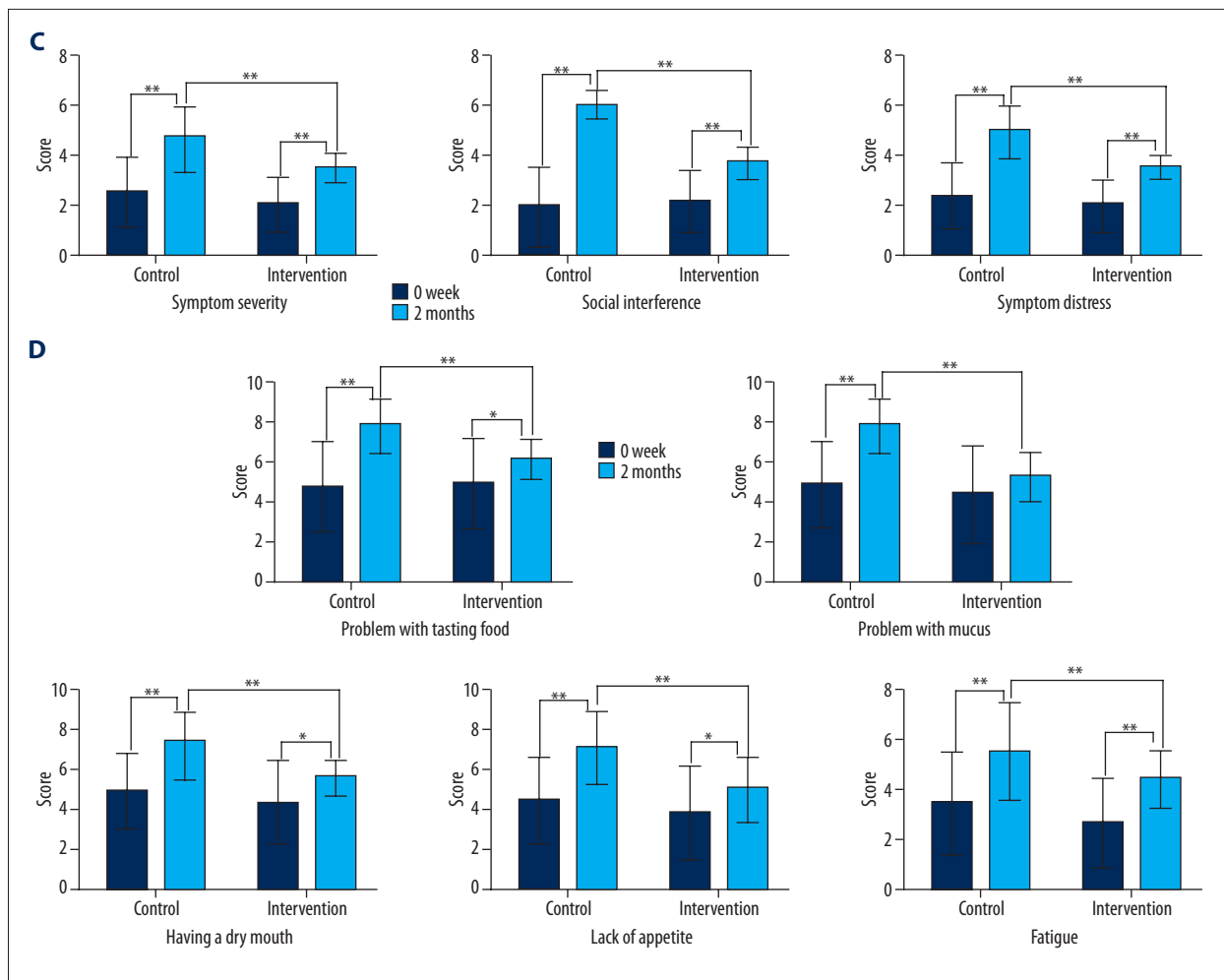
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Figure 1. Effects of RS training on RS, BF, SD, and symptom severity in patients with NPC during radiotherapy. (**A**) Effect of RS training on RS in patients with NPC during radiotherapy. (**B**) Effect of RS training on BF in patients with NPC during radiotherapy. (**C**) Effect of RS training on SD in patients with NPC during radiotherapy. (**D**) Effect of RS training on symptom severity in patients with NPC during radiotherapy. Control, usual-care group; Intervention, RS training group; 0 week, questionnaire survey data were collected before RS training intervention; 2 months, questionnaire survey data were collected after RS training for 2 months; Means, SDs, and statistical significance are denoted (* P<0.05; ** P<0.001 by *t* test of 2 independent samples).

low-to-moderate level, and the patients' LRS was over average level. Based on Confucianism in China, the people tend to be self-reliant rather than seeking help from others, which in return stimulates the grow of LRS. Older age, low literacy, and occupational restriction cause a shortage of effective SRS in NPC patients. In this study, after 2 months of RS training, the total RS, LRS, and SRS scores of NPC patients during radiotherapy in the intervention group were significantly improved compared to that in the control group and in the intervention group before RS training. This finding is consistent with the finding of Wu [26], who suggested that RS training could improve the level of RS in female patients with breast cancer. Therefore, medical staff should teach NPC patients some skills, such as knowledge of disease and treatment, priority setting,

positive self-talk, self-control, effective communication, and help-seeking, so as to improve their LRS and SRS.

Benefit-finding, as an effective positive incentive factor, can affect immune function [27], modulate psychosocial adaptation [10], optimize the use of social support [28], and promote recovery [29]. In the study, the average score of BF was (2.69±0.81), and the mean score of social relationship dimension was higher than that of family relationship dimension. The score of world view dimension was the lowest, and it might be that most people in Hunan province were not religious, so the patients rarely considered their world view. These findings revealed that the psychological comfort and care of NPC patients received from family and friends during the radiotherapy could

strengthen their intimacy and help to enhance the patients' BF. Age was negatively related to BF, but lower education level was associated with lower BF level. Therefore, medical staff should pay more attention to the elderly and less educated patients and their families and teach the importance of social and family relations in order to reduce the negative emotional experience and increase BF.

The findings indicated that RS was positively associated with BF in NPC patients during radiotherapy. A multiple regression analysis showed that LRS and SRS were important variables predicting BF, and LRS was the most significant factor influencing BF. The mean score for LRS was the highest, which indicated a high acceptability for LRS in patients. Lu et al. [30] found that the patients chose self-reliance when coping with stressful situations because when they faced a stressful event, they were reluctant to seek help from others. Instead, they tended to use personal knowledge such as former experience to cope with the problem. SRS is the second significant factor influencing BF in the patients. When the patients cannot handle stressful situations alone, or if inner resources (just like LRS) are insufficient, they turn to external resources (just like SRS) to solve their problem. Mei [31] reported that social support was of great importance to NPC patients undergoing radiotherapy, and effective social support contributed to positive thinking and improved their quality of life. SRS is indispensable for NPC patients undergoing radiotherapy to control stressful situations. Therefore, more attention should be paid to the cultivation of SRS so as to help patients cope better with their disease and promote the rehabilitation process.

Resourcefulness training is beneficial for NPC patients to stabilize negative emotions and enhance BF. After 2 months of RS training, average scores of the patients' family relations were more significantly enhanced in the intervention group than in the control group. The patients felt more care from family and friends and realized the importance of self-regulation of mental and living conditions in disease recovery. Emotion control training helped patients deal more patiently with things and reflect on the life process, use problem-solving skills to replan their future, handle stress issues better, and more systematically manage their life and time with reflection, problem-solving training, and PDCA cycles. The patients indicated they would like to work harder after the disease recovery to realize the value of life and finally improve the personal growth level. Taken together, our results suggest that RS training can improve personal growth of NPC patients during radiotherapy.

Previous studies showed that the better the social relationship in cancer patients was, the more hopeful their life was [32], and the better their quality of life [33]. In the present study, we taught the patients to seek formal and informal help, so that they could benefit from professional training. We found

the patients could actively participate in the RS training program, fully put forward their questions, and share their own experiences and sense the benefit and happiness of communication. Furthermore, the patients could make good use of the effort that caregivers had made in helping them recover and enhance confidence in their recovery. Altogether, their social relationships were improved and the process of recovery was promoted.

Radiation-induced damage to normal tissue and/or organs can cause SD in patients. Symptom distress is a subjective feeling along with the disease or treatment-related symptom, which varies from person to person due to differences in psychological wellbeing, sensation, and pain threshold. In our study, SD occurred in all patients. The 5 most common symptoms were fatigue, poor appetite, sore throat, dry mouth, and abnormal taste. Most of the patients (98%) considered their lives to be difficult, and 23.7% of patients believed that their normal life was severely altered because of these symptoms. Together, the findings suggest that radiation-induced symptoms cannot be neglected, and medical staff need effective interventions to alleviate SD and promote recovery. Goff et al. [23] reported that LRS was important in preventing and reducing the complications of diabetes. Liu et al. [34] suggested that valid social support could effectively improve patients' physical function and total health status. Thus, RS training is indispensable when medical staff provide health education to the patients. A previous study showed that depressed mood could aggravate physical symptoms, increase the toxicity of the medicine, and decrease pain threshold [35]. However, the positive affect could enhance social interaction and improve quality of life [36]. RS training can help patients decrease depressed mood, stabilize the disease, and improve their quality of life by helping them accept the positive effects through the application of inner influences [14], and improve their social interaction through the application of outer influences. This study showed that the improvement of acceptance for positive effects (just like BF) and the application for PDCA cycle in controlling the complications of radiotherapy can effectively improve the depressed mood arising from complications of radiotherapy, as well as its influence on life. During RS training, we taught the patients problem-solving strategies and illustrated the importance of health behavior in order to change their style of problem-solving and interrupt their habitual lifestyle. We also used the PDCA cycle to alleviate the complications of radiotherapy, encourage the patients to do exercises such as walking, tai chi, and rehabilitation gymnastics in a relaxed mood, and to develop a healthier lifestyle. In brief, after 2 months of RS training, the level of BF and the confidence in recovery were significantly improved and the sensation for discomfort was reduced. Altogether, after the systematic training, SD of the patients was effectively alleviated by RS training.

We found various degrees of symptom interference because of complications experienced by the patients during radiotherapy. Because of sleep disorders and malnutrition, the patients felt very tired when walking. Therefore, the patients' quality of life was drastically reduced and complications of radiotherapy greatly increased. After RS training for 2 months, the patients increased enjoyment of life by talking and playing cards with each other. They improved wellbeing and relationships with other patients, families, and friends by using communication skills. The patients managed their complications from radiotherapy by formulating a plan for dealing with symptoms, increased opportunities for information exchange, and acquainted themselves with other patients' friends who were sympathetic. The influence of symptoms on quality of life of the patients was effectively alleviated through these measures.

Conclusions

In summary, SD is very common in NPC patients during radiotherapy, seriously affecting quality of life and impeding the process of rehabilitation. Age, education level, occupation, monthly family income, method of payment of medical expenses, and histological types are factors significantly influencing RS and BF. The patients' BF and SD are correlated with their RS. RS training can enhance the level of RS and BF, palliate SD, and then promote disease rehabilitation. Taken together, our results provide strong evidence that medical staff need to use effective interventions to alleviate SD, decrease the negative impact on quality of life, and promote disease recovery in NPC patients during radiotherapy.

Conflicts of interest

None.

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