



The effect of attention and interpretation therapy on psychological resilience, cancer-related fatigue, and negative emotions of patients after colon cancer surgery

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Background: Colon cancer is the most common malignant tumor of the gastrointestinal tract. This cancer and the related treatments bring a raft of lasting physiological and psychological impacts to patients. This study explored the effects of attention and interpretation therapy (AIT) on improving psychological resilience, cancer-related fatigue (CRF), and negative emotions in patients after colon cancer surgery.

Methods: Patients who had undergone colon cancer surgery in the Affiliated Hospital of Jiangnan University were selected and randomly allocated into an experimental group and a control group, each with 100 cases. Patients in the control group received routine intervention measures, while the experimental group received an extra 10 weeks of AIT. Before and after 10 weeks of intervention, the effects of intervention were evaluated using the Connor-Davidson Resilience Scale (CD-RISC), Self-Rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS) and the Revised Piper Fatigue Scale (PFS-R).

Results: Before the intervention, there was no statistical difference between the scores of psychological resilience, CRF, and negative emotions between the two groups ($P > 0.05$). We compared the scores before and after the 10 weeks of intervention and found that the scores of psychological resilience of the experimental group were higher than before, and the scores of CRF and negative emotion were lower than before. After the intervention, the psychological resilience score of the experimental group was higher than that of the control group, the CRF and negative emotions scores were lower than those of the control group, and the differences were statistically significant ($P < 0.05$).

Conclusions: AIT can effectively strengthen the psychological resilience of patients after colon cancer surgery to a certain extent, reduce anxiety and depression, reduce the degree of CRF, and thus improve the patients' quality of life postoperatively.

Keywords: Attention therapy; interpretation therapy; colon cancer; psychological resilience; cancer-related fatigue (CRF); negative emotions

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Introduction

Colorectal cancer is currently one of the most common malignant tumors of the digestive tract in the world. Relevant literature shows that among the total mortality and morbidity of all cancers in Western countries, the mortality and morbidity of colorectal cancer ranks second. The epidemiological survey of colorectal cancer in my country has shown that the incidence of colorectal cancer is on the rise, and its incidence and mortality are ranked 4th and 5th in the total incidence and mortality of cancer in China. With the improvement of living standards and the continuous changes in environment and lifestyle, the incidence of colon cancer has risen steadily (1). At present, the treatment mode of colon cancer is no longer the single surgical resection of the past. Comprehensive treatment based on surgery is an important treatment principle for colorectal cancer, including surgery, radiotherapy, chemotherapy, immunotherapy, targeted therapy, traditional Chinese medicine treatment, nursing participation and other methods. Multidisciplinary comprehensive treatment based on surgical resection is an important treatment principle for colorectal cancer today (2). After colorectal cancer surgery, patients often have complications such as intestinal dysfunction and abdominal adhesions, especially for patients with intestinal stoma. The surgery not only brings physical discomfort to the patient, but also causes great psychological pressure, leading to their social psychology. Changes in state and psychological activities have reduced the quality of life of some patients. In the past, the quality of a certain surgical method mainly relied on the survival rate of patients after surgery, tumor recurrence rate, the number of lymph nodes removed, and the scope of tumor intestinal resection, while less consideration was given to the happiness or pain of the operation itself. Studies have reported (3-5) that about one-third of cancer patients experience severe anxiety and depression. As a key component of positive psychology (6), psychological resilience is considered to be the psychological and behavioral response of the subject to the changed environment (7). While psychological resilience is a popular field of psychological research, few studies have focused on the psychological resilience of colon cancer patients in China. Cancer-related fatigue (CRF) is a painful, persistent, cancer- or cancer treatment-related subjective feeling of exhaustion disproportionate to activity levels, which is often accompanied by dysfunction. CRF incidence is very common and lasting in cancer patients, and seriously affects

physical and mental health (8-10). The implementation of effective interventions to bolster psychological resilience of cancer patients, thereby alleviating CRF and reducing negative emotions, is vitally important to improve the quality of life of patients after surgery. Attention and interpretation therapy (AIT), as proposed by Loprinzi *et al.* (11), is a systematic method based on stress management and psychological resilience training. The goal of AIT is two-pronged (4,12): the first aim is to divert the patient's attention away from the threat posed by the cancer, train the patients' focus on new prospects, and cultivate a positive, optimistic, and grateful attitude towards life. The second is to help the patient be aware of and avoid negative emotions and to increase their psychological flexibility, thus minimizing stress, enhancing emotional management, and fostering their ability to physically and mentally adapt. Studies have shown that AIT can effectively improve the psychological elasticity of patients with gastrointestinal tumors to a certain extent and reduce anxiety and depression (13). The purpose of this study was to explore the effects of AIT on psychological resilience, CRF, and the negative emotions of patients after colon cancer surgery in order to generate a base of evidence for further promotion and application of this model in the future. We present the following article in accordance with the CONSORT reporting checklist (available at <http://dx.doi.org/10.21037/apm-20-1370>).

Methods

Subjects

Using the convenience sampling method, 200 colon cancer patients admitted between March 10, 2018 and December 25, 2019 to the Affiliated Hospital of Jiangnan University were selected as the research sample and were placed into an experimental or control group using a random number table. Each group comprised 100 cases. The inclusion criteria were as follows: (I) age ≥ 18 years old; (II) colon cancer diagnosis confirmed through pathological specimens; (III) treated with surgery; (IV) cognizance of own condition with the ability to express personal ideas; (V) not participating in other studies or psychological interventions that could affect the results of this study. The exclusion criteria were as follows: (I) other malignant tumors; (II) impaired function of vital organs such as the heart, liver, or kidney; (III) comorbid severe mental illness. This study was conducted in accordance with the ethical principles of

the Declaration of Helsinki (as revised in 2013), and was approved by the ethics committee of our hospital [(2017) KY098]. The study obtained the signed informed consent of all patients.

Interventions

The routine care of the patients in the control group mainly included dietary advice, infection prevention, and oral care guidance, along with monitoring of signs of bone marrow suppression, giving medication according to the doctor's instructions if needed, and providing disease-related education after surgery. On the seventh day post-surgery, patients began progressive muscle relaxation training, which was performed daily for 30 min/time for 10 weeks. During the period of hospitalization, the completion of the training was supervised by the responsible nurse; after being discharged, the patient was supervised by telephone follow-up.

On the basis of routine nursing, the experimental group set the intervention plan according to the theoretical basis of AIT. The experimental group was divided into 10 groups with 10 patients in each group. Before intervention, each group established a personal file based on the patient's case information, existing problems, and emotional state. All patients underwent the first intervention on the seventh day after the operation. As stipulated by the evaluation indicators of AIT, each patient participated in a 10-week stress management and psychological resilience training course. The specific intervention content is shown in *Table 1*.

Investigation method

General information questionnaire

The researchers compiled a general demographic information questionnaire, including gender, age, marital status, education level, payment method, and tumor-node-metastasis (TNM) staging.

Psychological resilience assessment scale

The patients' psychological resilience was assessed using the Connor-Davidson Resilience Scale (Connor-Davidson Resilience Scale, CD-RISC) (14). The scale includes a total of 25 items distributed across the 3 following dimensions: self-confidence (13 items), tenacity (8 items), and optimism (4 items). The items use the Likert 5-level scoring method, with 0 being "not true at all" and 4 being "true nearly all of the time". Scores range from 0 to 100, with a higher score indicating better psychological resilience. A Chinese version

of the scale was revised by Wu *et al.* in 2017, which yielded a Cronbach α coefficient of 0.91 (15).

CRF assessment scale

Patients with CRF were evaluated using the Revised Piper Fatigue Scale (PFS-R) (16). The scale is composed of 22 items categorized into the 4 following dimensions: behavioral severity (6 items), affective meaning (5 items), somatic sensation (5 items), and cognition/mood (6 items). Each item was scored on a visual analog scale from 0 to 10, with 0 indicating no fatigue and 10 indicating extreme fatigue. The score of each item was divided by the number of items to obtain the scale score. Higher scores were an indication of patients experiencing more severe fatigue. The test-retest reliability of the scale was 0.980, the total Cronbach's α coefficient of the scale was 0.914, and the Cronbach's α coefficient of each dimension was 0.891–0.932 (17).

Negative affect scale

The Self-rating Anxiety Scale (SAS) and the Self-rating Depression Scale (SDS) were used to assess the anxiety and depression levels of the two groups. The SAS and SDS both contain 20 items, and adopt the following 4-level scoring method: "none/insignificant", "mild/some of the time in frequency", "moderate/a good part of the time in frequency", "severe/most or all of the time in frequency"; these levels are scored 1–4 respectively. An SAS score ≥ 50 points indicates anxiety, an SDS score ≥ 53 points indicates depression, with even higher scores indicating a greater severity of anxiety and depression (18,19).

Survey methods

Surveys were conducted jointly by investigators and researchers who had undergone unified training. Everyone involved in administering the surveys used the same instructions to distribute questionnaires to those who met participation criteria. If the patient could not fill out the questionnaire themselves for some reason, the investigator read each question to the patient in a neutral and non-directive manner. After ensuring the patient had understood the question, the investigator helped them complete the questionnaire. The questionnaire was distributed and completed in one sitting.

Statistical analysis

SPSS 22.0 software was used for statistical analysis of all data. The measurement data are expressed as mean \pm

Table 1 The intervention content of AIT

Time (week)	Training method	Training content	Quality control methods
1	Intensive teaching	Explain to the patient the theoretical knowledge and intervention process of AIT	After the lecture, ask patients questions to consolidate what they have learned
2	Transcendental meditation	Introduce the method of transcendental meditation training, and emphasize the three elements of meditation, with closed eyes and contemplation	Choose a quiet and ventilated training environment and control the training time
3	Emotional control training	Introduce ways to vent and regulate emotions, such as listening to music, talking, and writing emotional diaries	Set up a WeChat emotion management applet for patients to record their emotions
4	Cultivating appreciation	Instruct patients to be grateful to the family members, friends, and medical staff who help them	After training, encourages patients to share their gratitude and experience
5	Individual intervention	Provide targeted guidance according to the individual psychological needs of patients	Ask the patient to make a list of psychological difficulties
6	Mindfulness-based interventions in cancer recovery	Give care according to the special needs of the patient, such as mindfulness breathing, meditation training, etc.	Supervise the patient's practice and ensure the effectiveness of the intervention; listen to the patient's chief complaint during training and adapt the training content to the patient's different conditions
7	Acceptance and commitment therapy	Reduce patient's subjective judgment, help them accept the disease, and guide patients to actively cope with life and establish productive values	Pay attention to psychological changes during training and control training time
8	Life-review therapy (LR)	Encourage and guide patients to recall the most beautiful things in life and recall positive life experiences	Check the content of growth anecdotes and distribute small gifts
9	Patient salon	Encourage patients to communicate with each other and talk together about their cancer treatment experience	Facilitate experience sharing
10	Consolidate the effect	Collect feedback about problems in skill training and guide individuals to explain the relevant issues	Provide revision materials to allow patients to do continuous practice; after the course, keep contact with patients, and communicate and answer questions at any time

AIT, attention and interpretation therapy.

standard deviation. Two independent samples *t*-test were used for comparison between groups, and a paired *t*-test was used for comparison within groups. Count data are expressed as number of cases and rate (%), and the Chi-Square (χ^2) test was used for comparison between groups. Statistical significance was set at $P < 0.05$.

Results

Comparison of general patient information in the two groups

This study comprised 200 post-surgery colon cancer

patients, with 100 patients allocated to each of the experimental group and control group. The control group participants' general information is described below: gender: 68 males (68%) and 32 females (32%); age: 18 (18%) under 50 years, 30 (30%) between 50 and 60 years, 42 (42%) between 60 and 70 years, and 10 (10%) over 70 years; education level: 64 (64%) high school and below, and 36 (36%) junior college and above; marital status: 80 (80%) married, 7 (7%) unmarried, 13 (13%) divorced or widowed; medical payment methods: 48 (48%) medical insurance, 44 (44%) new rural cooperative medical system (NCMS), and 8 (8%) self-funded; TNM staging: 58 (58%)

Table 2 Comparison of general information between the two groups

Items	Control group (n=100)	Experimental group (n=100)	Statistic (Z value)	P value
Gender			0.357	0.551
Male	68 (68%)	64 (64%)		
Female	32 (32%)	36 (36%)		
Age (years)			1.364	0.714
<50	18 (18%)	16 (16%)		
50–60	30 (30%)	32 (32%)		
60–70	42 (42%)	46 (46%)		
>70	10 (10%)	6 (6%)		
Marital status			0.566	0.754
Married	80 (80%)	84 (84%)		
Unmarried	7 (7%)	6 (6%)		
Divorced or widowed	13 (13%)	10 (10%)		
Education level			0.113	0.737
High school and below	78 (78%)	76 (76%)		
Junior college and above	22 (22%)	24 (24%)		
Medical payment method			0.113	0.945
Medical insurance	48 (48%)	46 (46%)		
NCMS	44 (44%)	45 (45%)		
Self-funded	8 (8%)	9 (9%)		
TNM staging			5.220	0.074
II	58 (58%)	56 (56%)		
III	30 (30%)	34 (34%)		
IV	12 (12%)	10 (10%)		

NCMS, new rural cooperative medical system.

stage II, 30 (30%) stage III, and 12 (12%) stage IV.

The experimental group participants' general information is described below. Gender: 64 males (64%) and 36 females (36%); age: 16 (16%) under 50 years, 32 (32%) between 50 and 60 years, 46 (46%) between 60 and 70 years, and 6 (6%) over 70 years; education level: 76 (76%) high school and below and 24 (24%) junior college and above; marital status: 84 (84%) married, 6 (6%) unmarried, and 10 (10%) divorced or widowed; medical payment methods: 46 (46%) medical insurance, 45 (45%) NCMS, and 9 (9%) self-funded; TNM staging: 56 (56%) stage II, 34 (34%) stage III, and 10 (10%) stage IV. The differences in gender, age, education level, marital status, medical payment method,

and TNM staging of patients between the two groups were not statistically significant ($P>0.05$), and were comparable (see *Table 2*).

Comparison of each dimension score and total score of the psychological resilience scale between the two patient groups before and after intervention

Before the intervention, the total psychological resilience score, tenacity dimension, self-confidence dimension, and optimism dimension of the experimental group (55.42 ± 3.51 points, 27.73 ± 3.59 points, 18.07 ± 3.00 points, 55.52 ± 3.7 points, 9.73 ± 4.51 points, respectively) were not statistically

Table 3 Comparison of psychological resilience scores between the two groups of patients before and after intervention ($\bar{x} \pm SD$, %)

Variables	Time (Intervention)	Control group (n=100)	Experimental group (n=100)	Statistic (t value)	P value
Total psychological resilience score	Before	55.52±3.70	55.42±3.51	0.196	0.845
	After	55.11±3.86	63.24±2.21	18.278	<0.000
	Statistic (t value)	0.767	18.853		
	P value	0.444	<0.000		
Tenacity dimension	Before	27.62±3.77	27.73±3.59	0.211	0.833
	After	27.56±1.85	30.88±4.31	7.079	<0.000
	Statistic (t value)	0.143	5.616		
	P value	0.887	<0.000		
Self-strength dimension	Before	18.87±3.03	18.07±3.00	1.876	0.062
	After	18.32±3.46	20.55±1.66	5.811	<0.000
	Statistic (t value)	1.196	t=7.233		
	P value	0.233	<0.000		
Optimism dimension	Before	9.03±5.11	9.73±4.51	1.027	0.306
	After	9.23±4.65	11.81±2.25	4.994	<0.000
	Statistic (t value)	0.290	4.127		
	P value	0.773	<0.000		

different from those of the control group (55.52±3.70 points, 27.62±3.77 points, 18.87±3.03 points, 9.03±5.11 points, respectively) ($P>0.05$). After the intervention, the total psychological resilience score and the scores of each dimension of the experimental group (63.24±2.21 points, 30.88±4.31 points, 20.55±1.66 points, 11.81±2.25 points, respectively, as above) were all significantly higher than those before the intervention, and the difference was statistically significant ($P<0.05$). The score of each dimension of the control group was not statistically significant when compared to before the intervention ($P>0.05$) (see *Table 3*).

Comparison of CRF between the two groups before and after intervention

Before intervention, the experimental group's dimensions in behavioral severity, affective meaning, somatic sensation, and cognition/mood (5.88±1.21 points, 6.06±1.14 points, 6.56±1.08 points, 6.49±1.18 points, respectively) were not statistically different from those of the control group (5.56±1.20 points, 6.04±1.05 points, 6.81±1.13 points, 6.78±1.31 points, respectively) ($P>0.05$). After

the intervention, the scores of each dimension of the experimental group (4.04±1.05 points, 4.01±1.15 points, 4.14±1.54 points, 5.21±1.12 points, respectively, as above) were significantly lower than those before the intervention, and the differences were statistically significant ($P<0.05$), while the scores of all dimensions in the control group were not significantly different from those before intervention ($P>0.05$) (see *Table 4*).

Comparison of negative affect scale scores between the two groups of patients before and after intervention

Before the intervention, the SAS and SDS scores of the experimental vs. control groups (56.42±3.98 points vs. 56.14±2.97 points, 55.71±4.11 points vs. 56.55±4.01 points) were compared, and there was no statistically significant difference ($P>0.05$). After the intervention, the scores of SAS and SDS in the experimental group (44.42±3.64 points, 43.95±4.14 points, respectively) were significantly lower than those before the intervention, and the differences were statistically significant ($P<0.05$), while the control group's SAS and SDS scores (56.55±4.21 points, 55.12±4.35 points, respectively) were not significantly different from those

Table 4 Comparison of PFS-R scores between two groups of patients before and after intervention ($\bar{x} \pm SD$, %)

Dimensions	Time (Intervention)	Control group (n=100)	Experimental group (n=100)	Statistic (t value)	P value
Behavioral severity	Before	5.56±1.20	5.88±1.21	1.878	0.062
	After	5.83±1.22	4.04±1.05	11.121	<0.000
	Statistic (t value)	1.578	11.485		
	P value	0.116	<0.000		
Affective meaning	Before	6.04±1.05	6.06±1.14	0.129	0.897
	After	6.11±1.09	4.01±1.15	13.253	<0.000
	Statistic (t value)	0.463	12.660		
	P value	0.644	<0.000		
Somatic sensation	Before	6.81±1.13	6.56±1.08	1.600	0.111
	After	6.75±1.22	4.14±1.54	13.285	<0.000
	Statistic (t value)	0.361	12.866		
	P value	0.719	<0.000		
Cognition/mood	Before	6.78±1.31	6.49±1.18	1.645	0.102
	After	6.88±1.06	5.21±1.12	10.830	<0.000
	Statistic (t value)	0.593	7.868		
	P value	0.554	<0.000		

PFS-R, Revised Piper Fatigue Scale.

Table 5 Comparison of negative affect scale (SAS and SDS) scores between the two groups of patients before and after intervention ($\bar{x} \pm SD$, %)

Scale	Time (Intervention)	Control group (n=100)	Experimental group (n=100)	Statistic (t value)	P value
SAS	Before	56.42±3.98	56.14±2.97	0.564	0.574
	After	56.55±4.21	44.42±3.64	21.795	<0.000
	Statistic (t value)	0.224	24.947		
	P value	0.823	<0.000		
SDS	Before	55.71±4.11	56.55±4.01	1.637	0.103
	After	55.12±4.35	43.95±4.14	18.601	<0.000
	Statistic (t value)	0.986	22.03		
	P value	0.325	<0.000		

SAS, Self-Rating Anxiety Scale; SDS, Self-rating Depression Scale.

before the intervention ($P>0.05$) (see *Table 5*).

Discussion

Colon cancer is a prevalent malignant tumor of the gastrointestinal tract, and the main treatment is a combination of surgery and chemotherapy (20). Colon

cancer patients commonly experience negative emotions like anxiety and depression as they endure the physical pain caused by both the disease and the treatment process. These negative emotions can hinder the implementation of the treatment plan and reduce the patient's quality of life (21). The study found that AIT can effectively increase the level of psychological resilience for postoperative patients with

colon cancer and reduce the degree of CRF and negative emotions.

AIT is conducive to improving the psychological resilience of patients after colon cancer surgery

The results of this study showed that the psychological resilience levels of the two groups before intervention were both relatively low. After the intervention, the CD-RISC score of the experimental group was significantly higher than the pre-intervention score ($P < 0.05$), while the score of the control group did not change significantly ($P > 0.05$). This result suggests that AIT can effectively improve the psychological resilience of postoperative colon cancer patients, which is consistent with the results of similar studies in China and abroad (22,23). AIT may improve the psychological resilience of patients after colon cancer surgery in several ways. First it can dislodge the patient's fixed assumptions and lead them to view problems more flexibly. Second, by learning a variety of new skills (forgiveness, acceptance and self-realization therapy, etc.), it can allow the patient to develop the ability to resolve inner struggles, and reduce the mental impact resulting from bodily trauma. Third, using gratitude as a foundation, AIT can eliminate negative emotions and stimulate positive emotions, thus relieving psychological pressure. Fourth, it can create warmth and ambience for the participants through group training and patient workshops. Overall, this approach encourages and enables the patient to understand himself or herself and change any inadequate behavior, thus strengthening confidence to defeat the disease. In the non-interventional control group, the participants instinctively focused on the disease itself, which compounds related stress, and increases the experience of negative emotions.

AIT is helpful in reducing the degree of fatigue of patients after colon cancer surgery

CRF is a complex syndrome caused by physical, psychological, emotional, and various other reasons. At present, there is no clear diagnostic standard or preferred treatment method (24). The results of this study showed that the PFS-R scores of the experimental group before intervention were not statistically different from those of the control group ($P > 0.05$). After the intervention, the scores of CRF in the experimental group were significantly lower than those before intervention ($P < 0.05$), while the scores

in the control group did not change significantly ($P > 0.05$). This result suggests that AIT is beneficial for reducing the fatigue of colon cancer patients postoperatively. It has been thought that lifestyle measures such as taking regular breaks and ensuring adequate sleep can help relieve CRF in cancer patients. AIT trains patients to practice transcendental meditation, and encourages participants' cultivation of self-care skills and dedication, so that they can establish an optimistic and healthy psychological state, thereby alleviating fatigue.

AIT helps to reduce negative emotions in patients after colon cancer surgery

The results of this study showed that the SAS and SDS scores of patients in the two groups before intervention both were high, indicating a state of depression and anxiety. After intervention, the scores of SAS and SDS in the experimental group were lower than those before intervention ($P < 0.05$), while the scores of SAS and SDS in the control group did not significantly decrease ($P > 0.05$). This result suggests that AIT beneficially reduces the anxiety and depression of postoperative patients with colon cancer, which is consistent with the results of Ye *et al.* (25). The rehabilitative mindfulness training of AIT can improve the participants focus, regulate the autonomic nervous system, and promote relaxation, which reduces emotional distress. Through the implementation of emotional diaries, We Chat, and video, patients can share cancer-related experiences, be supported by fellow participants, express their inner feelings, and vent negative emotions, thus effectively reducing the occurrence of anxiety and depression.

This study had some limitations, which includes a small sample size; a study with a larger sample size is needed for verification of the findings. Also, the research period was restricted to 10 weeks of intervention, and thus the effect of longer-term intervention is not clear, which necessitates further research using a longer study duration.

Conclusions

AIT can effectively improve the psychological resilience of patients after colon cancer surgery, relieve anxiety and depression, and reduce the degree of CRF.

The sample size of our research is not comprehensive enough to answer all relevant questions. In follow-up experiments, we will collect more patient data and will update the analysis results in another paper.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This study was conducted in accordance with the ethical principles of the Declaration of Helsinki (as revised in 2013), and was approved by the Ethics Committee of the Affiliated Hospital of Jiangnan University [(2017) KY098]. Informed signed consent was given by all participants.

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