

Article

A study of distance learning technology in psychological support groups for cancer patients

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Abstract: Mental health issues have become increasingly prominent in the treatment of cancer patients and have become an important factor affecting their outcome and quality of life. In recent years, a number of studies have revealed the psychological challenges faced by cancer patients, pointing out that psychological problems such as anxiety and depression are common among cancer patients, and that these problems not only diminish the patients' quality of life, but may also affect treatment adherence and treatment efficacy. Although traditional psychological support methods, such as face-to-face counselling, can alleviate patients' psychological pressure to a certain extent, their coverage and accessibility are limited by factors such as patients' physical conditions, remote living places and inconvenient transportation. Therefore, how to innovate the service mode and expand the coverage of psychological support has become an urgent problem. This study aims to explore the effectiveness of distance learning technology in psychological support groups for cancer patients, with a view to providing new ideas and practical solutions for future mental health interventions.

Keywords: distance education technology; cancer patients; psychological support; group interaction; emotional regulation

1. Introduction

Cancer patients face a myriad of challenges, not only physically but also psychologically, throughout their treatment journey [1,2]. The mental health issues of cancer patients have been gaining increasing attention in recent years, with research indicating that anxiety, depression, and fear of recurrence are common among this population [3,4]. Traditional face-to-face psychological support methods, while effective to some extent, are often limited by geographical barriers, physical conditions of patients, and resource availability [5,6]. Consequently, there is a pressing need to explore innovative approaches to psychological support for cancer patients.

In response to these challenges, distance education technology has emerged as a promising solution. The application of distance education platforms in the medical field has shown significant potential in providing convenient and continuous psychological support to patients [7–9]. For instance, studies have demonstrated the feasibility of remote psychological counseling and online support groups for cancer patients, highlighting their ability to break through geographical and time constraints [9,10]. Furthermore, the integration of artificial intelligence in remote medical services has enhanced the efficiency and quality of psychological interventions.

Despite the growing interest in distance education technology for cancer patients, the literature on the effectiveness of existing interventions remains limited.

Existing studies have primarily focused on the technical feasibility and acceptability of remote support services, with less emphasis on their long-term impact on patients' psychological well-being. Moreover, there is a lack of comprehensive literature reviews that systematically evaluate the effectiveness of various distance education interventions for cancer patients.

The current study aims to address this research gap by conducting a randomized controlled trial to evaluate the effectiveness of distance education technology in psychological support groups for cancer patients. Building upon previous research, this study will not only assess the impact of distance education interventions on patients' anxiety, depression, and emotion regulation abilities, but also examine their effects on group interaction and overall psychological health. By doing so, we hope to provide more robust evidence for the application of distance education technology in cancer care and identify potential areas for future research.

2. Materials and methods

2.1. Research design

This study used a randomized controlled trial design (RCT) to assess the effect of distance learning technology on the psychological state of cancer patients by randomizing 200 cancer patients into groups. The study subjects were randomized into experimental and control groups of 100 each. Patients in the experimental group will receive a psychological support group intervention based on a teleplatform delivery, while the control group will continue to receive traditional face-to-face psychological support. The main objective of the study is to compare the two groups of patients before and after the intervention in terms of changes in anxiety and depression levels as well as emotional regulation. The study period is 6 months, and each participant will be assessed twice, before and after the intervention, at baseline and at the end of the intervention. To ensure the scientific validity and reliability of the study, during the intervention period, all patients will participate in the interactive activities of the psychological support group on a regular basis, and the research team will provide regular data collection and feedback. The effect of the intervention of distance education technology will be assessed through a combination of quantitative data analysis and qualitative analysis. In analyzing the data, an independent samples *t*-test (*t*) and a paired samples *t*-test (*t*₁) were used to assess the level of significance of changes across and within groups. It was hypothesized that the changes in anxiety (*A*), depression (*D*), and emotion regulation (*ER*) between the experimental and control groups were ΔA , ΔD , and ΔER , respectively, with the following formulas:

$$\Delta A = A_{post} - A_{pre} \quad (1)$$

$$\Delta D = D_{post} - D_{pre} \quad (2)$$

$$\Delta ER = ER_{post} - ER_{pre} \quad (3)$$

Among them, A_{post} , D_{post} and ER_{post} respectively represent the scores of anxiety, depression and emotion regulation ability of patients after the intervention, while A_{pre} , D_{pre} and ER_{pre} represent the scores before the intervention.

2.2. Research subjects and inclusion criteria

The research subjects of this study are patients diagnosed with intermediate and advanced cancer, all of whom are inpatients or outpatients of a specialized cancer hospital in a certain region of China. Inclusion criteria included: 1) patients were between 18 and 70 years old; 2) patients were diagnosed with middle- to late-stage cancer and had certain treatment options and life expectancy; 3) they were able to use smart devices and had basic Internet capabilities; and 4) patients agreed to participate in the study and signed an informed consent form. Exclusion criteria included: 1) patients with a history of severe cognitive impairment or psychiatric illness; 2) patients who were in a terminal end-stage at the start of the study and were unable to receive any form of psychosocial intervention; and 3) patients who failed to complete the baseline assessment or withdrew midway through the intervention. The representativeness of the sample and the validity of the study results were ensured by strict inclusion and exclusion criteria.

2.3. Selection and introduction of distance education platforms

The selected distance learning platforms are renowned platforms tailored to the healthcare industry, incorporating a wide range of advanced interactive features designed to give users a comprehensive and convenient service experience. These include, but are not limited to, video conferencing, instant messaging, online questionnaires, rich online courses, emotional support, and other modules. The platform is highly flexible and convenient, supporting users to access it through mobile phones, computers, and other devices so that users can enjoy the service at any time and any place. More importantly, the platform's round-the-clock service ensures that patients can consult and communicate with each other at any time, which greatly meets their immediate needs.

In addition, the platform has a special module for managing patients' personal information and is able to provide personalized psychological support content according to the patient's condition and specific needs, highlighting its humane and caring side. To ensure the technical stability and data security of the platform, the research team worked closely with the platform developer to maintain the safe and reliable operation of the platform. The platform's ease of use and wide accessibility bring great convenience to special groups such as cancer patients, effectively reducing the inconvenience caused by physical conditions or geographic location limitations and greatly improving the feasibility and effectiveness of remote psychological support.

2.4. Formation and implementation method of psychological support group

The psychological support group is composed of several professional psychologists, cancer treatment experts, and nursing staff and adopts the form of

group intervention, aiming to provide emotional support, psychological guidance, and information sharing through online interaction. The number of people in each group was set at 6–8 to ensure sufficient interaction and a favorable atmosphere for psychological support. The intervention includes 1) weekly online psychological counseling courses covering emotion management, stress relief, cognitive-behavioral therapy, etc.; 2) twice-weekly group discussions, in which patients can share their own experiences, confusion, and emotions and receive support and help from other members; and 3) monthly expert lectures, in which oncologists and psychologists are invited to answer patients' questions and provide guidance on cancer treatment and psychological adjustment. All group activities were conducted through a remote platform to ensure that each patient could receive the psychological support they needed in a timely manner during the treatment process.

2.5. Data collection and measurement tools

Data were collected through a combination of quantitative and qualitative methods, and the main measurement tools included self-assessment scales, clinical interviews and group discussion records. The specific scales are as follows (**Table 1**):

Table 1. Data collection and measurement instrument form for research on psychological support for cancer patients.

Measurement Tool	Main Content	Frequency of Use
Self-Rating Anxiety Scale (SAS)	Measures patients' anxiety level	Pre- and post-intervention
Self-Rating Depression Scale (SDS)	Measures patients' depression level	Pre- and post-intervention
Mental Health Inventory (MHI)	Measures overall psychological health status	Monthly
Patient Self-Rating Intervention Effect Scale	Assesses patients' acceptance of remote education technology and psychological support effectiveness	End of intervention
Clinical Interview Records	Records psychological state and emotional changes through semi-structured interviews	Regular interviews during the study period

2.6. Methods of statistical analysis

We analyzed the data in depth using SPSS 26.0 statistical software, and all data are presented as mean $\pm$ standard deviation ($M \pm SD$). Between-group comparisons were made by independent samples *t*-test or Mann-Whitney *U*-test; paired samples *t*-test or Wilcoxon signed rank test for within-group changes. Qualitative data were analyzed using thematic analysis, whereby patient interview transcripts were used as the basis for extracting major themes, which were coded to determine the effectiveness of the intervention and the patient's mood changes. This study will use multifactorial regression analysis to evaluate the factors influencing the distance education intervention and further analyze the variability that exists in the effect of the intervention under different conditions.

3. Results

3.1. Basic information about the study participants

A total of 200 middle- and late-stage cancer patients were included in this study, and they were divided into experimental and control groups according to the

randomized grouping method, with 100 people in each group. There was no significant difference between the two groups in terms of basic characteristics such as gender, age, education level, and disease type, and they were comparable. The age range of patients in the experimental group was 35 to 68 years old, with an average age of 52.4 years; the age range of patients in the control group was 34 to 70 years old, with an average age of 53.1 years. The percentage of patients in both groups was approximately 45% male and 55% female. In terms of disease type, the distribution of cancer types was also similar between the experimental and control groups, with breast, stomach, and lung cancers predominating and other types of cancer being less common. The mental health status of the study participants at the baseline assessment was relatively poor, with about 70% of the patients having varying degrees of anxiety and depression symptoms, which is consistent with the psychological distress characteristic of clinical cancer patients.

3.2. The effect of distance education technology on the psychological state of cancer patients

The intervention of distance education technology had a significant positive impact on the psychological state of cancer patients. The two groups of patients were evaluated before and after the intervention through the Self-Assessment Scale for Anxiety (SAS) and Self-Depression Scale (SDS), and the results showed that the anxiety and depression levels of patients in the experimental group decreased significantly, while the changes in the psychological state of the control group were not obvious. The specific data are shown in **Figure 1**, where the anxiety scores of the experimental group decreased significantly ($P < 0.01$) and the depression scores were likewise significantly reduced ($P < 0.01$), whereas the control group did not show any significant changes ($P > 0.05$) during the intervention process. These results suggest that distance education technology can effectively alleviate the anxiety and depression of cancer patients and improve their mental health.

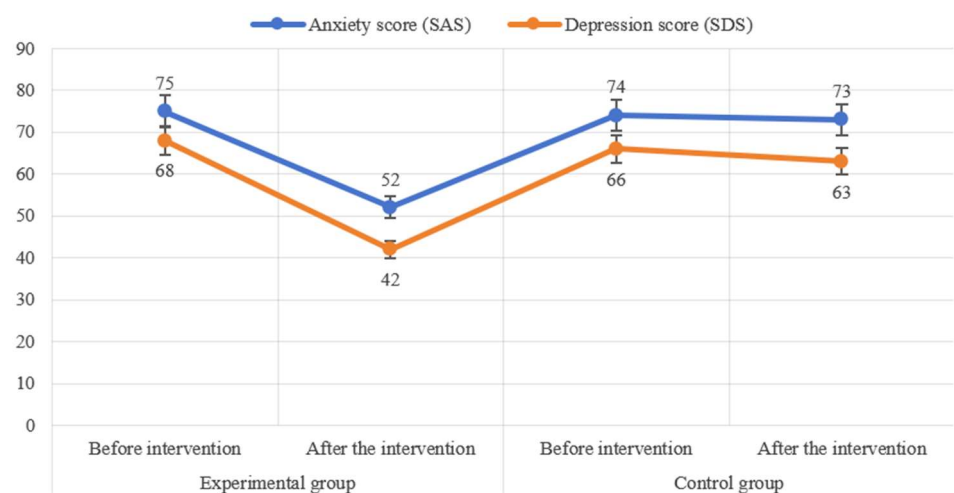


Figure 1. The effect of distance education technology on the psychological state of cancer patients.

3.3. The effect of distance education technology on the interaction of group members

Distance education technology not only reduces patients' psychological stress but also promotes communication and support among group members. In this study, the analysis of the group discussion records and the interaction data on the platform showed that patients in the experimental group had a higher level of participation in the psychological support group. In the early stage of the intervention, about 60% of the patients participated in group discussions twice a week, but this rate increased to 80% by the end of the intervention. In the control group, participation remained at about 55 percent. **Figure 2** demonstrates the interactions between the experimental and control groups and reveals that the frequency of interactions and the participation rate of the experimental group significantly exceeded those of the control group ($p < 0.01$), which suggests that the online support group provided by the distance learning platform greatly enhanced the patients' sense of participation and belonging and improved the emotional communication and support among members, similar to the findings of Liu et al. [10] and Diao et al. [11].

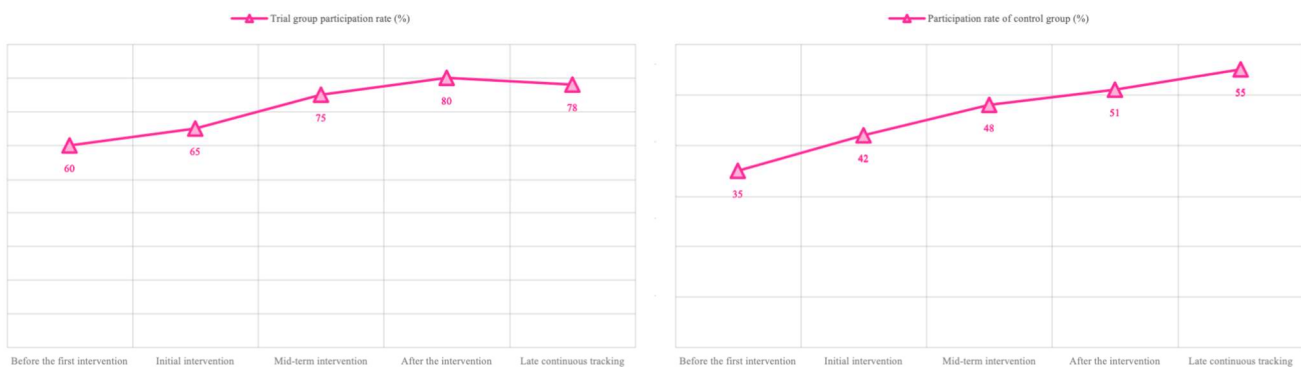


Figure 2. The effect of distance education technology on the interaction of group members.

3.4. The role of the psychological support group on patients' affective regulation

The role of tele-education technology on patients' emotion regulation is reflected in the data on the emotional changes of group members. By assessing the patients' emotional regulation, the experimental group's patients' emotional regulation was significantly improved. According to the assessment results of the Brief Mental Health Inventory (MHI), the experimental group's emotional regulation ability scores significantly improved after the intervention, while the control group showed no significant changes. **Figure 3** shows the emotion regulation ability scores of the two groups, and the experimental group showed a significant increase in emotion regulation scores ($p < 0.01$), while the control group showed little change ($p > 0.05$). Ma et al. [12] concluded that distance education technology plays an important role in helping cancer patients to regulate their emotions and enhance their emotional control ability, especially in the process of prolonged intervention, the patients gradually gained a more effective way of coping.

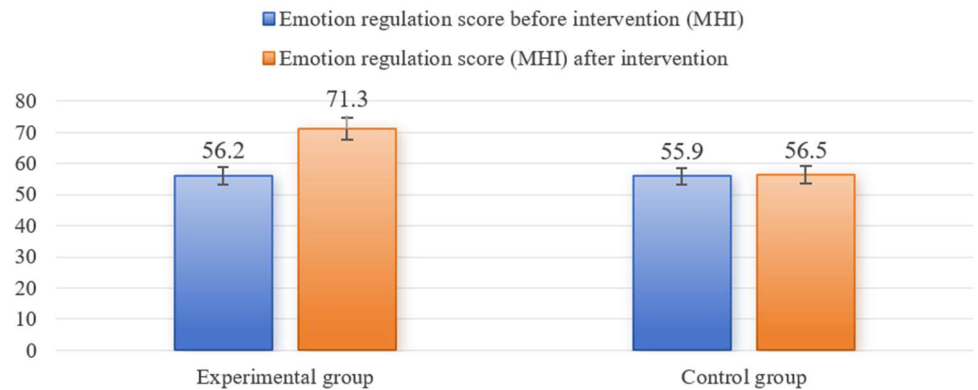


Figure 3. Effect of psychological support groups on patients' emotional regulation.

3.5. Statistical analysis results and significance

By statistically analyzing all the data, the results of the study show that the application of distance education technology in psychological support for cancer patients has a significant positive effect. The changes in several indicators such as anxiety, depression, and emotion regulation reached the level of statistical significance ($P < 0.01$). Patients in the experimental group were significantly lower than those in the control group in terms of anxiety and depression levels, and their emotional regulation was significantly improved. According to the multifactorial regression analysis, factors such as patients' age, gender, and type of disease did not significantly affect the intervention effect, which indicates that the intervention effect of distance education technology has wide adaptability and consistency among different patient groups.

4. Discussion

4.1. Analysis of the effectiveness of distance education technology in psychological support

The use of distance learning technology in psychological counselling, especially for psychological support for cancer patients, has shown significant potential. This study validated the effectiveness of a distance learning platform in improving anxiety, depression, and emotion regulation in cancer patients through a randomized controlled trial design. This result fits with several previous studies, such as Zhang et al. [13], who noted that the application of artificial intelligence in telemedicine significantly improved the efficiency and quality of healthcare services. Similarly, a study by Liu et al. [14] highlighted the positive role of telemedicine in home hospice care, providing more convenient and continuous psychological support for cancer patients.

This study further found that telemedicine techniques were not only effective in the short term, but their effects continued to be seen over time. This finding echoes Yu's study [15] on the role of Chinese medicine telemedicine services in the management of chronic diseases in the elderly, which demonstrated that telemedicine services have a significant effect in improving patients' long-term health status. In addition, a study by Wei et al. [16], also pointed out that the use of telemedicine in the home management of hematopoietic stem cell transplant patients

not only improved the quality of life of patients but also facilitated long-term interaction and support between the patients and their healthcare teams.

Notably, the significant improvement in emotional regulation in the experimental group of patients in this study suggests that distance learning technology helps cancer patients establish more positive and effective coping strategies. This is consistent with the findings of Liu and Pan [17], who found that distance support exercise combined with self-confidence development significantly reduced the sense of shame and fatigue symptoms in elderly patients undergoing radical lung cancer surgery, and improved their overall mental health.

4.2. Motivations and barriers for cancer patients to participate in remote support groups

The motivations of cancer patients to participate in tele-support groups are multifaceted, mainly including seeking emotional support, alleviating loneliness, and obtaining treatment-related information. This study found that the experimental group's participation and interaction frequency in the remote support group were significantly higher than those of the control group, which reflected the patients' high recognition of and need for telepsychological support. This finding coincides with the study of Zeng et al. [18], who noted that the need for supportive care for lung cancer patients' postoperative fear of cancer recurrence is closely related to psychological resilience. A study by Gao et al. [19] also further emphasized the importance of psychological support for cancer patients after discharge from hospital and noted that tele-interventions have significant advantages in meeting these needs.

However, cancer patients also face many barriers to participating in remote support groups. Technology adaptation, unfamiliarity with the remote platform, and privacy and security concerns were the main deterrents. These barriers are in line with Yuan et al.'s study [20], which pointed out the uneven distribution of technology and resources encountered by oncology specialist medical consortia during the development process. In addition, Fang's study [21] on the current status of the development of telemedicine technology application models and policy recommendations also emphasized the importance of policy support and technical training in promoting the popularity of telemedicine services.

In order to overcome these barriers, future research should further explore ways to enhance the ease of use of teleplatforms, improve patients' technological adaptability, and strengthen data security and privacy protection measures. Meanwhile, through long-term follow-up studies and feedback mechanisms, the sustained effectiveness of distance education technology in psychological counselling for cancer patients can be assessed, providing a strong basis for optimizing distance psychological support services.

In summary, the application of distance education technology in psychological counselling for cancer patients has significant effects that continue to emerge over time. However, barriers such as technology adaptation and privacy protection need to be overcome in order to fully realize its potential, and service quality and patient satisfaction need to be enhanced through continuous evaluation and optimization. Future studies should further explore the long-term effects and optimization

strategies of telepsychological support services to provide more comprehensive and effective support for the mental health of cancer patients.

4.3. Limitations and challenges of distance education technology

Although distance learning technology has achieved remarkable results in psychological support for cancer patients, its limitations and challenges should not be ignored. On the one hand, technical barriers are still one of the main constraints to the popularization of telepsychological interventions. Many patients, especially the elderly, may be unfamiliar with the operation of the Internet platform, leading to difficulties in the participation process. Although the design of distance learning platforms is getting easier, the technological adaptability of elderly patients is still weak, which affects the effectiveness of the intervention. On the other hand, distance learning technology cannot completely replace face-to-face communication, especially in providing emotional support and building deep interpersonal relationships. Some patients may feel isolated and lack sufficient emotional interaction when receiving online support. Although online support can provide convenience, its lack of physical contact and nonverbal interaction may lead to a lower quality of emotional support. The issue of data security and privacy protection in distance learning platforms has also raised widespread concerns. Patients' mental health data involve sensitive information, and if the platform fails to effectively safeguard data security, it will affect patients' willingness to participate and the effectiveness of interventions. Therefore, improving the ease of use of the technology, enhancing the security of the platform, and ensuring the realism and temperature of the emotional support remain the core issues to be addressed in the future development.

4.4. Prospects for the application of distance education technology in the cancer patient population

The application of distance education technology in the group of cancer patients has a broad prospect. With the progress of science and technology and the popularization of information technology, the application of distance education technology in the medical field has gradually become a trend. For cancer patients, distance education can not only provide daily psychological support but also help patients better understand their conditions and treatment plans through personalized health education and enhance treatment compliance. In recent years there have been several studies at home and abroad to support the prospect of distance education technology in cancer treatment. In the future, with the development of Internet technology, distance education will be increasingly combined with virtual reality, artificial intelligence, and other technologies to provide more diverse and customized support services for cancer patients. For example, psychological interventions combined with virtual reality can simulate actual treatment situations and help patients better cope with the psychological stress of chemotherapy and other treatment processes. Distance education technology will greatly improve the mental health of patients, promote the development of psychological support services in the

direction of personalization and specialization, and become an important auxiliary means of psychological intervention for cancer patients.

4.5. Shortcomings of the study and future research directions

Although this study provides preliminary empirical data for the application of distance education technology in psychological support for cancer patients, there are still some shortcomings that need to be improved. For one, the sample size of this study was small and limited to cancer patients in a certain region, so the generalizability and external validity of the results still need to be further verified. Future studies should expand the sample to cover patient groups from different regions and cultural backgrounds in order to further explore the applicability and effectiveness of distance learning techniques. Second, the intervention cycle of the study is short and lacks the follow-up and evaluation of long-term effects. The psychological status of cancer patients is often affected by the long-term treatment process, and the duration of the intervention period should be increased and long-term follow-up should be conducted in the future to assess the continued impact of distance education technology on patients' mental health during the long-term treatment process. Third, the study did not analyze different types of cancer patients in subgroups, and in the future, the impact of cancer type on the effectiveness of distance education interventions can be further explored to assess the differences in the needs of different patient groups. The design of the distance education platform and the adaptability of the technology need to be further optimized to enhance patient participation and intervention effectiveness. Through larger-scale studies and continued innovation in technology, distance education technology will play a greater role in the cancer patient population.

5. Conclusion

This study provides valuable insights into the effectiveness of distance education technology in psychological support groups for cancer patients. By conducting a randomized controlled trial, we have demonstrated that distance learning platforms can significantly improve anxiety, depression, and emotion regulation abilities in cancer patients. This finding not only validates existing knowledge on the potential of telemedicine in mental health interventions but also contributes a novel methodological approach to the field. Our study highlights the advantages of distance education technology in providing convenient and continuous psychological support to cancer patients, regardless of their geographical location or physical condition. This methodology not only enhances the accessibility of psychological support but also ensures that patients receive timely and effective interventions. The long-term impact of distance education technology on patients' psychological well-being is also highlighted in this study, further strengthening the argument for its application in cancer care. These findings contribute significantly to the field by providing empirical evidence for the efficacy and sustainability of telepsychological support for cancer patients.

Conflict of interest: The authors declare no conflict of interest.

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