



Research status of internet-delivered cognitive behavioral therapy in cancer patients

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Specialty type: Psychiatry

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Bakolis I, United Kingdom; Dalziel J, New Zealand

Received: August 7, 2023

Peer-review started: August 7, 2023

First decision: August 24, 2023

Revised: September 17, 2023

Accepted: September 26, 2023

Article in press: September 26, 2023

Published online: November 19, 2023



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Abstract

The latest global cancer burden data released by the International Agency for Research on Cancer of the World Health Organization in 2020 shows that there were 19.29 million new cancer cases worldwide, with 4.57 million in China, ranking first. The number of cancer survivors is increasing, with a 5-year survival rate exceeding 85%, but there are emotional disorders. Cognitive behavioral therapy (CBT) can improve negative emotions and has significant effects on patients. However, there is a limited number of physicians and high costs, so internet interventions have become a solution. The feasibility of web-based interventions for breast cancer patients has been proven. Research on internet-delivered CBT is also increasing. The purpose of this study was to review the concept of web-based CBT and its application status in cancer survivors, in order to provide relevant intervention for scholars and provide reference and supplement for patients to provide psychological therapy.

Key Words: Cancer survivors; Network; Cognitive behavioral therapy; Negative emotions

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Core Tip: The number of cancer survivors is increasing, but emotional disorders persist. Cognitive behavioral therapy (CBT) has shown significant effects in improving negative emotions. Due to limited physicians and high costs, internet interventions have become a solution. Web-based interventions for breast cancer patients have proven feasible, and research on internet-delivered CBT is growing. It is helpful to reviewing web-based CBT and its application in cancer survivors and provide intervention insights for scholars and psychological therapy references for patients.

Citation: Li BR, Wang J. Research status of internet-delivered cognitive behavioral therapy in cancer patients. *World J Psychiatry* 2023; 13(11): 831-837

URL: <https://www.wjgnet.com/2220-3206/full/v13/i11/831.htm>

DOI: <https://dx.doi.org/10.5498/wjp.v13.i11.831>

INTRODUCTION

According to the latest global cancer burden data released by the International Agency for Research on Cancer[1] of the World Health Organization, there were 19.29 million new cancer cases worldwide in 2020, and 4.57 million in China, which ranks first in the world. Thanks to improvements in diagnosis and treatment, the number of cancer survivors is increasing, with 5-year survival rates > 85%. Cancer survivors have varying degrees of mood disorders, including negative emotions, cancer-related fatigue, and sleep disturbances. It has been reported that mood disorders in cancer survivors are 2-4 times more prevalent than in the general population, leading to a lower quality of life, poorer daily functioning, and poor prognosis[2,3]. Meta-analyses show that cognitive behavioral therapy (CBT) improves negative mood, with effect sizes of 0.97 and 0.95 for patients with mood disorders, and 0.39 and 0.44 for cancer patients and survivors. However, due to the limited number of trained therapists, high cost, and limited time and space for cancer patients and survivors, providing CBT to patients in need remains a challenge[4]. Interventions delivered *via* the internet have become an increasingly popular way to overcome these challenges, and a review of e-health intervention systems for breast cancer patients and survivors demonstrated the universal feasibility and acceptability of interventions delivered *via* the internet[5]. There are also increasing studies on the intervention of patients with internet-delivered CBT (ICBT)[6-8].

OVERVIEW OF CBT

The origins of CBT can be traced back to Skinner and Joseph[9], who pioneered the CBT movement in the 1950s. CBT refers to changing adverse emotional reactions by correcting irrational cognitive concepts and/or behaviors, so as to resolve a series of physiological and psychological problems in patients[10]. In other words, changing behaviors will lead to emotional and cognitive changes. ICBT provides health education information to patients through the internet[11]. In ICBT, patients can obtain the same health information as CBT (such as psychological education on cognitive behavioral patterns, cognitive reorganization, behavioral skills, and relapse prevention)[12-14]. The material content of ICBT usually includes text, image, video and audio, *etc.*, and generally the intervention duration varies from 5 to 15 wk[15]. CBT is a problem-centered and action-oriented approach that aims to eliminate negative emotions and behaviors by changing thoughts and behaviors to change negative cognition[9]. It focuses more on the current situation than on past experiences, mental problems, and connections between wrong ways of thinking and ways of acting, which helps patients to better identify their own negative thinking, use cognitive technology to combat negative thinking, correct wrong cognition to improve anxiety, depression and other negative emotions, and relieve pain, sleep disorders, and other physical and mental symptoms. This study conducted a literature search using the keywords "internet-delivered cognitive-behavioral therapy" or "web-based cognitive-behavioral therapy" and "tumor" or "cancer" on PubMed, China National Knowledge Infrastructure, and Wanfang Database to retrieve relevant Chinese and English articles. After screening, a total of 49 articles were obtained for reviewing the concept of ICBT and its application in cancer survivors.

APPLICATION AND EFFECT OF CBT IN CANCER SURVIVORS

Reducing negative emotions

Compared with healthy people, cancer patients are more likely to experience negative emotions such as anxiety and depression[16]. A large Canadian study on mental disorders in 10153 cancer patients[17] showed that 19% had clinical anxiety symptoms, 22.6% had subclinical anxiety symptoms, 12.9% reported clinical depression symptoms, and 16.5% reported subclinical depression symptoms. Therefore, it is important to find treatment that can improve the psychological problems of cancer patients to improve their prognosis. Palay *et al*[17] found that breast and prostate are common cancer types with high survival rate, and such cancer survivors have some psychological distress, so they developed ICBT to improve the anxiety and depression symptoms of cancer patients in their daily life. The study began with screening of cancer patients at cancer hospitals and controlled follow-up of patients after initial treatment for symptoms of anxiety and depression in their daily lives. A total of 206 cancer patients were recruited for the study. These participants were randomly assigned to either the intervention group or the waiting control group for 10 wk each, with follow-up at week 5 (T2/mid-intervention), week 10 (T3/post-treatment), and week 34 (T4/6 mo post-treatment). The ICBT intervention program for improving anxiety and depression symptoms in cancer patients was developed by clinical psychologists who modified the original face-to-face CBT manual[19,20]. It lasted for 1 wk and consisted of eight modules, each consisting of written materials and audio exercises, writing tasks, examples of cancer patients, and expert videos. Participants completed a weekly training diary and mailed it to a therapist, who gave corresponding asynchronous written feedback[21]. The basic points of this treatment plan are as follows: (1) Nine therapists: Eight CBT-trained masters in psychology and

one experienced psychologist; (2) Supervision: Based on written feedback from therapists to participants, a manual reminder guide was developed, undertaken by therapist assistants, to urge participants to complete online questionnaires at stages T2, T3 and T4. If participants do not complete the questionnaire within 1 wk, they will receive three reminder emails, and if they do not respond, a research assistant will call to ask the reason; (3) Treatment compliance: To improve compliance of participants, researchers will give gifts or bonuses to participants at the middle and end of treatment as incentives; and (4) Internet platform: This is a website compatible with smart phones, and patients carry out daily exercises through their personal accounts. The waiting control group was given a cancer hospital health manual and followed up with a questionnaire at four time points. The study used the State-trait Anxiety Scale, the Patient Health Depression Questionnaire and the World Health Organization Quality of Life Index questionnaire[22-24] (Figure 1).

This study found that 5 wk after intervention, anxiety and depression in the ICBT group were significantly lower than those in the waiting control group[25], indicating that anxiety and depression were improved immediately after intervention. Model fitting analysis showed that depression scores were in line with a log-linear curve, indicating that the improvement in the ICBT group occurred at the beginning of the study and continued to improve over a period of time. At the 6-mo follow-up assessment, the improvement in anxiety and depression was 2.35 times greater in the ICBT group than in the waiting control group, and was effective in maintaining its effect on patients' negative mood. A meta-analysis showed that mindfulness-based behavioral therapy can be used as a basic treatment for emotional rehabilitation of cancer [26], while interventions provided by the internet may alleviate the suffering of cancer survivors who are unable to access face-to-face psychotherapy[27] (Figure 1).

Improving sleep quality

Sleep deprivation can have significant effects on daily functioning, mood, and self-management in cancer survivors. Sheikhzadeh *et al*[28] developed ICBT for breast cancer patients with insomnia by combining mindfulness meditation and CBT for insomnia. The study used two parallel randomized controlled trials in which 50 patients with cancer insomnia were recruited from 10 hospitals and randomly assigned 1:1 to a mindfulness intervention group or an education-only control group. The mindfulness intervention included a 6-wk online self-directed learning module that covered mindfulness meditation, sleep challenges, and behavioral strategies for improving sleep. The intervention strategy focused on using mindfulness as a sleep self-management technique to increase total sleep time and sleep efficiency. The development of the intervention module was published online. Each module each week contains instructional content on sleep and mindful meditation, using interactive text, video and audio meditation. Each module lasts about 20 min and can be completed at a time of the participant's choosing. There is also a message board for interaction with other participants and researchers[29]. During the day, patients communicate with researchers *via* text or email to obtain support. Reminders to complete daily sleep diaries and weekly modules were sent to participants at intervals by text message or email. During the study, participants completed an online or paper sleep diary each morning, which was modified to include symptoms of sleep disturbances and reports of daily meditation practices. At the end of the second week of the program, weekly feedback reports on adherence to the participants' personally recommended sleep schedules were provided *via* email. The control group was given only health education and no mindfulness or meditation (Figure 1).

The study found that ICBT significantly improved insomnia symptoms. After 6 wk of intervention, 71.2% of patients in the intervention group had sustained significant improvement in insomnia and fatigue symptoms. This study innovatively addressed sleep problems in cancer survivors, using a self-managed study design and methodology that was both available and cost-effective for a large number of cancer survivors, and larger randomized controlled trials can be conducted in the future to guide and refine intervention regimens (Figure 1).

Improving cancer-related fatigue

Fatigue is a symptom commonly experienced by cancer survivors at all stages of disease development. Survivors identified fatigue as an important problem that was not adequately addressed by healthcare providers[30]. Fatigue has a greater negative impact on functioning and health-related quality of life than other symptoms such as pain or depression [31-33]. Mak *et al*[34] selected 100 cancer patients with severe fatigue symptoms from 160 patients diagnosed with cancer according to inclusion and exclusion criteria for an 8-wk randomized controlled trial. The project was developed based on MacDonald and O'Hara's 10 elements of mental health[35], with resources for mental health promotion from the World Health Organization and government reports from the United Kingdom and Australia[36,37]. ICBT courses include didactic reading (such as transmitting Buddhist views on the nature of human suffering), experiential learning (such as guided meditation), and everyday life applications (such as developing an awareness of how attachment to letting go of a person can lead to inner peace). In order to improve the user experience, the project improved on the basis of the preliminary design. Weekly health tracking, built-in multimedia in each class, and dynamic content display made the content more interactive. The page and content color coordination, theme consistent graphics, and easy navigation made the web page more aesthetically attractive. The project incorporated the core concepts of traditional Buddhism, including discernment, compassion, impermanence, interdependence and nonattachment. By incorporating our mindfulness training into a traditional Buddhist foundation, the training program was designed to help participants build their own foundation of practice. Such an intention will lay the foundation for continuous and regular practice and may potentially influence the outcome of practice[38,39]. Participants were also given videos of stretching exercises, body scans, and audio of sitting meditation to guide them through the exercises. During the intervention, participants were given worksheets that included a mood diary, cognitive reconstruction, and a healthy lifestyle program to record their responses. All content was developed by members of the research team, who were clinical psychologists and mindfulness practitioners. The control group received routine nursing (Figure 1).

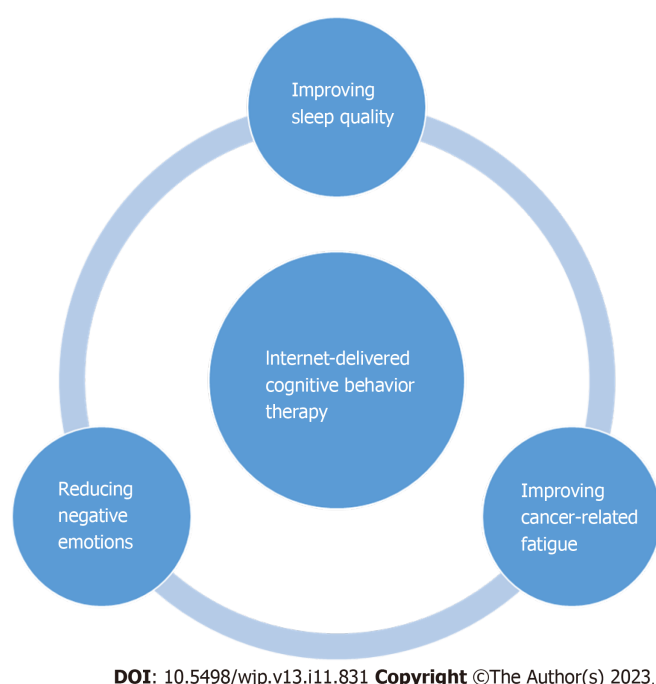


Figure 1 Application and effect of internet-delivered cognitive behavioral therapy in cancer survivors.

The study used the Cancer Related Fatigue Scale and the European Organization for Cancer Research and Treatment Quality of Life Scale to assess patients' quality of life and fatigue symptoms. The results showed that ICBT could significantly reduce cancer-induced fatigue and improve the quality of life of patients. The web page was designed reasonably, and course of treatment was moderate, with good patient feedback and high treatment compliance. Compared with face-to-face interventions, internet-based interventions are more accessible and affordable, and have the potential to satisfy the need to promote and prevent mental health in community settings and are worth scaling up in the future (Figure 1).

Limitation of ICBT

High dropout rate and poor compliance. Since ICBT courses are carried out in a standardized content and structured format, and therapists are not able to provide timely feedback and adjust the program according to the patient's response, this affects patient compliance[40]. Many complex problems in practice. Implementation of ICBT in five different European countries faced issues such as how to integrate it into the mental health care system, how to recruit patients, how to ensure the quality of the work of therapists, and how to provide long-term sustainable ICBT treatment[41]. Many influencing factors are unclear. At present, there are few studies on factors affecting treatment outcomes. One study explored the influencing factors from the content of emails from patients and therapists, and found that affirmation, encouragement, and self-exposure by therapists had a positive impact on treatment outcomes[42].

CONCLUSION

CBT is commonly used as first-line treatment for cancer survivors[43], and the American Medical Association recommends[10] that CBT be administered personally by trained therapists to promote self-management in cancer patients. Face-to-face CBT has been proven to be effective and worthy of promotion, but due to time, space and economic constraints, not all patients can easily access this treatment. With the increasing popularity of the internet, the combination of the internet and continuous care, and the full use of the advantages of the internet, can achieve the goal of promoting health education and prevention. ICBT has the advantages of low cost, easy access, and not being limited by time and space. ICBT can promote cancer patients' self-management, improve negative emotions, improve sleep quality, and relieve cancer-induced fatigue[44-46].

The research of the application of ICBT in cancer patients were summarized in Table 1. In the future, researchers can explore the influence of the duration of ICBT intervention on the intervention effect, so as to select the appropriate intervention time. It is imperative to cultivate high-quality therapists with a background in psychological medicine. In addition, ICBT is a psychological intervention that requires high-quality, multicenter, and large-sample randomized controlled trials. Qualitative interviews and descriptive data collection can be carried out to understand patients' subjective feelings, and improve intervention methods and guide intervention research.

Table 1 Research of the internet-delivered cognitive behavioral therapy application in cancer patients

Ref.	Patients (n)	Intervention	Indicators	Conclusion
Nissen <i>et al</i> [18]	Cancer survivors (1282)	Therapist-assisted iMBCT	Outcomes of anxiety and depression	iMBCT is a helpful intervention for cancer survivors suffering from symptoms of anxiety
Zachariae <i>et al</i> [47]	Breast cancer survivors (255)	ICBT-i or waitlist control	Sleep-related outcomes	ICBT-i appears to be effective in breast cancer survivors, with additional benefit in terms of reduced fatigue
Nissen <i>et al</i> [48]	Breast- and prostate cancer survivors (82)	iMBCT	Improvement in anxiety and depression scores from baseline to post-treatment and from baseline to six-months follow-up	iMBCT can be provided for cancer survivors regardless of their age, educational level, and time since diagnosis (up to five years) and therapeutic alliance is not crucial for treatment response
Dirkse <i>et al</i> [49]	Cancer survivors with symptoms of anxiety or depression (86)	ICBT program guided by a technician	Anxiety, depression, fear of cancer recurrence, quality of life	ICBT was associated with improved levels of anxiety, depression, fear of cancer recurrence, and quality of life
Murphy <i>et al</i> [50]	Breast cancer patients with generalized anxiety disorder (14)	ICBT	Health status, adherence, acceptability	ICBT has significant potential to be a suitable modality supervised by clinician
Murphy <i>et al</i> [51]	Cancer survivors (114)	ICBT or TAU	Anxiety and depression symptoms, fear of cancer recurrence, quality of life	Clinician-supervised iCBT has significant benefits for cancer survivors with clinical depression and anxiety disorders
Carbajal-López <i>et al</i> [52]	Gastrointestinal stromal tumors (99)	ICBT or internet-delivered cognitive program	General fatigue, reduced motivation, distress and global health status	Both intervention programs showed reductions in the dimensions of fatigue and improvements in distress and dimensions of quality of life

iMBCT: Internet-delivered mindfulness-based cognitive therapy; TAU: Treat-as-usual; ICBT: Internet-delivered cognitive behavioral therapy.

FOOTNOTES

Author contributions: Li BR and Wang J contributed equally to the conception, design, and literature search; Li BR drafted the manuscript and prepared the table and figure; Wang J modified and revised the manuscript.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

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S-Editor: Wang JJ

L-Editor: A

P-Editor: Wang JJ

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