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## International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

## Original Article

## Effects of mindfulness-based psychological care on mood and sleep of leukemia patients in chemotherapy

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## ARTICLE INFO

## Article history:

Received 16 February 2017

Received in revised form

19 May 2017

Accepted 4 July 2017

Available online 6 July 2017

## Keywords:

Chemotherapy

Leukemia

Mood

Sleep

Mindfulness

## ABSTRACT

**Purpose:** The aim of this research was to explore the benefits of mindfulness-based psychological care (MBPC) and assess whether the intervention would be beneficial in reducing insomnia and emotional symptoms of leukemia patients receiving chemotherapy.

**Methods:** A randomized control design study was applied in two hematology departments in a hospital in Zhengzhou. Patients in the experimental group received mindfulness-based psychological care (MBPC), and those in the control group received conventional care. Anxiety, depression, and sleeping problems were measured using the Self-Rating Anxiety Scale, Self-Rating Depression Scale, and the Pittsburgh Sleep Quality Index.

**Results:** Statistically significant differences were observed among anxiety, depression, and sleeping problems between the two groups in the post-test ( $P < 0.05$ ). A significant decrease in anxiety and depression and an improvement in sleep were observed between pre- and post-interventions ( $P < 0.05$ ) in the experimental group.

**Conclusions:** MBPC significantly improved sleep quality and mood of the experimental group. It is an effective complementary therapy for leukemia treatment that is inexpensive, noninvasive, and associated with relaxation and pain reduction.

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## 1. Introduction

Significant anxious and depressive symptoms are common in the course of leukemia and are related to physical symptom burden. Chemotherapy is a standard treatment for leukemia and benefits most patients. However, patients may experience many different chemotherapy-related side effects, such as discomfort, anxiety, and fatigue, which can significantly affect comfort and well-being during and after cancer treatment [1–4]. Patients receiving chemotherapy described the loss of the ability to touch or be touched by others due to the isolated environment to be the most significant psychological deprivation [5]. Moreover, disturbed sleep is common among cancer patients, and many frequently report daily sleep disturbance following primary treatment [6]. Disturbed

sleep may affect mental health and physical functioning [7,8]. These symptoms can lead to negative influence on the effects of chemotherapy and significantly impact the quality of life of leukemia patients.

Increasing the comfort and well-being of cancer patients during chemotherapy is a goal for all oncology nurses, and emphasis has been placed on the use of complementary interventions to achieve this goal [9]. The use of alternative medicine has grown exponentially since 2000, and an abundance of literature has shown an increase in comfort and well-being when complementary and alternative medicinal therapies are used for cancer patients [10]. Psychological care can increase patients' compliance to chemotherapy [11], and psychological interventions can improve the quality of life of cancer patients [12]. Various psychological interventions deal with the emotional problems of cancer patients. During treatment, patients are required to adhere to strict infection precautions because of their weakened immune systems [13]. This condition must be adequately considered when choosing a psychological intervention method to ensure that it is mild and relaxing. An increasingly popular type of psychological

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Peer review under responsibility of Chinese Nursing Association.

intervention to support people who are living with cancer is mindfulness-based therapy (MBT) [14].

MBT is a mild form of therapy that can reconcile the body and spirit through the mindfulness-based method. Mindfulness is the practice of bringing one's attention to the internal and external experiences occurring in the present moment [15]. It has its roots in Eastern techniques, in particular, Buddhist meditation. Numerous studies have shown that MBT enormously empowers patients with chronic pain [16,17], hypertension [18,19], heart disease, and psychological problems, such as depression [20] and anxiety [21,22], and improves the well-being of cancer patients [23,24]. Mindfulness-based psychological intervention has been used for many types of problems and had positive results. To the best of our knowledge, the effect of MBT on leukemia patients has seldom been studied. The aim of this study was to assess whether mindfulness-based psychological care (MBPC) improved the health outcomes of Chinese leukemia patients. The research questions were as follows: (1) How can MBPC be applied to leukemia patients? (2) Will the intervention improve mood and sleep? (3) How would patients value this kind of therapy? The original research hypothesis was that variable differences would be observed between pre- and post-intervention results for patients who received MBPC. Moreover, we hypothesized that the experimental and control groups would have differences in the post-test.

## 2. Methods

### 2.1. Research design and participants

This is an experimental, randomly assigned study using two groups. Participants were recruited from two hematology departments in the First Affiliated Hospital of Zhengzhou University. All patients who met the inclusion criteria and gave their consent to take part in the study were assigned to the experimental or control group via digital randomization. Inclusion criteria: (1) diagnosed with leukemia, including acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), chronic myeloid leukemia (CML), and other kinds of leukemia and were receiving chemotherapy; (2) age > 16 years; (3) conscious and has the ability to speak and read the scales or understand the measurement by listening and giving an answer. Exclusion criteria: do not know the diagnosis of their illness, unconscious, and had prior experience with MBT-type practices, such as yoga. The sample size was calculated to be  $\geq 34$  according to the two-sample mean comparison and the statistical calculation, and the coefficients in the calculation are the following:  $\alpha$  is 0.05 and  $1-\beta$  is 0.80; the estimated effect is 0.70. The sample size was decided as 38 in each group thinking over 10% lost.

Thirty-eight patients (20 males and 18 females, mean age  $\pm$  SD:  $38.35 \pm 8.93$  years, range: 17–70 years) were placed in the experimental group, and the same number (19 males and 19 females, mean age  $\pm$  SD:  $39.71 \pm 9.42$  years, range: 18–71 years) was placed in the control group at pre-intervention. At post-intervention, the experimental group consisted of 33 participants and the control group consisted of 32, all of whom received MBPC and successfully completed the measurements.

### 2.2. Interventions

#### 2.2.1. Conventional care

Conventional care involved physical assessment; protective isolation; medication; normal living care including safety, diet, and oral care; other necessary care; and health education on oral hygiene, emotional adjustment, leukemia, and self-protection/self-management. No other planned activities took place during the

IV infusion, although some patients chose to read, listen to music, or watch television.

#### 2.2.2. MBPC

Besides conventional care, patients received 30–40 min of MBPC during IV infusion that usually lasted at least 1.5 h. To coincide with the chemotherapy condition, MBPC was slightly modified based on the original mindfulness-based stress reduction (MBSR), which was established by Williams [25] and edited into Chinese by Liu [26]. It consists of seven meditation episodes, which would be played by an audio player or cell phone. MBSR is a structured group program that employs mindfulness meditation to alleviate suffering associated with physical, psychosomatic, and psychiatric disorders [14]. The manualized MBPC program in this study features five weeks of therapeutic sessions. The content and operation schedule are presented in Table 2. On the first week, caregivers guided the participants individually. After which, the participants engaged in mindfulness-based practice independently, and caregivers provided needed counseling and help. Caregivers initially provided the participants with explanations and directions on the therapy. After which, they slowly moved on to a purely encouraging role but still communicated with patients about their feelings after the practice. The participants were invited to focus with an interested, accepting, and non-judgmental attitude on their difficult sensations, emotions, cognitions, and behavior. They were guided by verbal cues with background music to focus their attention on movement, breathing, and feelings throughout the exercises (Table 1). Although walking and sitting forms of meditations are common tools for the mindfulness-based approach, lying dominated in this setting due to the chemotherapy. Eventually, the patients were encouraged to practice mindfulness in their daily lives. This continued the therapeutic process outside of the confines of the therapeutic sessions and allowed the patients to observe, explore, and experience mindfulness at other times. The caregivers and patients evaluated the effects and obstacles they encountered during daily life and used these as a catalysts for thought modification.

### 2.3. Measurements

A short demographic survey was used to determine the patients' age, gender, occupation, ethnicity, and satisfaction with the intervention. Patients were told that provision of this data was optional. Information about the disease, such as leukemia subtype and chemotherapy session, was filled out by the caregivers.

The second measurement was the Chinese version of the Pittsburgh Sleep Quality Index (PSQI). The PSQI is a self-administered questionnaire that measures the aspects of sleep quality. It is a standard instrument for measuring subjective insomnia with seven dimensions: subjective sleep quality, time of falling asleep, sleep time, sleep efficiency, sleep disorders, use of hypnotic drugs, and daytime dysfunction. A score of  $\geq 6$  is considered to be pathological [27]. A high score meant serious insomnia. The alpha reliability coefficient was 0.803 in this study.

The third measurement is the Self-Rating Anxiety Scale (SAS). It was designed by Zung [28] to quantify patients' levels of anxiety. The SAS is a 20-item self-report assessment device based on scoring in four groups of manifestations: cognitive, autonomic, motor, and central nervous system symptoms. Some questions are negatively worded to avoid the problem of set response. Overall assessment was based on the total score. The total raw scores range from 20 to 80. The raw score was then converted to a percentage standard score. The alpha reliability coefficient of SAS was 0.915 in this study.

The Self-Rating Depression Scale (SDS), also designed by Zung [29], assesses patients' level of depression. The alpha reliability

**Table 1**  
Implementing schedule of MBPC.

Sequence	Mindfulness-based Activity (Following the sound of the audio player)	Work of the Caregivers
Session 1	Meditation 1: Mindfulness of body and Breath (8 min) Meditation 2: Body Scan (length 15 min)	1. Explain the mindfulness and practical principles 2. Try to listen to the audio player with the participants for 8 min 3. Instruct the participants to experience the feeling of air passing in and out of their body 4. Encourage patients' expression
Session 2	Meditation 3: Mindful movement (9 min) Meditation 4: Breath and body (8 min)	1. Encourage patients' expression 2. Guide the patients' experience of mindfulness in bed
Session 3	Meditation 5: Sounds and thoughts (8 min) Meditation 6: Exploring difficulty (10 min)	1. Encourage expression 2. Instruct the participants to experience mindfulness in drinking and eating
Session 4	Meditation 7: Befriending (10 min) Meditation 8: Three-minute breathing space (3 min)	1. Direct the participants to experience mindfulness in life 2. Encourage expression
Session 5	Repeating two of the above seven meditations (approximately 30 min) Experiencing mindfulness in life	1. Direct the participants to experience mindfulness in life 2. Encourage expression

Instruction: Each session is performed once a day for 1 week with three repetitions for each practice.

**Table 2**  
Demographic characteristics of the Participants.

Demographic variable	Experimental group (n = 33)	Control group (n = 32)	t/ $\chi^2$	P
Gender				
Male	19	17	0.13	0.72
Female	14	15		
Age (years)	35.64 ± 15.60	33.58 ± 14.75	0.49	0.63
Time of Leukemia suffering (months)	9.28 ± 11.30	9.87 ± 10.54	0.19	0.85

coefficient was 0.927 in this study. This scale is a short self-administered survey to quantify the depressed status of a patient and has the same score calculation as the SAS.

#### 2.4. Data collection and analysis

Two of the authors (RNs as well as psychotherapists) were located on the inpatient ward and personally approached each patient about the study. If the person wished to participate, informed consent was obtained during the research period, and the patient was assigned to the experimental or control group by digital randomization. The measurements were performed in a quiet setting and carried out following the standard testing procedures. The data collectors gave each participant all the instruments at the beginning and the end of the research.

Patients in conventional care (control group) were treated as they normally would be when receiving chemotherapy. They were asked by the researchers to fill out the instruments for 30 min after the IV infusion for the baseline assessment and asked to do the same measurement five weeks later. Patients in the MBPC group (experimental group) were asked to fill out the instruments for the baseline assessment in the same setting as the control group. They then received the MBPC in addition to the conventional care for five weeks. After a five-week inpatient MBPC, the researchers provided post-test measurements in the same settings for both groups.

Data were analyzed using SPSS 19.0, and descriptive statistics were calculated for all study variables. The differences between the pre- and post-test scores were normally distributed, and t-tests were used to evaluate the changes in PSQI, SAS, and SDS from pre- to post-test. The contrasts between the conventional care and MBPC groups were examined. The distribution of the demographic category variables for the two groups was analyzed using chi-square tests. The level of significance was set at 0.05.

#### 2.5. Ethics and protection of participants

The study was approved by the Regional Ethics Board in Zhengzhou University. All participants were informed about the research purpose and voluntarily took part in and completed the measurement. They were assured that their answers would be kept confidential. To ensure confidentiality, the consent form, demographic survey, and instruments were individually coded. At the end of each day, the consent forms were separated from the data and filed, ensuring no patient names appeared on the responses. Data were stored in a specially allocated confidential location.

Human subject protection was ensured. All members of the research team were RNs or psychologists, and the conventional care providers were experienced and certified oncology nurses. Data collection and treatment did not begin until vital signs were stable and the patients were comfortable. In any occasion where patients became ill or uncomfortable, the nurses will identify the problem and provide assistance. Researchers asked each participant if they suffered any discomfort while receiving the intervention and gave them help when needed. Caregivers provided timely counseling during the whole research period.

### 3. Results

#### 3.1. Demographics and diagnosis

At post-intervention, the experimental group consisted of 33 participants, and the control group consisted of 32 participants. No significant difference was observed between the two groups in age, gender, and suffering time. A total of 8 ALLs, 7 AMLs, 5 CLLs, 7 CMLs, and 6 other kinds of leukemia were noted in the experimental group. In the control group, 7 ALLs, 7 AMLs, 6 CLLs, 7 CMLs, and 5 other kinds of leukemia were noted.

**Table 3**  
Differences in pre- and post-test scores of the two groups.

Variable	Experimental group (n = 33)		Control group (n = 32)		P		P	
	①Pre-test	②Post-test	③Pre-test	④Post-test	①vs②	③vs④	①vs③	②vs④
PSQI	10.04 ± 3.14	6.31 ± 4.08	9.73 ± 3.11	10.31 ± 4.76	0.002	0.321	0.523	0.001
SAS	56.83 ± 7.79	40.91 ± 10.03	56.91 ± 8.11	59.74 ± 9.35	<0.001	0.406	0.479	<0.001
SDS	63.35 ± 8.61	46.87 ± 7.48	61.87 ± 8.95	58.93 ± 7.43	<0.001	0.295	0.399	<0.001

### 3.2. Differences in sleep quality, anxiety, and depression

Using the PSQI, SAS, and SDS, no significant difference was observed between the baseline measurements of the two groups. No statistical differences were noted for insomnia, anxiety, or depression results related to the demographics ( $P > 0.05$ ). The experimental group did show improvements in insomnia, depression, and anxiety ( $P < 0.05$ ) from pre-to post-intervention, whereas the control group did not ( $P > 0.05$ ). Significant differences were noted between the experimental and control groups after the treatment ( $P < 0.05$ ) (see Table 3). Overall, the results supported the hypothesis that MBPC can significantly improve sleep quality and mood of leukemia patients in chemotherapy.

### 3.3. Satisfaction of MBPC recipients

The intervention was acceptable for all the participants in terms of time commitments in the experimental group. No participant reported side effects or discomfort. Patients in the experimental group expressed high satisfaction (90.9%) with the intervention. All recipients desired to devote themselves to the practice after the intervention was finished, although no guidance was provided after the intervention was completed.

## 4. Discussion

### 4.1. MBPC improves the mood and sleep quality of leukemia patients

This research showed that patients' anxiety had been significantly relieved after MBPC. Anxiety is the subjective unpleasant feeling of dread over anticipated events, such as the feeling of imminent death. Leukemia is a life-threatening form of cancer associated with substantial morbidity and mortality. It is associated with a great deal of uncertainty. Therefore, patients always worry about the treatment effects. Mindfulness involves paying attention to the event experienced in the present moment with a non-judgmental attitude. This kind of attitude helps patients observe the present situation but not predicate if it is good/bad or right/wrong. The mindfulness-based practice deals specifically with the internal conflicts of patients and helps them cope with stress and develop true calmness, in order to relieve anxiety.

Additionally, depression in leukemia patients was significantly decreased in this study. Patients with acute leukemia were more likely to report intense worrying or sadness [30]. When receiving chemotherapy, they may feel notably hopeless, helpless, dejected, or worthless. The depressive mood always influences the physical state of these patients. This depressed mood comes from the fear of the life-threatening disease itself and the contradiction that is created in the mind. MBT is a clinical application of principles found in Buddhism and other spiritual practices. It involves the key elements of non-judgmental acceptance of physical pain or psychological distress, thereby reducing the tendency to ruminate over and catastrophize these experiences [31]. Moreover, it has been proven to benefit mental health [32]. The mindfulness-based

practice advocates acceptance without judgment. It can, thus, help patients cope with sadness and relieve depression.

In the experimental group, sleep quality was better than that of the control group after the intervention. Sleep quality was obviously impacted by mood. The release of anxiety and depression can benefit sleep; therefore, patients who received the intervention had significantly improved sleep quality.

In this study, MBPC improved the mood and sleep quality of patients in chemotherapy in hospital wards. Evidently, mood and sleep quality significantly influence patients' well-being and quality of life. Therefore, this intervention can improve the psychophysical conditions of leukemia patients in chemotherapy and would benefit their overall treatment.

### 4.2. Implications for practice

MBPC is a mild and effective intervention that benefits leukemia patients receiving chemotherapy. It can be carried out in a nursing environment. From interviews with the participants, a high level of satisfaction with the intervention, from the style to the content, was attained. It is a type of intervention that is easily acceptable by leukemia patients. It also can be conveniently applied in a nursing environment. It is easy to learn, inexpensive, noninvasive, and associated with relaxation and stress reduction. Moreover, it can be practiced in lying or sitting positions or through walking, which increased participants' compliance to this intervention.

### 4.3. Limitations and research prospect

This study was conducted in one medical center with a homogeneous group of patients. Whether additional sites and a more heterogeneous population will produce different results needs further experimentation. Overall, the need for additional research in the care of leukemia patients related to mindfulness is evident. We hope that the intervention can provide long-lasting effects on patients' lives and that they will continuously apply the intervention after the study. That is, we anticipated that the patients would form a suitable lifestyle and thinking style, but we have not tested this theory. The long-term effects of the therapy should, therefore, be considered as a subject for future research.

## Funding

This study was supported by the "Basic and Frontier Technology Research Program" of Henan Province (25-132102310492) and the new subject research program of the Nursing College of Zhengzhou University (2014HLXK006).

## Conflicts of interests

The authors declare that they have no competing interests.

## Acknowledgments

The authors declare that they have no conflicts of interests. The

authors would like to express sincere thanks to Yuanqian Jiao for the advice of the program of mindfulness-based intervention.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ijnss.2017.07.001>.

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