



# The Effectiveness of Mindfulness-Based Cognitive Therapy on Catastrophizing and Anxiety associated with Pain in Adolescents with Leukemia

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## Quantitative Study

### Abstract

**Background:** Disorders and pain anxiety in adolescents with leukemia are very important. The purpose of this study was to determine the effectiveness of mindfulness-based cognitive therapy (MBCT) on catastrophizing and anxiety associated with pain in adolescents with leukemia.

**Methods:** A field experiment was conducted with a pretest and posttest design and control group. The statistical population of this study included all adolescents with leukemia in Isfahan, Iran, in 2016. Of these, 30 adolescents were selected as the sample (15 in the experimental group and 15 in the control group). The study tools used were the Pain Catastrophizing Scale (PCS) and the Pain Anxiety Symptoms Scale (PASS-20). First, the pretest was conducted in both groups. Then, the experimental group was subjected to 8 sessions of MBCT twice a week and each time for 1.5 hours. After the intervention, posttest was conducted in the two groups. Follow-up was conducted in both groups 45 days after the completion of the intervention. Data analysis was performed using multivariate covariance analysis (MANCOVA) and one-way analysis of covariance (ANCOVA).

**Results:** The results showed that MBCT decreased catastrophizing and anxiety associated with pain in adolescents with leukemia, and this reduction persisted at the follow-up stage.

**Conclusion:** The present study results showed that MBCT decreased catastrophizing and anxiety associated with pain. MBCT is an effective therapeutic approach that is possible in the form of group work. This method can provide a conceptual structure to help clients adapt to and accept their problems.

**Keywords:** Mindfulness, Catastrophizing, Pain, Anxiety, Leukemia

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### Introduction

Cancer is one of the major public health

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problems the incidence and mortality rate of which increase each year. According to previous research, cancer is the main cause of death in developed countries and the second leading cause of death in developing countries (Busjan, Hasenkamp,

Schmalz, Haak, Trumper, & Ziebolz, 2018). Across the globe, leukemia is the most common type of malignancy in children under the age of 5 years, has been reported more frequently in boys than in girls, and most cases have been observed in the age group of 2-4 years (Kim et al., 2017). Approximately 95% of cases of acute lymphoblastic leukemia (ALL) are diagnosed in childhood, and long-term survival of these patients is associated with adverse effects due to various therapies (such as chemotherapy and radiotherapy) during the course of treatment (Ren et al., 2017). Survival rate is the share of cancer patients who survive in a given period after diagnosis and is an appropriate indicator for assessing the effectiveness of care and diagnostic and therapeutic interventions for cancer (Jung, Tverdek, & Kontoyiannis, 2014). Although in recent decades, the survival rate of children with cancer has improved significantly and their five-year survival rate is 80%, there are many concerns about the survival of young people and young adults (Kong et al., 2015).

One of the components that causes more psychological problems in adolescents with leukemia is a disaster. Disaster is a negative emotional cognitive process that includes the exponential components of pain or distress and rumination. Pain calculation is one of the most important predictors of the therapeutic outcome of pain (Khongkow et al., 2016). Pain-induced disaster has a significant effect on pain experiences and is one of the small dimensions of pain matching that has a strong and stable relationship with pain experience. The most important impact of pain-induced disaster is that patients acquire an assessment of their pain that may make them feel tender or intimidated and fearful of experiencing pain in the future (Moore et al., 2015).

Anxiety is one of the factors that are effective in understanding and adapting to pain. For example, researchers have shown that various anxiety structures such as pain-related anxiety, health anxiety, trait anxiety,

and anxiety sensitivity are related to pain experience (Gasser et al., 2014). Pain-related anxiety, a common and universal experience in humans, occurs at an intensity of extreme or severe. Pain-related anxiety has various aspects including physical (including increased heart rate), cognitive (including negative thoughts on pain), behavioral (including avoidance behaviors), and emotional (including fear of pain) (Karibe, Shimazu, Okamoto, Kawakami, Kato, & Warita-Naoi, 2015). Pain-related anxiety predicts pain behaviors, hospitalization duration, post-traumatic stress disorder (PTSD), and physical constraints and contributes to the development of chronic pain and anxiety disorders. If pain-induced anxiety is not revealed, it will present in the form of fear, sleep deprivation, depression, and inability, and will lead to ineffective coping and lack of patient collaboration with therapies (Lin, Wu, & Yi, 2017). Based on clinical evidence, anxiety leads to selective attention to threatening triggers. Many of the anxiety-related clinical theories have reported that attention bias toward threatening triggers prompted the rapid identification of these stimuli, and consequently, the formation and continuation of anxiety (Lerman, Rudich, Brill, Shalev, & Shahar, 2015).

Cognitive-behavioral therapy (CBT) was effective in helping adolescents with leukemia. One of the shortcomings of this treatment is that it does not include all aspects of the symptoms of the disorder, and further studies are recommended in this regard (Bohlmeijer, Prenger, Taal, & Cuijpers, 2012). Mindfulness training can be considered as an intervention to reduce disaster-induced pain and anxiety associated with pain because it is a stress reliever. From that point of view, irritability and mood fluctuations are one of the main problems in patients with leukemia. Mindfulness is a momentary experience in the present, and one of the consequences of the skill of mind-consciousness is the understanding that most

thoughts are oscillating and unstable and this present-day experience can be considered simply as a mental phenomenon in comparison with reality (Bluth, Gaylord, Nguyen, Bunevicius, & Girdler, 2015). Given that fluctuations are caused by hormones, mind-awareness skills are a good study for disorders (Baer, 2013). The inability to stay in the moment separates one from reality and does not allow one to understand the position correctly and provide reasonable answers to his life (Gu, Strauss, Bond, & Cavanagh, 2015). Many scientific studies have shown that the reason for many of the psychological problems of individuals is their absence from here and the present moment, their very moment of life, while perceiving the conscious minds of the inner and outer realms freely and without distortion provides one with the ability to deal with a wide range of thoughts, emotions, and experiences (both pleasant and unpleasant) (Mak, Chan, Cheung, Lin, & Ngai, 2015).

The presence of mind with components such as acceptance (reality), presence (in the present time), and avoidance (from rumination) includes goals such as promoting one's well-being and awareness and that of the environment associated with modifying the mind. Unlike many psychotherapy schools, and of course, consistent with the goals and assumptions of positive psychology, the purpose of using the presence of the mind is not to create ideological changes, but to help to be aware of the processes that lead a person toward the mentality of harm or in situ in those mental states (Pidgeon, Ford, & Klaassen, 2014). Studies have shown that mindfulness education has a variety of health outcomes such as pain relief and anxiety, depression, and stress reduction; in addition, studies by Kabat-Zinn (2003) showed that mindfulness techniques are effective in increasing muscle relaxation and reducing anxiety and stress. In the study by Bluth et al. (2015), mindfulness-based stress reduction (MBSR) as a promising intervention for the improvement of the

symptoms of premenstrual dysmorphic disorder (PMDD) was carried out on 21 university students in North Carolina, USA. The results showed that after 8 sessions of MBSR, signs of stress such as depression, anxiety, mood swings, sensitivity, irritability, and conflict with others in the experimental group were significantly lower than the control group. However, a significant difference was not observed between the two groups in terms of symptoms such as headache, joint pain, and insomnia. Previous studies have shown that due to the high prevalence of this disorder, the effectiveness of mindfulness education on disaster and anxiety related to pain in adolescents with leukemia has not been studied. Therefore, in order to achieve this goal, the effectiveness of education on disaster awareness mindedness conception and anxiety associated with pain in adolescents with leukemia.

## **Methods**

In this research, a field experiment was conducted with a pretest and posttest design and control group. The experimental and control groups were selected through available sampling method. The pretest was applied to experimental and experimental groups and a pretest was performed on them. Posttest was performed at the end of treatment. The difference between pretest and posttest in each group was statistically significant. Thus, the effectiveness of mindfulness education was applied as an independent variable in order to determine its effect on assertiveness disorder and pain-related anxiety among adolescents with leukemic in Isfahan, Iran, as a dependent variable. The statistical population of this study included all adolescents with leukemia in Isfahan in 2016. The statistical sample included 30 individuals from the statistical population, who were selected using available sampling method. First, 100 people were selected from among all leukemia adolescents, and then, all of them were tested for disaster

and anxiety associated with pain. Subsequently, 30 of those who obtained the lowest score in these tests were selected. Of these, 15 were selected as the experimental group and 15 were selected as the control group. The study inclusion criteria included hospitalization in Shariati Hospital in Tehran, Iran, due to leukemia in 2016, willingness to participate in the research, and age range of 13 to 18 years. The exclusion criteria included physical and psychological illnesses associated with leukemia and the supplying of incomplete and invalid information.

Ethical considerations included assuring the subjects that all their information will remain confidential, and be used for research purposes only. In order to observe their privacy, the name of the participants was not registered, and to ensure the process, all the questionnaires were conducted by the researcher himself. The participants were also assured that they could leave the study whenever they wished.

The Pain Catastrophizing Scale (PCS) was designed by Sullivan, Bishop, and Pivik in 1995 to assess an individual's catastrophic thoughts and behaviors. This self-administered questionnaire consists of 13 articles and requires at least 6 literacy classes to be answered. The scale has been designed to assess the various dimensions of pain catastrophizing and better understand the mechanism of the disaster-induced impact on pain experience. Factor analysis has shown that it includes the subscales of ruminations, magnification or exaggeration, and helplessness. The questionnaire assesses the three components of pain-related negative thoughts. Participants are asked to select a number from 0 (never) to 4 (always) to describe the frequency of occurrence of 13 different feelings and thoughts related to pain experience. Lower scores represent less disaster, disabling pain, and chronic pain condition. The reliability of this scale

was obtained using Cronbach's alpha for the subscales of ruminations, magnification, helplessness as, respectively, 0.88, 0.67, and 0.98 and 0.92 for the whole scale (Nunes, 2014). In Iran, the convergent validity of this scale was calculated with the Beck Depression Inventory (BDI) and a positive and significant correlation ( $R = 0.46$ ) was found between these two scales (Davoudi, Zargar, Mozaffaripour, Nargesi, & Molah, 2012). In this study, the Cronbach's alpha of the scale was 0.83.

A short version of the Pain Anxiety Symptoms Scale (PASS-20) is a self-report tool consisting of 20 statements that were made in 2002 by McCracken and Dhingra based on the original PASS-40 scale. The PASS-20 was used in the present study to measure pain-related anxiety. The PASS-20 consists of the four subscales of cognitive, escape-avoidance, fear, and physiological (McCracken, & Dhingra, 2002). Each item of the scale is scored on a scale ranging from 0 (never) to 5 (always) and the total score of the scale ranges from 0 to 100 (Davoudi et al., 2012). Davoudi et al. (2012), among a group of 50 patients with rheumatoid arthritis in Iran, calculated the reliability of this scale using Cronbach's alpha coefficient for the total pain anxiety score ( $\alpha = 0.88$ ) and for the subscales ( $\alpha = 0.44-0.87$ ).

A pretest-posttest design and follow-up was implemented in a control and experimental group. Mindfulness training will be held in 8 weekly sessions for an hour and a half. The treatment guide proposed by Kabat-Zinn (2003) was implemented (Table 1). The mindfulness educational package was also adapted to the characteristics of the clients. Each session started with a training session, and continued with discussions about the practice and homework assignments. Follow-up was conducted in both groups 45 days after the posttest. Therapeutic interventions were conducted during the treatment sessions.

**Table 1.** Mindfulness training of Kabat-Zinn (2003)

Meeting	Sessions
One	Meditation and exercise awareness, the technique of eating raisins, 45 minutes of body checks and talking about emotions and homework, attending the moment, and closing the technique of eating raisins with other activities
Two	Discussion on homework, barriers to practice, and mindfulness solutions for it, meditation and practice exercises, mind-seeing exercises, 45-minute sitting session meditation, and daytime breathing Homework: performing a body examination for 45 minutes and increasing knowledge level in daily activities such as eating, bathing, sitting, and brushing
Three	Discussion on homework, 45-minute meditation practice and body checks, myths about meditation, the completion of calendars, useful events, and 3-minute breath-taking practice Homework: calendar recording, pleasant events, and continuity of daily activities with awareness and the practice of meditation
Four	Home reviews, 45-minute meditation exercises, body check, stress response, 1-minute respiratory exercise, calendar completion, unpleasant events, and daily activities Homework: completion of the calendar of unpleasant events and 3-minute workout of the respiratory tract
Five	House home exam, 45-minute meditation practice and body check, 3-minute respiratory report, and completion of contact work to focus on interactions that matter to your major people during the week Homework: completion of the contact worksheet and accompanying daily activities with awareness
Six	Discussion on homework, 45-minute meditation practice, conflict management styles, and discussion on stress responses, individual responses to difficult situations, and alternative attitudes and behaviors Homework: 45-minute meditation exercises, body checks, and daily activities
Seven	Home study, 45-minute meditation exercises, body check, discussion of pain process, relief from pain and anger processes, and pain reporting Homework: 45-minute meditation and body check, daily activity continuity, and pain reporting
Eight	Home reviews, 45-minute meditation exercises and body checks, 3-minute breathing space, and correction of what has been taught so far, and questions about the whole intervention, such as Have the participants achieved their expectations?; Do they feel that their personality has grown?; Do they feel that their coping skills have increased; and Do they want to continue meditation?

The collected data were analyzed using descriptive and inferential statistics in SPSS software (version 22, IBM Corporation, Armonk, NY, USA). In order to describe the data, mean and standard deviations, inferiority analysis, analysis of covariance (ANCOVA), and the validity of the underlying assumptions were used.

## Results

Among the adolescents, 16 (53.3%) were girls and 14 (46.6%) were boys. The mean (standard deviation) age in the experimental group was 19.19 (0.5) and in the control group was 15.5 (4.1). In terms of education, all of the adolescents were educated in the first grade.

The results show that none of the subscales in the lone test are significant

among the scales related to catastrophic pain and anxiety related to pain; therefore, it can be said that the groups were homogeneous in terms of the research variables before the beginning of the intervention ( $P > 0.05$ ). Considering that the significance level of the calculated value of the spider spheres is greater than 0.05 ( $P > 0.05$ ) and the data assume homogeneity of covariance under question, ANCOVA can be used. In table 2, a summary of ANCOVA of grades is presented.

As shown in table 2, the summary of ANCOVA indicates that the effect of mindfulness training on disaster is significant. Pretest and posttest catastrophizing scores had a significant difference ( $P < 0.05$ ). The results of ANCOVA indicated that the effect of mindfulness training on pain-related anxiety was significant.

**Table 2.** Summary of analysis of covariance to assess the effect of mindfulness-based stress reduction on the concept of disaster

Variables		SS	df	MS	F	P	Eta
Catastrophizing	Group	1054.82	2	527.41	11.93	0.0001	0.29
	Error	2562.51	58	44.18			
Anxiety associated with pain	Group	532.86	2	266.43	6.86	0.0020	0.19
	Error	2251.13	58	38.81			

df: Degree of freedom

## Discussion

The study showed that, by pretest control, the significant levels of all tests indicated that among adolescents with leukemia in the experimental and control groups, a significant difference in at least one of the dependent variables (pain catastrophizing and anxiety related to pain). The results of this study were consistent with the results of Bluth et al. (2015).

Mindfulness allows individuals to look back on and analyze their living conditions, and react in a new way, rather than a habitual way (Frank, Reibel, Broderick, Cantrell, & Metz, 2015). Considering that behavior combined with rebellion promotes the development of successful communication and the expression of positive emotions, love, and appreciation, and increased respect and mindfulness can improve the expression of self and excitement. According to the cognitive perspective, anxiety and anxiety disorders are the result of false and unrealistic thoughts and beliefs, especially irrational beliefs that are exaggerated regarding natural hazards. The cognitive view holds that individuals acquire, interpret, and use information in solving their life problems. In rational-emotional therapy (a clinical approach based on a scholarly theory), two goals are pursued; first, individuals are made to doubt their fundamental, but mistaken, beliefs, and second, they are provided with more constructive beliefs. In mindfulness, one of the techniques is "meditation." Meditation is an activity of mental consciousness (including emotions, memories, and dreams). Through meditation, we can understand our mistakes and adjust our minds so that we can think and react more realistically and honestly (Cairncross & Miller, 2016). We learn to have

fewer irrational expectations from people and things, as a result, we are less confused and frustrated, relationships improve, and life becomes more stable and satisfying. We develop a broad, clear sense of what is going on around us. One of the mechanisms of mind-consciousness is meta-cognitive awareness, which refers to the beliefs people have about their thinking. This knowledge includes beliefs about specific types of thinking as well as beliefs about memory efficiency or power. These beliefs affect how people respond and how their thoughts are regulated. As a result, according to the above facts, it can be argued that mindfulness has an undeniable effect on dissonance and anxiety related to the pain among adolescents with leukemia. Indeed, it seems that the tendency to engage in automated processes, rather than informed-based processes, with a lack of flexibility and awareness regarding the current moment, makes people think more and more about the present moment, and thus, its risk is more likely to increase. Based on the definitions of the presence of mind, it seems that a state of unconsciousness without an evaluation of the presence of mind can prevent the onset of pain assessment processes and, by interrupting or reducing habitual patterns in the face of different experiences, reduce pain intensity anxiety. Consciousness means the special, purposeful, and contemporary, and empty of prejudice and judgment. A conscious individual, at any moment, becomes aware of the mode of thought. For the mind, two main ways are considered, doing and being. Individuals learn consciousness to move the mind from one way to another. The mindfulness requires a behavioral, cognitive, and metacognitive strategy to concentrate the

attention process, and to the growth of a new perspective and the emergence of pleasant thoughts and excitements (Idusohan-Moizer, Sawicka, Dendle, & Albany, 2015).

Research carried out in laboratory experiments has shown that the manipulation of attention without correction or cognitive change causes a change in the mood. Researchers have shown that mindfulness education helps individuals modulate negative behavior patterns and auto-thinking thoughts and regulate positive health-related behaviors (Ruffault et al., 2017). In other words, educating mindfulness through the combination of vitality and clear experiences can lead to positive changes in disaster and anxiety related to the pain among adolescents with leukemia. Subjective education also helps the modification of unconscious feelings and increasing of awareness of psychological and physical emotions and helps the clear observation and acceptance of emotions and physical phenomena as they happen. Thus, it can play an important role in adjusting the anxiety scores associated with pain in adolescents with leukemia. This has been shown in previous studies to help educate the mindset in modulating negative behaviors and negative thoughts and causing positive health behaviors. In other words, it can be said that the education of the mind increases the attention of the individual towards emotional and psychological feelings, and the feeling of trust in life, deep sympathy, and real acceptance of life events (Jennings, 2015).

## Conclusion

This study showed that mindfulness education has an impact on dissonance and anxiety associated with pain in adolescents with leukemia in Isfahan. Although drug and therapeutic interventions may have a greater impact on psychological issues and behavioral counseling on aggression and the reduction of physical discomfort, symptoms, and complaints, mindfulness awareness has also illustrated this effect.

## Conflict of Interests

Authors have no conflict of interests.

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