

■ Original article

Effectiveness of mindfulness based cognitive therapy on the distress tolerance of nurses and job burnout

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Abstract

Background and Purpose: Distress is an important issue with significant effects on nurses and patients in the nursing profession. This study aimed to investigate the effects of mindfulness-based cognitive therapy (MBCT) on the distress tolerance of nurses with job burnout.

Methods: This quasi-experimental study was conducted with a pretest-posttest design and a control group. Study population consisted of 202 female nurses employed at Fatemeh Zahra Hospital (heart center) of Sari, Iran in 2015. Collected data were indicative of job burnout in 70 participants. In total, 30 nurses were selected as eligible subjects and equally divided into two groups of intervention and control. Pretest was performed on both groups. Nurses in the intervention group received eight sessions of training (two hours each) twice per week, while the control group had no intervention. Both groups were evaluated after the intervention (posttest). Data were collected using Maslach Burnout Inventory (MBI) and Simons and Gaher's Distress Tolerance Scale (DTS). Data analysis was performed in SPSS version 21 using analysis of covariance.

Results: In this study, use of MBCT was observed to positively affect the distress tolerance of nurses with job burnout.

Conclusion: According to the results of this study, factors such as prompt decision-making, job difficulty, long working shifts, and stressful environments were significantly involved in the psychological and physical stress of nurses, and MBCT could effectively enhance distress tolerance in the participants.

Keywords: Distress tolerance, Job burnout, Mindfulness-based cognitive therapy

Introduction

Psychological distress has been increasingly affecting medical professionals across the world (1). Nurses are constantly faced with obstacles and challenges due to the nature of their job. Some of the influential factors known to impose psychological pressure on nurses are rules and regulations, patient care problems, and failure to meet the needs of patients (2).

Today, job burnout is considered a common problem in various professions, especially among

nurses (3, 4). According to the findings of Maslach et al. (5), burnout is a psychological syndrome frequently experienced in professions requiring long-term, close interactions with other individuals (5). Burnout is defined as the negative change of attitude, mood or behavior in the face of stressful events in a job (6).

Employees with job burnout tend to feel tremendously pressured, which leads to the exhaustion of their emotional resources due to

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contact with the individuals who receive a particular service. Consequently, these employees become unconcerned toward their responsibilities and recipients of services, which ultimately gives rise to negative emotions (7).

Considering the job content and emotional demands, nurses are highly prone to experiencing job burnout (8). According to the literature, burnout in nurses might reduce their ability in proper patient care (9). Furthermore, this phenomenon is associated with employee absenteeism and possible resignation, which ultimately diminishes the quality of patient care (10).

Individual, interpersonal and organizational changes are known to cause stress and burnout in different professions (11). In this context, nurses could be evaluated in terms of the effects of confusion on their professional performance (12). Confusion could induce various psychological problems in nurses; for instance, it may lead to distress through several external factors, including limited resources, security pressures, experiencing pain, and lack of patient dignity (13). When nurses are faced with organizational barriers and interpersonal conflicts, confusion might arise primarily due to frustration, anger and anxiety.

Previous studies have denoted several issues, such as feelings of weakness and insufficiency, to describe distress in nurses (14). Continuous confrontation with stressful conditions leads to the decline of resistance resources in nurses, thereby leading to low job satisfaction and burnout. Nurses with discomposure are most likely to change their workplace or leave their profession (15, 16).

In this regard, Hemrich (17) suggests that job burnout may lead to devastating psychological problems in nurses (e.g., chronic depression) since these healthcare providers might often feel helpless due to their long working shifts and daily challenges. Some of the evident symptoms of chronic depression include unnecessary crying, insomnia, nightmares, loss of appetite, palpitation, headaches, and changes in physical performance (18). Moreover, nurses who experience turmoil in their work environment tend to talk about wretchedness, futility, and melancholy (12, 13).

Evidence suggests that turmoil in nurses affects the quality of patient care and causes secondary health problems in the patients (19, 20). Inability of nurses in proper patient care is associated with a traumatic emotional state, which undermines the adaptability and self-esteem of nurses, as well as the quality of patient care (12). Receding, escape, and avoidance are among the negative coping mechanisms used by nurses to manage their moral confusion in case they feel guilty for not fulfilling the basic needs of patients; these factors might encourage nurses to leave their job (2).

Mindfulness-based cognitive therapy (MBCT) is a prominent approach used to manage psychological trauma. This method is based on the mindfulness-based stress reduction program by Kabat-Zinn, which consists of various techniques (physical examination, meditation and yoga) to improve the quality of mindfulness (21).

Presence of mind could be attained through three major qualities, including the refusal to judge, intentional awareness, and focused attention on the present moment, which encompasses all the aspects of immediate experiences (i.e., cognitive, physiological or behavioral activities).

Exercises and techniques based on the presence of mind have remarkable effects on daily activities, learning abilities, and recognition of the automatic function of the mind in the past and future. The mind could be controlled through awareness of thoughts, emotions, and physical states, resulting in the automatic negligence of past and future events (21).

In a study by Williams et al. (22) entitled the "Impact of cognitive-behavioral therapy on psychological distress tolerance and treatment of depression", distress tolerance was defined as the ability to properly understand and experience negative emotional states. Findings of the mentioned study were indicative of a significant inverse relationship between distress tolerance, severity of depression, and psychological distress.

Cognitive therapy has proven effective in reducing depressive symptoms. Current findings in this regard have suggested distress tolerance to be a significant variable in the treatment of depression. According to the literature, mindfulness-based interventions

diminish attentional and emotional bias, avoidance behaviors, and automatic emotional responses to low self-esteem, while enhancing emotional self-regulation (23).

Previous studies by Crane (24), Hartenstein (25), Song (26), Hamill (27), and Schmertz (28) regarding the effectiveness of MBCT have indicated that this method results in several positive outcomes, including overall relaxation, self-awareness, emotional self-regulation, decreased sensitivity of the behavioral inhibition system, avoidance and evasion, psychological distress control, improved mindfulness, and reduced anxiety and depression. Furthermore, Wels (23) has confirmed the effectiveness of mindfulness-based training in the treatment of generalized anxiety disorder, noting that this approach has been widely used to manage pathological worry and stress in order to enhance the quality of life of patients during the follow-up period.

This study aimed to evaluate the effectiveness of MBCT in the distress tolerance of nurses with job burnout.

Materials and Methods

This quasi-experimental study was conducted using a pretest-posttest design with a control group. Study population consisted of 202 female nurses engaged at Fatemeh Zahra Hospital (heart center) of Sari, Iran in 2015. Results of the questionnaires indicated that 70 nurses had job burnout (scores of ≥ 66).

Using random sampling, 30 nurses with burnout were selected based on their working shifts and willingness to participate in the training intervention.

In compliance with the MBCT protocol, 8-12 subjects were allocated to each study group, and considering the possible sample loss, 15 participants were assigned to each group.

Effect of confounders were adjusted by controlling the dependent variables (e.g., age, gender, department of employment, work experience) and selecting the participants based on gender, work experience of more than 10 years, age of more than 40 years, and employment in particular health

sectors.

Inclusion and exclusion criteria

Inclusion criteria of the study were as follows: 1) female nurses engaged in Fatemeh Zahra hospital; 2) job burnout based on the results of the questionnaire (scores of ≥ 66); 3) absence of specific physical diseases; 4) no psychiatric disorders and use of psychiatric medications within the past two months; 5) willingness to participate in therapy sessions; 6) work experience of over 10 years; 7) age of more than 40 years and 8) employment in other particular health sectors. The only exclusion criterion was the absence of subjects from the training intervention for more than two sessions.

In case of illness or unwillingness to continue participation, subjects were allowed to withdraw from the study. Moreover, written informed consent was obtained from all the nurses to ensure full participation. To reduce the possibility of sample loss or absence of subjects, part of the training session was focused on explaining the importance of psychological interventions in the elimination of distress in nurses.

Finally, 30 nurses were randomly assigned to two groups of intervention and control (15 subjects per each group), and pretest was performed on both groups afterwards. Nurses in the intervention group received eight sessions of MBCT training (two sessions per week, two hours each), while the control group received no intervention. After completing the training course, posttest was carried out on both study group.

Contents of training sessions and educational packages were designed based on the MBCT treatment guide by Segal et al., which has been translated into Persian by Mohammad Khani, Tammanayefar, and Jahani Tabesh (2004). Summarized contents of the therapy sessions are presented in Table 1. In order to observe the ethical principles after conducting the tests on the experimental and control groups, subjects in the control group received treatment for eight sessions.

Since in MBCT and most psychotherapies participants and therapists are aware of the intervention, we controlled the subjects to eliminate

Table 1. Therapy session contents

| Sessions | Educational content |
|----------|--|
| One | Autopilot (participants were instructed on techniques of physical examination/physical verification CDs and sheets were distributed as home assignments) |
| Two | Encountering obstacles (meditation was performed in sitting position/explaining exercises to record pleasant events during the week and distribution of related sheets) |
| Three | Breathing exercises with presence of mind (reviewing previous exercises/practicing seeing and hearing for 5 min/training on walking technique with universal consciousness and breathing space for 3 min/distribution of CDs and booklets with theme of breathing with presence of mind) |
| Four | Staying in the present (reviewing previous exercises/mindful meditation of breathing, body, voice and mind/regular 3-minute breathing space and 3-minute coping exercise in case of intense unpleasant feelings) |
| Five | Presence permission (review of previous exercises and sitting meditation/awareness of breathing, body, sounds, and thoughts/discussion on the importance of acceptance and its properties/emphasis on the importance of 3-minute breathing space/distribution of leaflets) |
| Six | Thoughts are not facts (automatic recognition of routines, frustration, and lack of interest in daily activities/avoidance of stressful situations/description of new methods used to view routine thoughts differently) |
| Seven | Self-care (previous techniques were reviewed as a common daily practice to encourage presence of mind in routine lifestyle of nurses) |
| Eight | Review of previous sessions and applications of training contents (promoting knowledge of delicate changes/related discussions/planning effective strategies to continue the topics of previous training sessions) |

bias. For the same purpose, our research team consisted of four trainee researchers in order to avoid the impact of researcher bias on the results and different stages of research (proposal, treatment implementation, data collection, and data analysis). It is noteworthy that only the researchers in charge of the preparation of the proposal and implementation of treatment were aware of the hypotheses in this study. To investigate the hypotheses, required data were collected using the following tools:

Maslach Burnout Inventory (MBI)

Maslach Burnout Inventory (MBI) has been developed by Maslach and Jackson (29) based on a new estimate of the phenomenon of stress (i.e., burnout). This scale consists of 22 sample to investigate job burnout in three domains of emotional exhaustion, depersonalization, and individual accomplishment (30).

According to Maslach and Jackson, internal consistency coefficient of the domains of emotional exhaustion, depersonalization, and individual accomplishment is 0.9, 0.79, and 0.71, respectively. Validity and reliability of MBI have been confirmed for the Iranian population by Filian (31) at the Cronbach's alpha reliability coefficient of 0.78.

Additionally, Behnia (32) determined the reliability of this scale at the Cronbach's alpha of 0.55-0.87, while Badri Gregory (33) reported the reliability of MBI to be within the range of 0.75-0.84.

As for the job burnout questionnaire, this scale has been shown to be a valid measurement tool. Maslach and Jackson have confirmed the validity of this scale by determining the correlations between the scores and total score (as obtained by an individual with complete knowledge of the respondents), work experience and job burnout, as well as the scores of the questionnaire and different outcomes associated with job burnout.

Distress Tolerance Scale (DTS)

Distress Tolerance Scale (DTS) has been developed by Simmons and Gaher to evaluate emotional distress tolerance through self-rating (34). Items in DTS measure distress tolerance based on the ability of the individual to cope with emotional distress, assessment of mental confusion, and attention of individuals to negative emotions, offering regulatory measures in the event of action to alleviate distress.

DTS is a self-indicator of emotional distress tolerance, which is composed of 15 items and

4 subscales of emotional distress tolerance, assimilation, assessment, and regulation. Alpha coefficients for the reliability of the mentioned subscales have been determined to be 0.72, 0.82, 0.70, respectively, while the reliability of the entire scale has been confirmed at 0.82. Intraclass correlation of DTS has been reported to be 0.61 after six months. Moreover, this scale has been shown to have favorable criterion validity and initial convergence.

DTS has a positive association with the adoption of morality and a negative association with coping strategies in case of alcohol and marijuana consumption, as well as their use to improve relationships (34). In a study by Andami Khoshk (35), Cronbach's alpha of this scale was estimated at 0.86, while Azizi, Mirzaei and Shams (36) have reported the induction of this questionnaire to be 0.67 with the test-retest reliability of 0.79 (36).

Data analysis

Data analysis was performed in SPSS version

21 using descriptive and inferential statistics. Descriptive statistics were applied for the accurate description of the studied variables with tables and graphs to compare the mean pretest-posttest scores. In addition, since the experiment was conducted on two groups of intervention and control, analysis of covariance and effect size were used to evaluate the collected data.

Results

In this study, mean, standard deviation, minimum and maximum scores of job burnout and its components were calculated separately for each study group (Table 2).

Mean, standard deviation, minimum and maximum scores of the tolerance component of distress tolerance were calculated separately for the intervention and control groups before and after the experiment (Table 3). According to the information in Table 3, distress tolerance in the experimental group at post-test had a significant difference with

Table 2. Descriptive index of job burnout and its components

| Variable | Experimental | | | | Control | | | |
|--------------------------|--------------|--------------------|---------|---------|---------|--------------------|---------|---------|
| | Mean | Standard deviation | Minimum | Maximum | Mean | Standard deviation | Minimum | Maximum |
| Emotional exhaustion | 27 | 6.15 | 16.00 | 39.00 | 27 | 4.89 | 26.00 | 44.00 |
| Depersonalization | 24.27 | 3.01 | 20.00 | 29.00 | 15 | 4.69 | 11.00 | 29.00 |
| Lack of personal success | 24 | 5.13 | 14.00 | 32.00 | 24 | 6.43 | 14.00 | 35.00 |
| Job burnout | 66 | 9.16 | 65.00 | 93.00 | 66 | 12.28 | 56.00 | 100.00 |

Table 3. Descriptive index of tolerance component of distress tolerance

| Group | | Pre-test | | | | Post-test | | | |
|----------------------------------|--------------|----------|--------------------|---------|---------|-----------|--------------------|---------|---------|
| | | Mean | Standard deviation | Minimum | Maximum | Mean | Standard deviation | Minimum | Maximum |
| Tolerance | Experimental | 7.13 | 1.92 | 4.00 | 10.00 | 10.93 | 1.75 | 7.00 | 14.00 |
| | Control | 7.07 | 1.91 | 3.00 | 9.00 | 8.27 | 1.44 | 6.00 | 11.00 |
| Absorption | Experimental | 7.93 | 2.49 | 5.00 | 13.00 | 12.27 | 1.87 | 10.00 | 15.00 |
| | Control | 7.53 | 2.00 | 5.00 | 11.00 | 7.60 | 1.96 | 5.00 | 12.00 |
| Assessment of distress tolerance | Experimental | 18.80 | 5.41 | 12.00 | 28.00 | 23.53 | 4.02 | 18.00 | 30.00 |
| | Control | 18.13 | 5.19 | 10.00 | 29.00 | 17.93 | 4.80 | 12.00 | 28.00 |
| Distress tolerance regulation | Experimental | 5.00 | 1.41 | 3.00 | 8.00 | 7.40 | 1.80 | 5.00 | 10.00 |
| | Control | 5.27 | 1.79 | 3.00 | 8.00 | 5.60 | 1.59 | 4.00 | 8.00 |
| Total distress tolerance | Experimental | 37.87 | 8.99 | 26.00 | 56.00 | 54.13 | 7.03 | 43.00 | 65.00 |
| | Control | 38.00 | 7.08 | 29.00 | 55.00 | 39.40 | 6.75 | 30.00 | 53.00 |

the pre-test phase.

In this study, assumptions of the analysis of covariance included the normal distribution of variables in study groups (based on the Kolmogorov-Smirnov test), similar mean and variance at pre-test, linear relationship between pre-test and post-test values, identical variance of variables at post-test, homogeneity of the slope of regression lines, and correlations between dependent variables.

According to the information in Table 4, components of distress tolerance had significant correlations in the post-test evaluation ($\alpha=0.05$). As such, these components can be used to examine some of the assumptions of the multivariate analysis of covariance with multivariable nature.

According to the information in Table 5, MBCT simultaneously affected the components of distress tolerance in nurses ($P<0.001$; Df: 21,4; $F=35.933$). Furthermore, pre-test distress tolerance scores were observed to influence these components simultaneously in the post-test evaluation ($P<0.036$; Df: 25,4; $F=3.131$).

On the other hand, pre-test scores of aassimilation were found to affect the components of distress tolerance at the post-test phase ($P<0.041$; Df: 21,4;

$F=3.026$). Moreover, pre-test scores of assessment affected the components of distress tolerance at post-test ($P<0.001$; Df: 21,4; $F=27.495$). Pre-test scores of regulation were observed to influence the components of distress tolerance at post-test ($P<0.001$; Df: 21,4; $F=11.802$). Analysis of covariance of the studied variables is presented in Table 6.

According to the information in Table 6, MBCT could affect the distress tolerance of nurses ($P<0.000$; Df: 27,1; $F=26.120$; $MS=52.209$). In addition, pre-test distress tolerance scores were observed to affect distress tolerance at post-test ($P<0.006$; Df: 27,1; $F=8.954$; $MS=17.898$).

On the other hand, MBCT was found to influence the employment of nurses ($P<0.001$; Df: 27,1; $F=76.668$, MS). Pre-test scores of employment were observed to affect the post-test employment of nurses ($P<0.001$; Df: 27,1; $F=26.930$; $MS=51.200$). Furthermore, MBCT was found to influence nursing assessment ($P<0.001$; Df: 27,1; $F=147.991$; $MS=469.011$). Finally, MBCT was significantly effective in nursing regulation ($P<0.001$; Df: 27,1; $F=26.633$; $MS=30.482$), as the pre-test regulation scores influenced the post-test evaluation ($P<0.001$;

Table 4. Correlations between components of distress tolerance

| | | Tolerance | Absorption | Assessment | Regulation |
|------------|-------------------|-----------|------------|------------|------------|
| Tolerance | Correlation value | 1 | 0.730 | 0.501 | 0.409 |
| | Probability | | 0.000 | 0.005 | 0.025 |
| Absorption | Correlation value | 0.730 | 1 | 0.684 | 0.436 |
| | Probability | 0.000 | | 0.000 | 0.016 |
| Assessment | Correlation value | 0.501 | 0.684 | 1 | 0.403 |
| | Probability | 0.005 | 0.000 | | 0.027 |
| Regulation | Correlation value | 0.409 | 0.436 | 0.403 | 1 |
| | Probability | 0.025 | 0.016 | 0.027 | |

Table 5. Analysis of multivariate covariance between components of distress tolerance

| Source changes | Method | Index | F | Degree of freedom | Probability | Effect size | Test power | Box's test |
|-----------------------|--------|-------|--------|-------------------|-------------|-------------|------------|--------------------|
| Tolerance (pre-test) | Pillai | 0.374 | 3.131 | 4,21 | 0.036 | 0.374 | 0.717 | |
| Absorption (pre-test) | Pillai | 0.366 | 3.026 | 4,21 | 0.041 | 0.366 | 0.701 | |
| Assessment (pre-test) | Pillai | 0.840 | 27.495 | 4,21 | 0.000 | 0.840 | 1.000 | 3.704 $P=0.978$ |
| Regulation (pre-test) | Pillai | 0.692 | 11.802 | 4,21 | 0.000 | 0.692 | 1.000 | |
| Group effect | Pillai | 0.873 | 35.933 | 4,21 | 0.000 | 0.873 | 1.000 | |

Table 6. Single-factor ANCOVA with separate components

| | Source changes | Sum of squares | Degree of freedom | Mean square | F | Probability | Effect size | Test power |
|-------------------|----------------|----------------|-------------------|-------------|---------|-------------|-------------|------------|
| Tolerance | Pre-test | 17.898 | 1 | 17.898 | 8.954 | 0.006 | 0.249 | 0.822 |
| | Group Effect | 52.209 | 1 | 52.209 | 26.120 | 0.000 | 0.492 | 0.998 |
| | Error | 53.968 | 27 | 1.999 | | | | |
| Absorption | Pre-test | 51.200 | 1 | 51.200 | 26.930 | 0.000 | 0.499 | 0.999 |
| | Group Effect | 145.764 | 1 | 145.764 | 76.668 | 0.000 | 0.740 | 1.000 |
| | Error | 51.333 | 27 | 1.901 | | | | |
| Assessment | Pre-test | 464.011 | 1 | 464.011 | 147.991 | 0.000 | 0.846 | 1.000 |
| | Group Effect | 193.376 | 1 | 193.376 | 61.675 | 0.000 | 0.696 | 1.000 |
| | Error | 84.656 | 27 | 3.135 | | | | |
| Regulation | Pre-test | 50.352 | 1 | 50.352 | 44.072 | 0.000 | 0.620 | 1.000 |
| | Group Effect | 30.428 | 1 | 30.428 | 26.633 | 0.000 | 0.497 | 0.999 |
| | Error | 30.848 | 27 | 1.143 | | | | |

Table 7. Analysis of single factor covariance

| Source changes | Sum of squares | Degree of freedom | Mean square | F | Probability | Effect size | Test power |
|----------------|----------------|-------------------|-------------|---------|-------------|-------------|------------|
| Pre-test | 952.017 | 1 | 952.017 | 68.124 | 0.000 | 0.716 | 1.000 |
| Group effect | 1488.379 | 1 | 1488.379 | 106.505 | 0.000 | 0.798 | 1.000 |
| Error | 376.316 | 27 | 13.975 | | | | |

Df: 27,1; F=44.072; MS=50.352).

According to the information in Table 7, MBCT had a significant effect on the distress tolerance of nurses ($P<0.001$; Df: 27,1; F=505.106; MS=379.1488), as the pre-test scores of distress tolerance influenced the post-test evaluation ($P<0.001$; Df: 27,1; F=124.68; MS=017.952).

Discussion and Conclusion

According to the results of the present study, MBCT could affect distress tolerance in nurses ($P<0.001$; F=505.106), as the pre-test scores of distress tolerance were observed to influence the post-test evaluation ($P<0.001$; F=124.68). Furthermore, MBCT was found to affect distress tolerance ($P<0.000$; F=120.26), employment ($P<0.001$; F=668.76), and nursing assessment ($P<0.001$; F=633.26). Consistent with the results obtained by Williams et al. (22), Rosenzweig et al. (37), Kabat (38), and Baer (39), these findings could elucidate repetitive, uncontrollable thought patterns (e.g., excessive worry) as indications of long-term

mental disorder and confusion (40).

In previous studies, MBCT has been applied to facilitate the timely identification of thought patterns, feelings and physical sensations in different patients before the appropriate stage of development and expansion (19). Mindfulness involves behavioral, cognitive and metacognitive strategies to particularly focus on a process, which in turn prevent the tendency toward excessive worry and growing answers, thereby creating pleasant thoughts and emotions (41).

In MBCT, patients learn to shift their attention from inefficient thoughts and feelings to their body and surroundings (24). Moreover, MBCT alters the emotional state since mental confusion and anger without self-restraint might lead to the tendency toward conflict and controversy in some individuals (42).

Use of MBCT to alleviate distress in nurses is justifiable through certain principles, such as respiratory training with presence of mind, practicing mindful seeing and hearing, walking techniques with universal consciousness, staying in the present, non-judgmental observation, promoting

acceptance, raising awareness of experiences, and showing adaptive responses to different conditions (43). Continual practice of mindfulness results in remarkable behavioral changes for better self-care and coping with turmoil in nurses.

Limitations of the study

In the present study, we only investigated the short-term effects of MBCT on the distress tolerance of nurses, which might have affected the generalizability of the results. Furthermore, sample population was limited to female nurses employed at Fatemeh Zahra Hospital of Sari, Iran.

Recommendations

Distress tolerance in nurses could be enhanced through the implementation of training programs based on MBCT, job consultation, and raising individual awareness. In addition, evaluating the efficacy of other therapies as easier, more economical approaches is necessary for the application of other psychological techniques to reduce trauma and moral confusion in these healthcare providers. In this regard, research collaborations between hospitals and research institutes could eliminate common issues in the process of experimentation.

Among other essential factors for further research in this area are the formation of groups to recount the events and challenges associated with distress tolerance and mental health of nurses in hospitals, assembling appropriate committees, strengthening professional ethics, and improvement of communication skills. Extensive research could provide an appropriate background in order to compare the results and increase the quality of future studies. It is also suggested that future studies in this regard consider the social status of samples as a variable overlapping with the effectiveness of MBCT. Finally, further research in this area requires the development of follow-up plans for the participants.

Conflicts of interest

None declared.

Authors' contributions

All authors contributed equally to the writing of the scientific proposal, data collection, and manuscript drafting. The final manuscript was reviewed and approved by all the authors.

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