

Article

Not peer-reviewed version

Investigating the effectiveness of Mindfulness-Based Stress Reduction on mental health, mindfulness, and sleep quality in post COVID period

[Mansooreh Azizzadeh Forouzi](#) , Fahimeh Baghbani , Azam Zare Arashlouei , Abolfazl Hossein Nataj , Malihe Pooredalati , Fatemeh Khajooi , Elham Pourafrouz , [Atefeh Ahmadi](#) ^{*} , Vahideh Arabfaridy

Posted Date: 20 July 2023

doi: 10.20944/preprints202307.1383.v1

Keywords: Mindfulness based stress reduction, mental health, mindfulness, sleep quality, post COVID period



Preprints.org is a free multidiscipline platform providing preprint service that is dedicated to making early versions of research outputs permanently available and citable. Preprints posted at Preprints.org appear in Web of Science, Crossref, Google Scholar, Scilit, Europe PMC.

Copyright: This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Article

Investigating the Effectiveness of Mindfulness-Based Stress Reduction on Mental Health, Mindfulness, and Sleep Quality in Post COVID Period

Mansoorh Azizzadeh Forouzi ¹, Fahimeh Baghbani ², Azam Zare Arashlouei ³,
Abolfazl Hossein Nataj ⁴, Malihe Pooredalati ⁵, Fatemeh Khajooi ⁶, Elham Pourafrouz ⁷,
Atefeh Ahmadi ^{8,*} and Vahideh Arabfaridy ⁹

¹ Neuroscience Research Center, Institute of Neuropharmacology, Kerman University of Medical Science, Kerman, Iran; forozy@gmail.com

² Student research Committee, Razi faculty of nursing and midwifery, Kerman University of Medical Science, Kerman, Iran; s.baghbani@gmail.com

³ Student research Committee, Razi faculty of nursing and midwifery, Kerman University of Medical Science, Kerman, Iran; zare.arashlouei.azam@gmail.com

⁴ Department of Biostatistics, Faculty of Health, Mazandaran University of Medical Sciences, Sari, Iran; abolfazlh_68@yahoo.com

⁵ Nursing research center, Department of counselling in midwifery, Razi faculty of nursing and midwifery, Kerman University of Medical Science, Kerman, Iran; malihe_edalati@yahoo.com

⁶ Nursing research center, Department of midwifery, Razi faculty of nursing and midwifery, Kerman University of Medical Science, Kerman, Iran; khajoei.fateme@gmail.com

⁷ Psychology department, Shandiz University, Mashhad, Iran; el_afrooz@yahoo.com

⁸ Nursing research center, Department of counselling in midwifery, Razi faculty of nursing and midwifery, Kerman University of Medical Science, Kerman, Iran

⁹ Neuroscience Research Center, Kerman University of Medical Science, Kerman, Iran; v_arab@kmu.ac.ir

* Correspondence: atefeahmadi59@gmail.com

Abstract: (1) Background: COVID-19 had devastating effects on both physical and mental well-being, prompting the need for interventions. This study aimed to explore the impact of mindfulness-based stress reduction on mental health, mindfulness, and sleep disorders in COVID-19 survivors.; (2) Methods: In this interventional parallel study, the sample was selected university students in nursing and midwifery faculties using total population sampling. The intervention included providing counseling on mindfulness methods by trained experts. General health, mindfulness and sleep quality questionnaires were used for data collection. Data were analyzed using SPSS22, descriptive and inferential statistic. A significance level of 0.05 was considered; (3) Results: In this study, the mean age of the students was 20.29 ± 2.03 years. 69.5% of the participants were female and 96% were single. 71.3% were studying nursing and 67% had a history of Corona infection. The intervention was only effective on general health questionnaire and the mean score of this questionnaire was 1.7 higher than the control group; (4) Conclusions: the study indicated that MBSR intervention improves mindfulness, mental health, and sleep quality in COVID-19 survivors. Regular assessment and use of this intervention can help address long-term challenges and improve overall well-being.

Keywords: Mindfulness based stress reduction; mental health; mindfulness; sleep quality; post COVID period

1. Introduction

COVID-19 was discovered as a new infectious disease caused by a new type of coronavirus, called SARS-CoV-2 in Wuhan, China in 2019 (1) and became a pandemic in late February 2020 (2). The COVID-19 pandemic has affected the world and imposed significant stress on the healthcare system (3). This disease is highly infectious and the major clinical symptoms include fever, dry cough, fatigue, muscle pain (1), and shortness of breath. People who contract the severe type of this

disease may experience acute respiratory distress syndrome (2), septic shock, metabolic acidosis, hemorrhage, and coagulation disorders (4).

The rapid spread of COVID-19 has caused dramatic social, economic, and political disorders throughout the world (5) and harm to people's mental health (6) the same as previous pandemics (7). There are logical concerns that mental disorders can occur during the COVID-19 pandemic and affect all generations, minorities, and majorities (8). In a study conducted recently in the US on 775 adults, it was reported that 55% of them believed COVID-19 had affected their mental health, and 71% were worried about the protentional effects of isolation on American people's mental health (9). Studies conducted by Wang (2020) and Qiu (2020) reported severe mental disorders (stress, depression, and anxiety) in China (10, 11). Xiao (2020) believed that COVID-19 has endangered employees' physical and mental health and that stress and anxiety can affect their sleep (12). Bauerle (2020) highlighted that the fear and uncertainty resulting from COVID-19 cause problems such as anxiety, depression, anger, drug abuse, and sleep disorders. Xiang et al. (2020) reported that it is time to deal with mental health during the pandemic (13). Previous studies have shown that cognitive-behavioral therapy affects mental health outcomes after disasters and Mindfulness-based stress reduction (MBSR) has led to a decrease in the negative outcomes of manmade disasters (14). Mindfulness is one of the tools that can improve mental health during the COVID-19 pandemic (15).

MBSR was used for a large number of patients with diseases such as cancer, chronic pain, depression, anxiety, heart problems, AIDS, stress-related gastrointestinal disorders, hypertension, sleep disorders, and panic attacks have benefited from this method (16). It has a positive relationship with mental health, satisfaction with life, emotional intelligence, openness, flexibility, self-esteem, and optimism. It is high effective in treating anxiety (17). Through mindfulness, patients become aware of their anxiety and stress and their causes and explore and isolate the unsettled though related to these feelings. They also learn how to deal with these problems by self-talk (18).

In general, by awareness of negative emotions, they learn to express their thoughts with acceptance, nonjudging, and ease of mind. This approach helps patients develop, maintain, and improve strategies for coping with diseases, reducing stress, mood disorders, and enhancing the immune system (19).

Studies on the effects of MBSR on anxiety, stress, depression, and mental health during COVID-19 pandemic revealed its effectiveness (20). Verweij et al. (2018) studied the effects of MBSR on residents. The initial findings indicated that this method was not effective in reducing their emotional distress. However, it was effective for those who had basic levels of emotional distress (21). The influence of MBSR on reducing healthcare providers' stress showed that this method had improved their quality of life (22) Lim (2020) believes that online education of mindfulness is a beneficial intervention for reducing stress but does not lead to the improvement of sleep quality over time (23).

Generally, during a pandemic, people experience anxiety, fear, depression, and sleep disorders due to the fear of being infected. No study has been conducted on the effect of MBSR on mental health, mindfulness, and sleep disorders. Therefore, due to the necessity of interventions for reducing mental disorders during this pandemic, this study was conducted to investigate the effects of MBSR on mental health, mindfulness, and sleep disorders among COVID-19 university students' survivors in Kerman, Iran, in 2022.

2. Materials and Methods

2.1. Design and Setting

This study was an interventional parallel study with two groups including a control group conducted to determine the effects of mindfulness-based stress reduction on mental health, mindfulness, and sleep disorders among students having survived COVID-19 in 2022 in Kerman. The study population consisted of all the students accepted in nursing and midwifery schools of Kerman University of Medical Sciences and Islamic Azad University of Kerman in 2022. The exclusion criteria included being absent in more than 2 sessions of mindfulness training, having a physical disorder, and taking psychiatric medication.

2.2. Sampling

The sample was selected using total population sampling. The participants were invited to take part in the study. Islamic Azad University and Kerman University of Medical Sciences were selected as the control and intervention groups, respectively to prevent data contamination and data leak from the intervention group to the control group.

The potential confounding variables were controlled in group matching using statistical analysis methods. Ethics Code No. IR.KMU.REC.1399.606 was obtained from the ethics committee of Kerman University of Medical Sciences first. An informed consent form, mental health and mindfulness questionnaires, and Pittsburgh Sleep Quality Index were completed by both groups in pre-test and post-test.

The intervention included providing counseling on mindfulness methods by trained experts. Counseling was done in 6 sessions (twice a week) of 90 minutes. The control group did not receive any intervention, but those who were willing were given the chance to attend the sessions after the study. Also, the sessions were held using Adobe Connect under the supervision of the IT expert at Kerman University of Medical Sciences.

Data Collection Tools

Data was collected using a demographic and contextual information form, and mental health, mindfulness, and sleep quality questionnaires.

The demographic and contextual information form included age, gender, marital status, job, education, time of infection, hospitalization length, hospitalization place, etc.

The mental health inventory-28 (MHI28) consists of 28 questions, 14 of which are about mental well-being and the other 14 about mental distress. It uses a 5-point Likert scale ranging from 1 (Totally disagree) to 5 (Totally agree). The lowest and highest scores are 28 and 140, respectively. The cut-off point is 23. The validity and reliability of the questionnaire were assessed by Basharat (2009). The validity of this questionnaire was 0.87 and 0.88 for mental well-being and mental distress, respectively. According to his report, the results of the internal consistency test, which was performed twice, based on Cronbach's alpha showed that this coefficient was between 0.89 and 0.94 for mental well-being and distress in sick and normal patients, and the results of the retest ranged from 0.85 to 0.91 (24). The five-facet mindfulness questionnaire (FFMQ) was developed by Baer et al. (2006) to demonstrate mindfulness elements, which are observing, describing, acting with awareness, nonjudging regarding internal experience, and nonreactivity to internal experience. This tool is a self-assessment scale with 39 items and uses a 5-point Likert scale ranging from 1 (Never) to 5 (Always). In this study, the standard score of mindfulness refers to the score a respondent assigns to the questions. The score ranges from 39 to 195. The sum of the scores of each subscale leads to a total score showing that higher scores represent better mindfulness. The observing domain has 8 questions (1,6,11,15,20,26,31,36), the describing domain has 8 questions (32,16,37,27,22,12,7,2), the acting with awareness domain has 8 questions (5,8,13,18,23,28,34,38), the nonjudging domain has 8 questions (3,10,14,17,39,35,30,25), and the nonreactivity domain has 7 questions (4,9,19,21,24,29,33,4). The validity and reliability of this questionnaire were assessed in "Checking the validity and reliability of the five-dimensional mindfulness questionnaire in Iranian non-clinical" conducted by Ahmadvand et al. (2013). The findings of this study indicated that the questionnaire enjoys a desirable validity (alpha coefficients between 0.0 and 55.83) and reliability among non-clinical samples in Iran (25).

The Pittsburgh Sleep Quality Index is a self-assessment questionnaire consisting of questions in 7 domains, which are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each question has a score from 0 (never experienced) to 3 (experienced three times a week or more). The score can range from 0 to 2, and higher scores indicate worse sleep quality. A score of 0-5 shows ideal sleep quality, and scores of 7-21 indicate undesirable sleep quality. The validity of this questionnaire has been approved for an Iranian population, and its reliability has been estimated to be 0.98 based on Cronbach's alpha.

The intervention protocol was developed based on the guideline for mindfulness-based stress reduction and is presented in the Table 1.

Table 1. The intervention protocol.

Session	Intervention protocol
First	Introduction, specifying objectives, defining the main variables of the research, being familiarized with the concept of mindfulness, observing without judgment, the flow of internal and external stimulants, being free from the mind’s autopilot, the raisin exercise
Second	Homework: eating consciously (focusing on what we do at home) Discussing the homework and the difference from the previous session, talking about the barriers to the exercise (restlessness and mind-wandering) Discovering the limitations and boundaries, understanding the body, feelings and responses to stress, better self-control (flying or fighting) Body scan exercise (body meditation), sitting meditation and breathing Homework: Previous homework plus new activities (sitting meditation) Discussing the previous homework, emphasizing living at the moment (getting out of thinking and dreaming), Seeing and hearing exercise (2 minutes),
Third	nonjudging, focusing on the five senses (3 minutes) Homework: sitting meditation, body scan, breathing, seeing and hearing consciously in an unpleasant occurrence and alternative behaviors Discussing the previous homework, defining stress and body’s response to it
Fourth	Paying attention to body sounds, breathing, breathing and thought, responding to challenging situations, conscious walking, Homework: Previous homework, 3-minute exercise in an unpleasant occurrence, alternative behaviors, and conscious walking Discussing the previous exercises, beginning the second stage of body’s conscious moves and having a more efficient response to stress
Fifth	having a more efficient response to stress, meditation in daily life, awareness of thoughts and emotions, saving more energy to cope with problems homework: previous exercises,3-minute exercise in an unpleasant occurrence Discussing the previous exercise and doing exercises in groups of 3, exercising the successive thoughts technique for 1 hour
Sixth	Confronting others, mindful socialization, the contents of thoughts are mostly unreal, what is the best way of protecting myself? Homework: doing a combination of the exercises, the 3-minute exercise in an unpleasant occurrence, and a new activity Discussing the previous exercises, let’s take better care of ourselves (life is like the game of snakes and ladders, regaining balance in life)
Seventh	Four-dimensional meditation, specifying unpleasant occurrences and a way of making them pleasant, through the 3-imute mindfulness exercise Homework: a combination of the techniques, the 3-minute exercise in an unpleasant occurrence, and a new activity
Eighth	Mountain meditation in an open space in the nature, doing the previous exercises there, discussing achieving objectives, personality growth, and enhancing coping skills

In this study, the study sample was selected using cluster sampling. Based on the study, the mean and standard deviation of the mindfulness questionnaire were 121.3 and 13.3, respectively. We calculated 280 samples by considering a 3-unit impact (d), the consistency between the two measures was 0.1 (ρ), the significance level was 0.05, and the power was 0.8 (26, 27).

$$n = \frac{2 * \left(z_{1-\alpha/2} + z_{1-\beta}\right)^2 * \sigma^2 * (1 - \rho)}{d^2}$$

2.3. Data Analysis

To analyze the data, frequency, percentage, mean, and standard deviation for descriptive statistics and t-tests, Chi-square test (or Fisher's exact test), paired t-test and mixed models were used. The Kolmogorov-Smirnov test was applied to check the normality of the data. Statistical analyses were performed in SPSS 22 with a significance level of 0.05.

2.4. Ethical Consideration

The research was registered in the research deputy of Kerman University of Medical Sciences, the ethics code IR.KMU.REC.1399.606 was obtained from the ethics committee, and a letter of introduction was received from the research deputy. Also, all of the participants' consent was gained, and principles of confidentiality were observed.

3. Results

In this study, the mean age of the students was 20.29 ± 2.03 years. 69.5% of the participants were female and 96% were single. 71.3% were studying nursing and 67% had a history of Corona infection. None of the students had a history of taking psychiatric medication or sleep disorders. Table 2 reports and compares demographic variables and compared separately for the intervention and control groups. Only the gender variable had a significant difference in the two groups (P -value <0.001) and the other variables in the two groups had almost the same distribution.

The descriptive information of the questionnaires and their subscales before and after the intervention was reported in Table 3. The mean (SD) of the mindfulness questionnaire before the intervention was 132.63 (14.64) and after the intervention was 129.98 (16.61). Also, the mean (SD) of the general health questionnaire before the intervention was 52.30 (7.55) and after the intervention was 53.81 (8.42), and the mean (SD) of the sleep quality score before and after the intervention was 5.12 (3.34), 4.52 (3.45) respectively.

Table 4 shows the results of questionnaires in two groups before and after intervention. There was a significant difference between the two groups in the mindfulness score both before and after the intervention. Also, in each intervention and control group, the mean score of mental health before and after the intervention decreased statistically. In terms of general health score, there was no significant difference between the two groups before the intervention. However, after the intervention, the intervention group scored significantly higher (p -value=0.032). Also, in the intervention group, the mean score of general health after the intervention had a significant increase (P -value <0.001), but in the control group, this difference was not significant at before and after intervention.

In terms of the mean score of sleep quality, there was no significant difference between the two groups before and after the intervention. After the intervention, this difference was statistically borderline (p -value=0.051). Also, in each intervention and control group, the mean score of sleep quality before and after the intervention did not differ statistically.

Due to the significance of the mindfulness score difference between the two groups before the intervention and the difference in gender frequency in the groups, covariance regression analysis was used to control the confounding variables in each questionnaire. Table 5 shows the regression coefficients of the variables in the intervention group, gender, and the initial values (before the intervention) of each score of the questionnaires. Only the mindfulness score before intervention had a significant relationship with the mindfulness score after the intervention. With each 1 score increase in the values of mindfulness before the intervention, the mindfulness mean score after the intervention increased by 0.84. In other words, people with higher scores before the intervention gained higher scores after the intervention. The intervention group and gender did not have a significant relationship with the mindfulness after the intervention.

The intervention group and the initial general health score had a significant relationship with the general health score after the intervention. The final general health score of the intervention group

was 1.7 higher than that of the control group, and with each 1 score increase in the general health score before the intervention, the general health score after the intervention increased by 0.70.

Moreover, there was a significant relationship between the initial sleep quality score and the final sleep quality score. With each 1 score increase in the sleep quality before the intervention, the sleep quality score after the intervention increased by 0.6. The intervention group and gender did not show a significant relationship with the sleep quality after the intervention.

Table 2. Descriptive information of the demographic variables for the intervention and control groups.

Variable	Total	(n=219) Intervention	(n=102) Control	p-value*
Age	20.29±2.03	20.16±2.12	20.56±1.82	0.106 ⁺
Gender				
Male	98 (30.5)	88 (40.2)	10 (9.8)	<0.001*
Female	223 (69.5)	131 (59.8)	92 (90.2)	
Marital status				
Single	308 (96.0)	210 (95.9)	98 (96.1)	0.999*
Married	13 (4.0)	9 (4.1)	4 (3.9)	
Education				
Nursing	229 (71.3)	163 (74.4)	66 (64.7)	0.073*
Midwifery	92 (28.7)	56 (25.6)	36 (35.3)	
Number of children				
0	221 (69.1)	157 (72.1)	64 (62.7)	0.338*
1	8 (2.5)	4 (1.8)	4 (3.9)	
2	25 (7.8)	16 (7.3)	9 (8.8)	
>2	66 (20.6)	41 (18.8)	25 (24.6)	
Contracting COVID-19				
Yes	215 (67.0)	148 (67.6)	67 (65.7)	0.737*
No	106 (33.0)	71 (32.4)	35 (34.3)	
Medication us				
No	315 (100.0)	215 (100.0)	100 (100.0)	-
yes	0	0		

+: chi-square test +:t-test.

Table 3. Descriptive information of the questionnaires before and after the intervention.

Questionnaire	Scale	Before		After	
		Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)
Mindfulness	Observing	28.93 (5.52)	29 (25-33)	28.03 (6.31)	28 (24-32)
	Describing	28.71 (4.67)	29 (25-32)	28.16 (4.96)	28 (24.25-32)
	Acting with awareness	28.79 (5.43)	29 (25-33)	27.42 (6.25)	28 (24-32)
	Nonjudging	24.97 (4.98)	24 (22-28)	24.94 (5.80)	24 (21-28)
	Nonreactivity	21.24 (3.38)	21 (19-24)	21.41 (4.16)	21 (19-24)
	Total	132.63 (14.64)	132 (122.5-142)	129.98 (16.61)	127 (117-140)
General Health	Physical	12.04 (2.73)	12 (10-14)	12.5 (3.03)	12 (10-15)
	Anxiety	10.25 (3.08)	10 (7-13)	10.69 (3.59)	10 (7-14)
	Social	21.10 (1.69)	21 (21-22)	21.14 (2.40)	21 (21-22)
	Depression	11.84 (3.23)	10 (10-12)	9.41 (3.38)	8 (7-11)
	Total	52.30 (7.55)	50 (46-57)	53.81 (8.42)	52 (47-60)
Sleep Quality	Total	5.12 (3.34)	5 (3-7.75)	4.52 (3.45)	4 (2-7)

Table 4. A comparison of the mean scores of mindfulness, general health, and sleep quality before and after the intervention in the two groups at different times.

Questionnaire	Group	Before	After	p-value**
Mindfulness	Intervention	129.88±13.43	126.94±14.98	<0.001
	Control	138.14±15.46	135.90±18.07	0.008
	P-value*	<0.001	<0.001	
General Health	Intervention	52.61±7.29	54.56±8.73	<0.001
	Control	51.68±8.02	52.33±7.61	0.301
	P-value*	0.315	0.032	
Sleep Quality	Intervention	5.34±3.29	4.83±3.69	0.933
	Control	4.72±3.43	3.90±2.84	0.438
	P-value*	0.219	0.051	

*: independent sample t- test, **: paired t-test.

Table 5. The regression coefficients of the questionnaires using mixed model.

Questionnaire	Parameter	Regression coefficient	SE	95% CI	p-value
Mindfulness	Intervention group	-1.48	1.45	-4.34, 1.38	0.309
	Gender (male)	-2.10	1.42	-4.90, 0.69	0.140
	Mindfulness before the intervention	0.84	0.04	0.76, 0.93	<0.001
General Health	Intervention group	1.70	0.85	0.04, 3.37	0.045
	Gender (male)	-0.43	0.86	-2.13, 1.28	0.623
	General health before the intervention	0.70	0.05	0.61, 0.80	<0.001
Sleep quality	Intervention group	0.49	0.51	-0.51, 1.49	0.336
	Gender (male)	0.28	0.52	-0.76, 1.32	0.597
	Sleep quality before the intervention	0.60	0.06	0.47, 0.73	<0.001

4. Discussion

According to the findings, mindfulness-based stress reduction has led to an improvement in mindfulness, general health, and sleep quality among nursing students who recovered from COVID-19. Various studies have been conducted in this regard. Zhang claimed that mindfulness meditation, body awareness, Yoga, and mindfulness-based stress reduction can lead to spiritual awakening and can improve self-regulation and decrease stress in addition to its influence on mindfulness (28).

Rahmani et al. (2014) stated that one of the objectives of mindfulness-based stress reduction programs is the improvement of mindfulness and self-acceptance skills (29). No study has been conducted having investigated the effect of this type of intervention on university students who recovered from COVID-19. However, in other studies, mindfulness intervention was found effective on the participants’ mindfulness. For instance, the findings of the study conducted by Lampe and Müller revealed that this intervention could impact the participants’ mindfulness over a 6-month period (30). The results of a systematic review and meta-analysis showed that online mindfulness-based intervention was effective on the mental health and mindfulness of university students. Considering the effectiveness of this intervention on the mindfulness of students who recovered from COVID-19, it appears that through this intervention students learned the skills that are usually improved by mindfulness, which can be effective in dealing with the problems associated with post-COVID period (31). According to Adelian et al. (2021), mindfulness skill training is performed to help improve present-moment awareness as well as resilience to everyday stress (31).

Furthermore, the results of the present study showed that mindfulness-based stress reduction training was effective on the general health of the students who recovered from COVID-19. Many

studies had been conducted on the impact of this intervention on the health of different groups, ink. Chen Chang, in their study, reported that online mindfulness-based stress reduction intervention was able to improve mental health, mental image, and self-efficacy among cancer patients (32). Gu et al. stated that the improvement of flexibility resulting from MBSR can be a significant variable in the relationship between mindfulness skills and mental health in stressful situations (33).

The findings of another study proved that a full curriculum of MBSR, which is provided in online live classes, is practical and acceptable and shows a potential to reduce the effects of major stressors such as the COVID-19 pandemic on mental and physical health. According to the review of the literature and the usefulness of MBSR for different groups suffering from diseases and later complications, this approach can improve people's health by reducing mental disorders and can guide them toward a better quality of life and more peace (34, 35).

Another finding of the present study was the positive effect of MBSR on sleep quality. The literature review did not result in finding any study having assessed the effect of this intervention on COVID-19 survivors' sleep quality. However, the effects of this intervention on other groups' sleep quality have been analyzed. Zhao et al (2020) reported that mindfulness had a positive effect on breast cancer survivors' sleep quality (36). Kang et al. also reported the effect of MBSR on cancer survivors' sleep quality during and after the intervention (37). Also, Zhao et al (2019) who studied the effect of mindfulness on asthma patients' sleep quality confirmed the effectiveness of this method (38). Relevant but separate studies have highlighted the positive effects of mindfulness training on sleep quality. High mindfulness is associated with improved sleep quality, and an increasing number of randomized controlled trials have reported the improvement of sleep quality after mindfulness training in clinical and non-clinical populations (39). The results of a meta-analysis indicated that there is moderate strength of evidence that MBSR affects sleep quality (40).

MBSR on sleep quality, mental image, and perception of mindfulness among cancer patients was effective (41).

5. Conclusions

The findings of the present study indicated that MBSR intervention was effective in increasing mindfulness and improving mental health and sleep quality in COVID-19 survivors. Since COVID-19 survivors may face mental and physical disorders over time, it is suggested that these people be continuously assessed, and this type of intervention be used as a reliable and stable treatment to reduce, improve, or moderate other problems.

References

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *New England journal of medicine*. 2020;382(8):727-33.
2. Bonanad C, García-Blas S, Tarazona-Santabalbina F, Sanchis J, Bertomeu-González V, Fácila L, et al. The effect of age on mortality in patients with COVID-19: a meta-analysis with 611,583 subjects. *Journal of the American Medical Directors Association*. 2020;21(7):915-8.
3. WHO. WHO. Coronavirus disease 2019 (COVID-19) Situation Report 2020 [Available from: https://covid19.who.int/?gclid=CjwKCAjwkdL6BRAREiwA-kiczNtleO9AcXnV_rJVm1e-ksl4pHAE_7ybFuEXh2_zpfoRLDuQeXjK0RoCGA0QAvD_BwE.
4. Zhong B-L, Luo W, Li H-M, Zhang Q-Q, Liu X-G, Li W-T, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International journal of biological sciences*. 2020;16(10):1745.
5. Bhagavathula AS, Aldhaleei WA, Rahmani J, Khubchandani J. Knowledge, Attitude, Perceptions and Practice towards COVID-19: A systematic review and Meta-analysis. *MedRxiv*. 2020:2020.06. 24.20138891.
6. Kontoangelos K, Economou M, Papageorgiou C. Mental health effects of COVID-19 pandemic: a review of clinical and psychological traits. *Psychiatry investigation*. 2020;17(6):491.
7. Sim K, Chua HC. The psychological impact of SARS: a matter of heart and mind. *Cmaj*. 2004;170(5):811-2.
8. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: address mental health care to empower society. *The lancet*. 2020;395(10224):e37-e8.
9. WHO. Mental health and COVID-19 2020 [Available from: <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical>

- guidance/coronavirus-disease-se-covid-19-outbreak-technical-guidance-europe/mental-health-and-covid-19.
10. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health*. 2020;17(5):1729.
 11. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General psychiatry*. 2020;33(2).
 12. Xiao H, Zhang Y, Kong D, Li S, Yang N. The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Medical science monitor: international medical journal of experimental and clinical research*. 2020;26:e923549-1.
 13. Xiang Y-T, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *The lancet psychiatry*. 2020;7(3):228-9.
 14. Bäuerle A, Graf J, Jansen C, Musche V, Schweda A, Hetkamp M, et al. E-mental health mindfulness-based and skills-based 'CoPE It' intervention to reduce psychological distress in times of COVID-19: study protocol for a bicentre longitudinal study. *BMJ open*. 2020;10(8):e039646.
 15. HM S. Mindfulness during after covid [Available from: <http://info.primarycare.hms.harvard.edu/blog/mindfulness-during-after-covid>.
 16. Azimi S. Evaluation of the effectiveness of mindfulness in reducing students' stress and depression. *Journal of Recent Advances in Behavioral Sciences*. 2018;3(22):1-17.
 17. Shahoie R, Karimi A, Sharifish S, Soufizadeh N, Khanpour F. Evaluation of the effectiveness of mindfulness-based stress reduction on anxiety in pregnant women. *Scientific Journal of Nursing, Midwifery and Paramedical Faculty*. 2019;5(3):83-94.
 18. Sanaei H, Mousavi SAM, Moradi A, Parhoon H, Sanaei S. The effectiveness of mindfulness-based stress reduction on self-efficacy, perceived stress and life orientation of women with breast cancer. *Thoughts and Behavior in Clinical Psychology*. 2017;12(44):57-66.
 19. Fatemeh K, Homayoon HR. Effectiveness of mindfulnessbased stress reduction training on the quality of sleep and psychological distress in patients with type II diabetes. *J Diabetes Nurs*. 2019;7(3):844-56.
 20. Williams KA, Kolar MM, Reger BE, Pearson JC. Evaluation of a wellness-based mindfulness stress reduction intervention: A controlled trial. *American Journal of Health Promotion*. 2001;15(6):422-32.
 21. Verweij H, van Ravesteijn H, van Hooft ML, Lagro-Janssen AL, Speckens AE. Mindfulness-based stress reduction for residents: a randomized controlled trial. *Journal of general internal medicine*. 2018;33:429-36.
 22. Ducar DM, Penberthy JK, Schorling JB, Leavell VA, Calland JF. Mindfulness for healthcare providers fosters professional quality of life and mindful attention among emergency medical technicians. *Explore*. 2020;16(1):61-8.
 23. Lim J, Leow Z, Ong JC, Pang L-S, Lim E. The effects of online group mindfulness training on stress and sleep quality during the COVID-19 pandemic in Singapore: a retrospective equivalence trial. Available at SSRN 3629960. 2020.
 24. Basharat M. Reliability and validity of the 28-item form of mental health scale in Iranian population. *Journal of Legal Medicine*. 2009;15(2):78-91.
 25. Ahmadvand Z, Heidarinassab L, Shaeiri M. Checking the validity and reliability of the five-dimensional mindfulness questionnaire in Iranian non-clinical samples. *Behavioral Sciences*. 2013;25(7):229-38.
 26. Nejati S, Zahiroddin A, Afrookhteh G, Rahmani S, Hoveida S. Effect of group mindfulness-based stress-reduction program and conscious yoga on lifestyle, coping strategies, and systolic and diastolic blood pressures in patients with hypertension. *The Journal of Tehran University Heart Center*. 2015;10(3):140.
 27. Khazaeili M, Zargham Hajebi M, Mohamadkhani P, Mirzahoseini H. The effectiveness of mindfulness-based intervention on anxiety, depression and burden of caregivers of multiple sclerosis patients through web conferencing. *Practice in Clinical Psychology*. 2019;7(1):21-32.
 28. Zhang J-Y, Ji X-Z, Meng L-N, Cai Y-J. Effects of modified mindfulness-based stress reduction (MBSR) on the psychological health of adolescents with subthreshold depression: a randomized controlled trial. *Neuropsychiatric Disease and Treatment*. 2019:2695-704.
 29. Rahmani S, Talepasand S, Ghanbary-Motlagh A. Comparison of effectiveness of the metacognition treatment and the mindfulness-based stress reduction treatment on global and specific life quality of women with breast cancer. *Iranian journal of cancer prevention*. 2014;7(4):184.
 30. Gong X-G, Wang L-P, Rong G, Zhang D-N, Zhang A, Liu C. Effects of online mindfulness-based interventions on the mental health of university students: A systematic review and meta-analysis. *Frontiers in Psychology*. 2023;14:1073647.
 31. Adelian H, Khodabandeh Shahraki S, Miri S, Farokhzadian J. The effect of mindfulness-based stress reduction on resilience of vulnerable women at drop-in centers in the southeast of Iran. *BMC women's health*. 2021;21(1):1-10.

32. Chang Y-C, Chiu C-F, Wang C-K, Wu C-T, Liu L-C, Wu Y-C. Short-term effect of internet-delivered mindfulness-based stress reduction on mental health, self-efficacy, and body image among women with breast cancer during the COVID-19 pandemic. *Frontiers in Psychology*. 2022;13:949446.
33. Gu J, Strauss C, Crane C, Barnhofer T, Karl A, Cavanagh K, et al. Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological assessment*. 2016;28(7):791.
34. Accoto A, Chiarella SG, Raffone A, Montano A, de Marco A, Mainiero F, et al. Beneficial effects of mindfulness-based stress reduction training on the well-being of a female sample during the first total lockdown due to COVID-19 pandemic in Italy. *International journal of environmental research and public health*. 2021;18(11):5512.
35. Riley TD, Roy S, Parascando JA, Wile K, LaGamma C, Dong H, et al. Mindfulness-based stress reduction live online during the COVID-19 pandemic: A mixed methods feasibility study. *Journal of Integrative and Complementary Medicine*. 2022;28(6):497-506.
36. Zhao Y, Liu J-E, Lewis FM, Nie Z-H, Qiu H, Han J, et al. Effects of mindfulness-based cognitive therapy on breast cancer survivors with insomnia: A randomised controlled trial. *European Journal of Cancer Care*. 2020;29(5):e13259.
37. Kang C, Sun S, Yang Z, Fan X, Yuan J, Xu L, et al. The psychological effect of internet-based mindfulness-based stress reduction on the survivors of breast cancer during the COVID-19. *Frontiers in Psychiatry*. 2021;12:738579.
38. Zhao D, Wang H, Feng X, Lv G, Li P. Relationship between neuroticism and sleep quality among asthma patients: the mediation effect of mindfulness. *Sleep and Breathing*. 2019;23:925-31.
39. Lim J, Leow Z, Ong J, Pang L-S, Lim E. Effects of web-based group mindfulness training on stress and sleep quality in Singapore during the COVID-19 pandemic: retrospective equivalence analysis. *JMIR mental health*. 2021;8(3):e21757.
40. Rusch HL, Rosario M, Levison LM, Olivera A, Livingston WS, Wu T, et al. The effect of mindfulness meditation on sleep quality: a systematic review and meta-analysis of randomized controlled trials. *Annals of the New York Academy of Sciences*. 2019;1445(1):5-16.
41. Chang Y-C, Lin G-M, Tseng TA, Vitale E, Yang C-H, Yang Y-L. The Experience of Mindfulness-Based Stress Reduction on Menopausal Symptoms, Sleep Disturbance, and Body Image among Patients with Breast Cancer—A Qualitative Study. *Current Oncology*. 2023;30(1):1255-66.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.