

The Effect of Online Mindfulness-Based Stress Reduction Program on Sleep Quality in Mothers of Children with Autism Spectrum Disorder: A Randomized Clinical Trial

Abstract

Background: Mothers of children with autism spectrum disorder (ASD) would experience elevated levels of stress and psychological distress. This study examined the effect of an online Mindfulness-Based Stress Reduction (MBSR) Program on sleep quality in mothers of children with ASD. **Materials and Methods:** This was a randomized single-blinded controlled trial that was conducted in 2022 on 72 mothers of children with ASD from Fatemeh Zahra and Parnian Autism Centers in Isfahan City, Iran. Participants were recruited through a convenient sampling and randomly assigned to intervention ($n = 36$) and control ($n = 36$) groups. The intervention group underwent eight 90-min MBSR sessions twice a week. Data were collected using a demographic information form and the Pittsburgh Sleep Quality Index (PSQI) at baseline, immediately after, and one month after the intervention. Data were analyzed using independent samples: t -test, Chi-square, and one-way repeated-measure. **Results:** The intervention group showed significantly improved sleep quality scores immediately after ($F = 107.004$, $P < 0.001$) and one month after ($F = 107.004$, $P < 0.001$) the intervention compared to the control group (lower PSQI score indicates better sleep quality). Repeated-measure ANOVA indicated a significant change in sleep quality scores over time within the intervention group ($F = 107.004$, $P < 0.05$), but no significant change was found in the control group ($F = 1.292$, $P > 0.05$). **Conclusions:** The findings of this study demonstrate that MBSR effectively improves sleep in mothers of children with ASD. Given its cost-effectiveness, MBSR should be integrated into healthcare protocols.

Keywords: Autism spectrum disorder, disease managements, mindfulness, nursing, sleep quality, stress

Introduction

Autism spectrum disorder (ASD) is a pediatric developmental disorder characterized by abnormal communication behaviors, deficits in social communication, limited interests, and repetitive behaviors.^[1] These children's connection with the outside world is severed, and the defects in receiving and perceiving external sensory stimuli seriously disrupt their learning process and the establishment of proper social relations.^[2,3] The increasing prevalence of ASD has turned it into an important healthcare problem.^[2,4] The prevalence of ASD among children of 3–17 years in the United States in 20 was equivalent to 3.2% of the children population.^[5] In Iran, the prevalence of this disorder has been reported as 6 in 10,000 births. The growing statistics

of ASD has made it one of the most important issues of health systems.^[6] The required care for these children is naturally expected to affect the life of the entire family. Appropriately responding to the multiple needs of these children often demands good levels of adaptation and can impose intense stress on other family members. The stress experienced by these families is caused by the difficulty of finding services, confusion in finding effective treatments, insufficient financial resources to meet the child's care and treatment needs, and the family's reduced social relations and interactions with other people.^[7,8] Moreover, due to the nature of the disorder, children with ASD experience different clinical problems, such as anxiety, bad temper, aggressiveness, irritability, annoying behaviors, hyperactivity,

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restlessness, poorer physical health, harming behaviors for themselves and others, and sleep disorders, which are a serious challenge for the family members.^[9]

Mothers are usually the main caregivers of these children and are responsible for their various care-related tasks. The need to respond to the continuous and numerous care needs of these children, along with the responsibilities of housekeeping, taking care of other children, and attending to the needs of the family, would expose these mothers to intense psychological pressure caused by the multiplicity of roles. Psychological pressures and the burden of care have adverse impacts on mothers' health over time; for instance, they can cause stress and worries.^[10,11] The high levels of stress imposed on mothers due to this caregiving burden may disrupt their sleep quality. The long-term care for these children imposes stress and other negative emotions on the mothers, such as feeling lack of control over one's life, guilt, and many other concerns—all of which can disrupt their sleep quality.^[12] Another problem experienced by these children is a sleep disorder, which may in turn affect the mothers' own sleep quality.^[11,13,14] Sleep problems experienced by the mothers of these children include overall low quality of sleep, delayed sleep latency, sleep disorders, frequent awakenings, and daytime drowsiness.^[11,15] The quality of sleep has a direct effect on health, mood, daily function, and overall quality of life of mothers, and can therefore be an important factor in the quality by which the mother responds to her ASD child's care needs. Poor sleep quality impairs the mothers' general health and reduces their ability to deal with the stress caused by caregiving. It may further have other consequences for the mother, such as depression and a subsequent reduction in the quality of care and attention for other family members.^[11,14,16]

Although using drugs is considered one of the therapeutic methods for sleep disorders nowadays, some people may prefer nonpharmacological methods such as alternative medicine over medicinal treatments, for various reasons such as their side effects.^[17,18] Mindfulness is a nonpharmacological treatment used for stress control.^[19] This method is a novel approach in cognitive therapy that reduces negative thoughts and unpleasant emotions through concentration.^[20] Since one of the factors that could disturb the sleep quality is rooted in cognitive arousal, during recent years, mindfulness-based therapy has also been administered for this purpose in addition to cognitive-behavioral therapy. Mindfulness therapy means being aware of the present moment and accepting the existing conditions. People with high mental awareness respond to stimuli in a nonjudgmental way and let go of thoughts, beliefs, and emotions that lead to distress and arousal. In mindfulness therapy, people learn methods that would help them keep their attention focused on the present moment. Since people usually tend to avoid their distressing internal experiences, mindfulness training offers

a different direction that addresses and responds to anxiety openly with acceptance. Therefore, mindfulness training increases the ability to tolerate anxiety and prevents people from habitually avoiding concerns, ultimately improving adaptive self-regulation and healthy mind-body functioning.

Evidence shows that Mindfulness-Based Stress Reduction (MBSR) can create positive changes in people's lifestyles, such as reducing stress and anxiety, promoting the ability to deal with problems, and managing negative emotions.^[17,19,21] Mindfulness-based training allows people to focus on their mental and physical conditions.^[16] The results of previous studies have shown the effectiveness of mindfulness-based stress reduction in improving the mental health of patients with cancer and insomnia and patients with other chronic physical illnesses.^[17-23] Considering the importance of physical and mental health for mothers of autistic children in order to provide high-quality care to these children, it seems necessary to address issues that could affect mothers' health and quality of life such as sleep quality. Trying to maintain and improve the mental health of patient caregivers is one of the duties of the care team members.

Nursing care is not limited to taking care of patients in hospitals, but beyond that it also includes the effective role of nurses in the society to maintain and improve people's health. Previous studies have mostly focused on patients or caregivers of patients with physical disorders; most of them were aimed to implement interventions based on mindfulness programs, but the implementation of stress reduction mindfulness has not been the target of researchers. Therefore, given the importance of the topic and the research team's interest, this study aimed to examine the effect of an online MBSR program on sleep quality in mothers of children with ASD.

Materials and Methods

The present study was a randomized single-blinded controlled trial with two groups that was conducted at three stages (before, immediately after, and one month after the intervention). This study was conducted in 2022 (the sampling period lasted from October to March). The study environment included selected ASD centers in Isfahan City (Iran), including Fatemeh Zahra Association (for children under 14) for clients with ASD and Parnian Education and Rehabilitation Center. The inclusion criteria were being the mother of a child with ASD and having only one child with a disorder under their responsibility in the family, not participating or having participated in any similar researches, having no history of psychiatric disorders diagnosed by a psychiatrist that had led to pharmacotherapy or hospitalization (It was investigated by asking the participants), being able to speak, read, and write in Farsi, having no experience of severe stress over the past six months, such as death of loved ones, and not

taking sleeping medications. Furthermore, the mothers were required to have access to a smartphone or computer, an internet connection with good speed, and familiarity with cyberspace. The exclusion criteria were unwillingness to continue participating in the study, missing more than two sessions of the training course, and the occurrence of any physical or mental problems or severely stressful events for the mother during the study, such that she could no longer cooperate.

Samples were selected using a convenient sampling method from eligible mothers of children with ASD who had medical files in the selected centers. After visiting the ASD centers, the researcher first examined the medical files of children to find the contact numbers of their mothers; for this matter, the researcher randomly selected a digit from the table of random numbers with closed eyes. Then, by moving in the table of random numbers, she chose the required number of even and odd numbers. All the numbers were placed in separate envelopes and then, in one box. When samples were enrolled using a convenient sampling method, one of the cards given to them, and depending on whether the card had an even or odd number written on it, they were randomly placed in one of the two intervention or control groups. Also, the number of samples was increased by 10% regarding any possible sample loss. At the time of sampling, due to the spread of the Corona pandemic and the need to maintain health and preventive protocols, the sampling and briefing on the objectives of the research were performed virtually. The samples were then randomly assigned to the intervention and control groups. Random allocation of participants into two groups was performed using a table of random numbers. The sample size for each group was set at 36.

Statistical parameters were Z1, 95% confidence coefficient which was 1.96, Z2, power factor of the test which was 80% equal to 0.84, s which was an estimate of the average standard deviation of sleep quality scores in two groups and was considered to be 0.7, and d was the minimum difference in the average score of sleep quality between two groups, which showed a significant difference. Data were analyzed using IBM SPSS Statistics for Windows, Version 16.0 (IBM Corp., Armonk, NY, USA), employing independent sample *t*-test, Chi-square, and one-way repeated-measure ANOVA. The level of significance was set at 0.05 for all statistical tests.

Mothers of the intervention group were added to a WhatsApp group by the researcher. After receiving some introductory notes and explanation on the objectives of the research through voice messages in WhatsApp, mothers were officially invited to participate in the study. An informed consent form was sent to each of the mothers privately, and they expressed their consent to participate in the research by typing the sentence "I have read the informed consent form and accepted its content" if they

wished to participate. They were also assured that their information would remain confidential. In the first group meeting, participants were surveyed, and based on the agreement of the majority, files and online meetings were presented at a certain time.

The content of the online courses of the stress management program was developed based on scientific texts and implemented for the intervention group in a scheduled format^[24] [Table 1]. The educational content of the mindfulness-based stress management program was prepared based on the existing texts in the form of a schedule for implementation and approved by five members of the faculty of the Psychiatry Department of Isfahan Nursing and Midwifery Faculty.

This program was held online in eight 90-min sessions on the Big Blue Button platform; the audio file of the training session was uploaded to the WhatsApp group of the control mothers after the study was completed. The process of holding each meeting included reviewing the contents of the previous meeting, feedback, answering questions, resolving ambiguities, teaching the considered materials and techniques, including meditation skills (audio and video files), discussing stress and coping methods, and providing homework during the planned meetings. The mothers sent their experiences of doing the assigned tasks in the form of audio files via WhatsApp messenger or to the researcher's personal page during the interval between two sessions, and received feedback, such as meditation corrections or encouragement to continue working.^[25,26] [Table 1].

The control group did not receive any of the interventions administered to the intervention group. Participants of the intervention and control groups filled out the questionnaires at three stages: Before, immediately after, and one month after the intervention. Since mothers needed to reduce stress, the response rate was 100%. All the participants answered the questionnaires completely, and there was a response until one month after the end of the intervention. All the participants remained in the study from the beginning to the end [Figure 1].

Data were collected using demographic information form including mother's age, severity of child's ASD, socioeconomic status of the family, number of children, age of the child with ASD, mother's educational level, child's gender, and mother's employment status, plus the Pittsburgh Sleep Quality Index (PSQI), which was sent to the mothers online via PorsLine survey software and filled out by them. The PSQI was developed by Buysse *et al.*^[22] to measure sleep quality during the past month. This 18-item questionnaire assesses seven components of subjective sleep quality (item 18), sleep latency (sum of items 2 and 6), sleep duration (item 4), habitual sleep efficiency (interpretation of the open-ended question), sleep disturbances (sum of items 6–15), use of sleeping medication (item 15), and daytime dysfunction (sum of

Table 1: The content and assignments of the mindfulness-based stress management program^[32]

Session	Content description	Assignment
1	- Introducing the program and its goals. - Explaining stress and its symptoms. - Explaining the concept of mindfulness and addressing the automatic direction of thoughts and their identification.	Writing feelings and thoughts during the exercise experience and sending it to the researcher
2	Explaining the sources and factors causing mental pressures and anxiety, examining stressors, proper reactions to daily stresses and pressures, training, and practicing diaphragmatic breathing.	Writing down your feelings and thoughts during today's session and sending them to the researcher.
3	Examining a list of the group members' pleasant daily activities, training, and practicing conscious attention and concentration on breathing (mindful breathing), and explaining the changes created in breathing pattern with mood.	Writing down your feelings and thoughts during today's session and sending them to the researcher.
4	Explaining presence in the moment, directing thoughts toward being and remaining in the present, preventing the intrusion of negative thoughts, conscious attention to the surroundings as a viewer, and attention to positive points and aspects of events and conditions.	Writing down your feelings and thoughts during today's session and sending them to the researcher.
5	Explaining the importance of assuming responsibility for one's actions, practicing conscious walking, and focusing on the posture and changes in the body while walking.	Writing down your feelings and thoughts during today's session and sending them to the researcher.
6	Releasing one-sided, one-dimensional, and unreasonable thoughts, beliefs, and wishes through acceptance and gaining awareness of them, and considering and examining problems in a multidimensional way with an open and clear mind.	Writing down your feelings and thoughts during today's session and sending them to the researcher.
7	Describing depression and its symptoms, investigating the issues and factors causing sleep disorders and stress, and teaching conscious reactions to stressful issues, such as balancing one's physical reactions to stress (deep breathing and muscle contraction).	Writing down your feelings and thoughts during today's session and sending them to the researcher.
8	Receiving feedback from the group members about the instructed principles, reviewing and summing up the entire content of the previous sessions, recommending daily planning for activities, using mindfulness techniques (mindful walking, mindful listening to music, mindful eating, etc.) in life, and generalizing it to the whole flow of life.	Thanks to mothers for their cooperation with the research team.

items 16 and 17) on a four-point Likert scale from 0 (not during the past month) to 3 (three or more times a week). Each subscale receives a score of 0 to 3. The results are interpreted as follows: 0 = no sleep problem, 1 = moderate sleep problem, 2 = serious sleep problem, and 3 = very serious sleep problem. The sum of scores from the seven subscales ranges from 0 to 21, and a total score higher than 5 for the entire index denotes poor sleep quality. Buysse reported that the score of all the PSQI subscales has an overall Cronbach's alpha (reliability) of 83%, indicating a high degree of internal consistency.^[27] Kooshki and Harunorrashidi^[28] found the reliability of the questionnaire to be 0.80 using Cronbach's alpha.

Ethical considerations

This article was adopted from a master's thesis in the field of psychiatric nursing from Isfahan University of Medical Sciences, Faculty of Nursing and Midwifery. The Ethics Committee of Isfahan University of Medical Sciences has approved this study (Ethical code: IR.MUI.RESEARCH.REC.1399.205). Before beginning the intervention, all the participants were briefed on the purpose and methods of the

study and the voluntary nature of participation. They were also assured about confidentiality of their information and submitted their written informed consent. They were told that they would receive the results of the research if they wished.

Results

A total of 72 mothers of children with ASD who met the inclusion criteria were selected and randomly divided into two groups: intervention ($n = 36$) and control ($n = 36$). No significant difference was found between the two groups regarding their demographic characteristics [Tables 2 and 3]. An independent *t*-test showed that the mothers' mean score of sleep quality did not have a significant difference between the two groups before the intervention. Moreover, mothers' mean scores of sleep quality immediately after ($F = 107.004$, $P < 0.001$) and one month after the intervention ($F = 107.004$, $P < 0.001$) were significantly lower in the intervention group than the control group (in PSQI, a lower score means higher sleep quality). Repeated-measure ANOVA showed that mothers' mean score of sleep quality differed significantly in the intervention group between the three time

points ($F = 107.004$, $P < 0.05$), but in the control group, no significant difference was observed in these scores between the three time points ($F = 1.292$, $P > 0.05$) [Table 4].

Table 2: Mean age of mothers and children in both groups

Group Variable	Intervention group	Control group	Independent samples <i>t</i> -test		
	Mean (SD)	Mean (SD)	<i>t</i>	df	<i>P</i>
Mother's age	39.19 (6.098)	37.97 (6.017)	0.856	70	0.395
Child's age	8.94 (3.569)	9.44 (3.193)	-0.626	70	0.533
Number of children	2.22 (0.929)	1.89 (1.063)	1.416	70	0.161

Discussion

Based on the results, the MBSR program had a significant effect on the sleep quality of mothers in the intervention group, and their mean score of sleep quality was lower immediately after and one month after the intervention compared to before the intervention. The most common sources of stress for parents, both during pregnancy and after, are related to the health of their child. All parents want to have a healthy child with normal development. In fact, any disease that could lead to possible consequences of lifelong disability in mental and physical fields is a source of stress for parents.^[29] One of the problems caused by the stress of

Table 3: Frequency distribution of the severity of disease, occupation status, and educational level in both groups

Group Variable		Intervention group	Control group	Chi-square test		
		Number (%)	Number (%)	χ^2	df	<i>P</i>
Disease severity	Mild	9 (25.00)	9 (25.00)	0.300	2	0.861
	Severe	11 (30.60)	13 (36.10)			
	Moderate	16 (44.40)	14 (38.90)			
Occupation status	Housewife	31 (86.10)	24 (66.70)	3.773	1	0.094
	Employed	5 (13.90)	12 (33.30)			
Level of education	Academic education	10 (27.80)	19 (52.80)	5.003	2	0.082
	High-school diploma	19 (52.80)	11 (30.60)			
	Below high-school diploma	7 (19.40)	6 (16.70)			
Family's socioeconomic status	Equal to the amount needed for life expenses	22 (61.11)	23 (63.91)	0.059	1	0.50
	Less than the amount needed for life expenses	14 (38.91)	13 (37.51)			
Child's gender	Boy	24 (66.70)	23 (63.91)	0.061	1	0.50
	Girl	12 (33.31)	13 (36.10)			

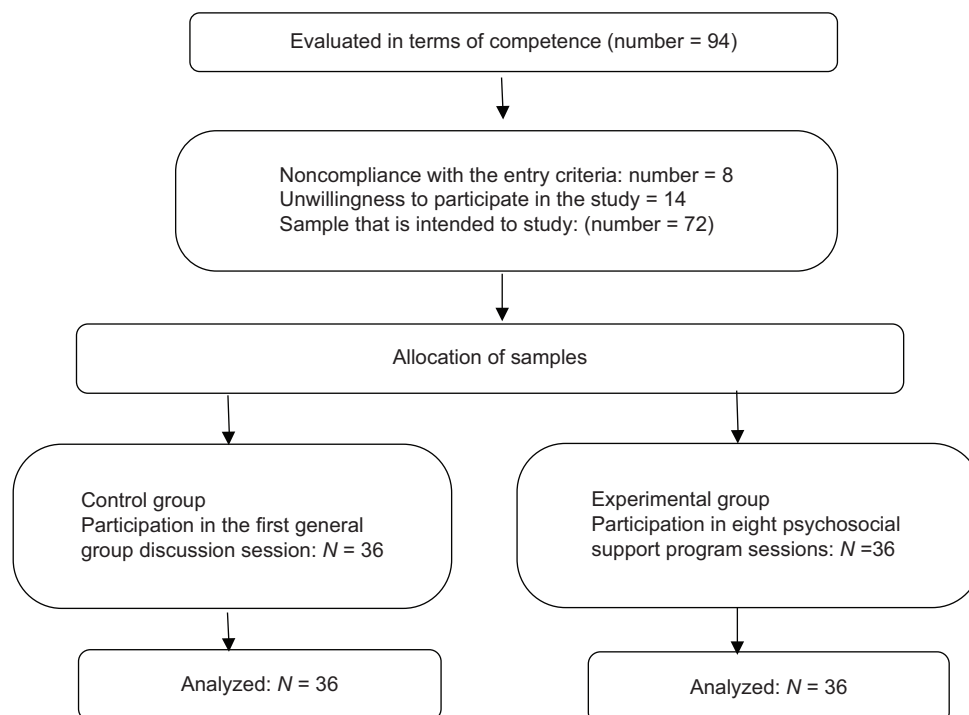


Figure 1: Consort diagram: Sampling, intervention, and data collection diagram

Table 4: Comparing the mean score of sleep quality of mothers at different time points between both groups

Group Time	Intervention group	Control group	Independent sample t-test		
	Mean (SD)	Mean (SD)	t	df	P
Before the intervention	13.64 (2.939)	13.67 (2.726)	-0.042	70	0.967
Immediately after the intervention	5.33 (2.563)	13.67 (2.402)	-14.232	70	>0.001
One month after the intervention	6.14 (2.244)	14.47 (2.145)	-16.107	70	>0.001

mothers is a sleep disorder. Studies have shown that high levels of intrusive thoughts, avoidance, and overstimulation are related to poor sleep quality. Mindfulness techniques can help a person sleep because of improving awareness and reducing reactions to negative thoughts.^[30,31]

In healthy people, sleep quality disorders are usually rooted in cognitive processes; therefore, it seems that the MBSR intervention given in the present study as a type of cognitive therapy has interrupted the vicious cycle of negative thoughts, feelings, and emotions in the mothers and helped them release their constant worries about their children's condition by helping them focus their attention on the present moment. The negative effects of stress on sleep quality are evident; since part of the intervention involved deep breathing exercises, mindful walking, body scanning, and mindful eating, it must have prevented the mothers' engagement with negative thoughts and subsequent worries by distracting their mind; by maintaining the mother's connection with the present moment and experiencing what is happening here and today, the intervention has helped release the mothers' stress; and this mitigation of stress may have thus caused their better sleep quality. Performing the meditations of the mindfulness program reduced the mother's mental effort to avoid the existing negative situations, and by creating peacefulness, it prepared their mind for good-quality rest during sleep. This finding was consistent with the results reported by Dykens *et al.*^[32] The present findings were also consistent with the study by Zhang *et al.*,^[27] who showed that mindfulness had a significant effect on chronic insomnia in older adults. This finding was also in line with the results of the studies by Chen *et al.*,^[28] Huberty and Puzia,^[33] and Javadzade and Esmaeili.^[20]

Unlike the studies cited above, the present findings were inconsistent with some of the previous studies. For example, Suh *et al.*^[34] conducted a study on women with cancer in Denmark to examine the effectiveness of mindfulness intervention on sleep quality. They showed no statistically significant difference between their intervention and control groups over time after the intervention. The reason for this discrepancy could be due to the differences in the

target groups of both studies; in addition, women with breast cancer have other problems besides disease-related stress, such as the long-term treatment process and severe complications caused by treatments, death anxiety, which would further complicate their condition. It, therefore, seems that breast cancer patients need multidimensional and longer interventions compared to other groups to control their stress, improve their quality of sleep, and rest patterns. Although the current study demonstrated the impact of MBSR on the quality of sleep in mothers, it had certain limitations, such as implementing the program only for mothers and gender restrictions. This program could be administered to all caregivers, including both mothers and fathers, through in-person group training for larger samples of caregivers. Conducting this procedure online can be an innovation in educational methods for treating such patients.

Conclusion

It can be concluded that the MBSR markedly reduced the mean score of sleep quality in the intervention group, which indicated a better sleep quality compared to the control group. According to the results of this study, the need to use an interprofessional and collaborative approach between nurses and the treatment team to maintain and improve the mental health of this group was revealed. This program can be useful as a complementary intervention along with treatment programs for children with ASD with the aim of improving the mental health of the mothers and ultimately improving the quality of life of all family members of the affected child. In addition, due to the cost-effectiveness of this program, it is suggested to be used as a support program for families with children with ASD in the welfare of the country, and also this intervention should be taught to nurses as a way to support patients and their families.

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Conflicts of interest

Nothing to declare.

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