

## Effect of Balint Group Combined with MBSR on Psychological Crisis of Nurses in Public Health Emergencies: A Randomized Controlled Trial

Zhaoming Cao<sup>1</sup>, Bei Wang<sup>2</sup>, Huijun Zhang<sup>1\*</sup>

<sup>1</sup>Department of Nursing, Nursing College of Jinzhou Medical University, Liaoning, China

<sup>2</sup>Department of gynecological oncology, Affiliated Hospital of Hebei University, Hebei, China

**\*Corresponding author**

H Zhang, Department of Nursing, Jinzhou Medical University, No.40, Section 3, Songpo Road, Linghe District, Jinzhou City, Liaoning, China

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### Abstract

**Background:** It has been more than three years since the outbreak of COVID-19 pandemic in China in late 2019. During this period, all Chinese nurses who fight the front lines during the pandemic have been subjected to enormous mental and psychological pressure. How to maintain their mental health during the epidemic period and enable them to relax themselves after high intensity work so as to ensure the quality of their work is necessary. The purpose of this study was to evaluate the effects of a training table which combined Balint group and MBSR on maintaining the mental health of nurses during the pandemic.

**Methods:** This was a prospective, single-blind, randomized, controlled trial. Totally 112 nurses were randomly assigned to the intervention group ( $n = 56$ ) with an 8-week group training, the control group ( $n = 56$ ) received routine psychological counselling services. The outcomes were assessed at pre-and post-training intervention with the Five Facet Mindfulness Questionnaire, the Chinese Perceived Stress Scale, the Maslach Burnout Inventory - Human Services Survey, and Ryff's Scales of Psychological Well-being.

**Results:** At the pre-training intervention, the scores of FFMQ, PSS, MBI and SPWB for both groups suggest the high burnout, pressure and low psychological well-being for participants. At the post-training intervention, the scores of PSS and MBI for the intervention group were significantly lower than the control group.

**Conclusions:** Using "empathy circle" to vent emotions reasonably and effectively, and then combined with mindfulness decompression to relieve tension can improve nurses' mindfulness level and work in a stable emotional state. Combination of Balint group and mindfulness decompression also provides a new idea to alleviate the psychological pressure of nurses. The training table can be extended to other regions or countries to relieve the mental and psychological pressure of nurses or the other medical staff in emergency public health events.

**Trial Registration:** This study retrospectively registered in Chinese Clinical Trial Registry on January 16, 2022; registration number is ChiCTR2200055731

**Keywords:** Psychological Crisis, Nurses, Balint Group, Perceived Pressure, Psychological Well-Being, Burnout

### Introduction

The outbreak of coronavirus disease 2019 (COVID-19) has become a major public health issue worldwide. On March 11, 2020, the World Health Organization officially announced COVID-19 to be a global pandemic [1]. The worldwide pandemic has been going on for three years. Playing a crucial role in disaster medicine provision and the front-line staff battling against COVID-19, nurses are responsible for emergency relief, epidemic prevention, and health education. During the pandemic, nursing staff must come in close contact with patients because of their engagement in nursing care and sampling. Fear of being infected, intense work schedules, frequent confrontation with deaths, and other negative incidents have concurrently imposed

physical and psychological challenges on front line nurses, causing them to develop anxiety, depression, excessive psychological stress, and burnout. These negative emotions can last for a long time, even leading to post-traumatic stress disorder in some nurses [2]. To avoid said problems, effective psychological interventions must be conducted to help maintain the psychological health of front line nurses.

A Balint group, created by the psychiatrist Michael Balint, comprises 8–12 members, of which the group leader is a professional psychotherapist. This method was initially adopted to help general practitioners develop and solve various problems in treatment practices [3]. Research has demonstrated that Balint groups can

mitigate anxiety and depression in medical staff, thereby increasing their sense of security [4]. Mindfulness-based stress reduction (MBSR) training has been widely applied to stress management, emotion regulation, and physical and psychological health maintenance [5]. Studies have found that MBSR can effectively reduce nurses' psychological stress and negative emotions as well as increase their well-being [6]. Incorporating MBSR into a Balint group and adopting a randomized controlled design, the present study administered an 8-week intervention to front line nurses combating the COVID-19 pandemic. The purpose was to determine the effects of the proposed Balint–MBSR intervention on the perceived stress, burnout, and well-being of front line nurses. The research results are expected to provide an effective intervention method for enhancing the psychological health of front line nurses handling a major public health incident.

## Methods

### Design

This was a prospective, single-blind, randomized, controlled trial. Participants were divided into two groups (i.e., the intervention group and the control group) with a random number generator. Because of the nature of the intervention, only the statistician who independently performed the data analysis on our team was blinded to the treatment allocation.

### Participants and Study Setting

Participants were front line nurses recruited from a Large general hospital in Liaoning province, China, from June 2021 to August 2021. The inclusion criteria were as follows: (1) Nurses who have obtained the nurse qualification certificate; (2) Direct contact with confirmed, probable, or suspected novel coronavirus (2019-nCoV/SARS-CoV-2) infection patients; (3) Nurses working in isolation ward, intensive medical ward and new fever clinic of emergency transformation. The exclusion criteria were as follows: (1) Auxiliary nurses who distributed meals, atomized drugs and changed bed sheets for front-line departments; (2) Nurses with a history of anxiety. Participants were informed about the objective of the study and the option to terminate participation at any time. Informed consent was obtained from all participants before starting the study. This study was approved by the Ethics Committee of Jinzhou Medical University [No. JZMU2020001], Trial Registration Number: ChiCTR2200055731, This work was supported by Education Department of Liaoning Province, China [No. JYTJCZR2020085].

### Sample Size

G\*Power software (University of Dusseldorf, Germany, version 3.1) was used to calculate the optimal sample size for each of the two groups. The following parameters were entered: alpha error probability = 0.05, power = 0.9, effect size  $d = 0.8$  and allocation ratio ( $n_2/n_1$ ) = 1, computed for independent sample t-test for two groups. The sample size was estimated as 34 for each group. Accounting for 15% participant dropouts, the optimal sample size for each group was determined to be at least 39.

### Interventions

The control group was assigned a psychologist, psychologist provide remote psychological counseling services. Participants in the intervention group further divided into 7 subgroups, each consisting of eight individuals. A registered psychotherapist with more than 5 years of experience was assigned as the group leader to each subgroup received an 8-week group training. By referring to research on Balint group-based activities and MBSR, the present researchers developed an 8-week activity plan table. Before the program began, each group leader introduced the purpose of Balint activities, the concept of MBSR, and the 8-week activity plan to group members, followed by self-introductions of the leader and members [1, 4, 7, 8]. In each activity session, a member shared a case related to the member's work in combating COVID-19 and the theme set in the session in question; each member had to share two cases when the prevention ended. After listening to a case report, other members expressed their thoughts and feelings. During the discussions, the group leaders guided their members and produced a conclusion for each session. The MBSR activities were held according to the proposed activity plan table. At the end of each session, the leader introduced the knowledge, connotations, training methods, experience, and skills associated with MBSR. Additionally, participants in the intervention group were required to engage in mindfulness practice for  $\geq 20$  min daily and check in with their WeChat group. Table 1 details the themes, contents, and schedules of activity sessions per week. The control group received routine psychological counseling. The training is conducted twice a week, and every session duration  $\geq 1.5$ h. Because social distancing was required due to the pandemic, activities were held through Tencent Meeting (an online meeting application). All participants in both groups were asked to complete an anonymous online questionnaire at two time points: pre- and post-intervention (8 weeks).

**Table 1: Plan of Balint group–based activities combined with MBSR**

Week number	Activity number and theme	Part 1: Balint group–based activity	Part 2: MBSR training
Week 1	Activity 1: Mitigating anxiety	① One of the members shares things that made him or her anxious during the pandemic outbreak, talks about his or her difficulties and thoughts, and describes how they felt in detail (10 min). ② Other members express their thoughts on the shared case (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The leader introduces the concept of MBSR and basic steps of MBSR practice. Mindfulness helps one enhance concentration and awareness of one’s body, mind, and feelings, thereby increasing one’s perceived well-being (10 min). ② The group leader introduces the concept, causes, and consequences of anxiety and instructs members how to use mindfulness to beat anxiety (10 min). ③ Mindfulness practice: Meditation (20 min).
	Activity 2: Reducing depression	① One of the members describes things that made him or her feel depressed or wronged, talks about his or her difficulties and thoughts, and describes how he or she felt in detail (10 min). ② Other members express their thoughts on the shared case (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① Taking the case as an example, the group leader explains how feeling depressed or wronged develops (10 min). ② The leader then teaches the members how to let go and forget said negative emotions (10 min). ③ Mindfulness practice: Body scan (30 min).
Week 2	Activity 3: Directly facing fears	① One of the members describes things that scared him or her, talks about his or her difficulties and thoughts, and describes how they felt in detail (10 min). ② Other members express their thoughts on the shared case (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① Taking the case as an example, the group leader guides members in directly facing their fears and difficulties (10 min). ② The leader provides approaches that are helpful in freeing one from the existing concepts (10 min). ③ Mindfulness practice: Mindful stretching standing up and breathing (30 min).
	Activity 4: Getting rid of compulsive behavior	① One of the members lists his or her compulsive behavior when severely stressed at work and provides an example (10 min). ② Other members express their thoughts on the shared case (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① Taking the case as an example, the group leader guides the members to let go of meaningless obsession (10 min). ② The leaders guide the members to focus and introduce the advantages of being focused. ③ Mindfulness practice: Silent retreat (30 min).
Week 3	Activity 5: Earning trust	① One of the members shares an experience of being trusted or distrusted (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① Taking the case as an example, the group leader teaches the members how to trust others (10 min). ② The leader shares a story of how they earn trust (10 min). ③ Mindfulness practice: Loving kindness practice and sun visualization (20 min).

	Activity 6: Accepting others	① One of the members shares an experience of having a conflict with patients or coworkers (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① Taking the case as an example, the group leader guides the members to accept others (10 min). ② The leader teaches members how to interact with others using empathy. ③ Mindfulness practice: Exploring difficulties (20 min).
Week 4	Activity 7: Deeply reducing stress	① One of the members shares an experience of having a conflict with patients or coworkers (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader shares some stress reduction tips (10 min). ② The members are encouraged to experience the present moment. ③ Mindfulness practice: Mindful walking and two practices for the state of knowing (i.e., mindfulness connection and impartial thinking).
	Activity 8: Sleeping better	① One of the members shares the latest experience of struggling to fall asleep (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader shares some tips to achieve deep sleep (10 min). ② The leader guides the members to relax. ③ Mindfulness practice: Raisin eating and water drinking exercises to train concentration (20 min).
Week 5	Activity 9: Having the power of now	① One of the members shares an experience of being frustrated (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The leader guides the members to free themselves from existing thinking. ② The leader introduces how the body can react with one's thinking. ③ Mindfulness practice: Contemplation (20 min).
	Activity 10: Developing an attitude of nonstriving	① One of the members shares an experience of being extremely eager to achieve something (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to be relaxed and calm, allowing things to happen naturally. ② The leader guides the members to engage in focus training. ③ Mindfulness: Confronting difficulties and maintaining positive emotions (20 min).
Week 6	Activity 11: Regaining confidence	① One of the members shares an event that made him or her lose confidence (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to free themselves from their thoughts (10 min). ② The leader introduces how the body can react with one's thinking. ③ Mindfulness practice: Contemplation (20 min).

	Activity 12: Being grateful	① One of the members shares an experience of being grateful to another individual such as a colleague or patient (10 min). ② Other members express their thoughts on the shared experience (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to practice gratitude. ② The leader teaches the members how to develop the ability to love others in daily life. ③ Mindfulness practice: Impartial mind training and loving kindness practice in pairs (20 min).
Week 7	Activity 13: Back to the original intention	① One of the members tells the others about his or her original intention to participate in the battle against COVID-19 (10 min). ② Other members express their thoughts on the shared experience and briefly state their own intentions (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to think about happy memories (10 min). ② The leader introduces offers tips on calming oneself down (10 min). ③ Mindfulness practice: Contemplation (20 min).
	Activity 14: Learning to stay focused	① One of the members talks about things that can easily distract him or her (10 min). ② Other members express their thoughts on the shared experience and briefly share their own (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides members to stay focused in the present moment and take back their attention (10 min). ② The leader guides the members to stay focused when walking, eating, and drinking water. ③ Raisin practice (10 min).
Week 8	Activity 15: Finding internal freedom	① One of the members talks about a thing that confused him or her the most during the pandemic outbreak (10 min). ② Other members express their thoughts on the shared experience and briefly share their own experiences (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to free themselves from their thoughts (10 min). ② The leader instructs the members to practice open mindedness (10 min). ③ Mindfulness practice: Mindful meditation and observing one's breath (20 min).
	Activity 16: Stabilizing your mood	① One of the members talks about an experience of an emotional outburst or having serious mood swings (10 min). ② Other members express their thoughts on the shared experience and briefly share their own experiences (30 min). ③ The group leader draws a conclusion and provides psychological counseling on problems shared by most of the participants (10 min).	① The group leader guides the members to identify where their feelings come from and to be aware of their inner thoughts (10 min). ② The leader guides the members to get rid of emotional problems (10 min). ③ Mindfulness practice: Lying and standing mindful stretching (20 min).

### Outcome Measures

Five Facet Mindfulness Questionnaire (FFMQ), Chinese Perceived Stress Scale (CPSS), Maslach Burnout Inventory (MBI) and Ryff's Psychological Well-Being Scale (SPWB) were used to measure.

Five questionnaires were used for assessing the effectiveness of the method that combined Balint group-based activities and MBSR program on the levels of perceived stress, burnout, and psychological well-being, including general survey for collecting demographic information (sex, age, marital status, seniority, job title, and educational attainment).

Five Facet Mindfulness Questionnaire (FFMQ), the FFMQ developed by Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) was adopted [9]. The FFMQ measures one's level of mindfulness and comprises five facets, namely observation (eight items), description (eight items), aware actions (eight items), nonjudgmental inner experience (eight items), and non-reactivity (seven items). A high mean score indicates a high level of mindfulness in each facet. With a Cronbach's  $\alpha$  of 0.74, the FFMQ can effectively appraise the mindfulness level of the individual to be treated.

Chinese Perceived Stress Scale (CPSS), the present researchers CPSS developed by Yang and Huang, who adapted the original Perceived Stress Scale proposed by the American psychologist Cohen (1983) for Chinese participants [10]. The CPSS comprises 14 items reflecting how nervous and uncontrollable one perceives the item to be (seven positive and seven reverse-scored items). Each item is rated on a 5-point Likert scale, from 0 (never), 1 (almost never), 2 (sometimes), 3 (often), to 4 (very often). A high score indicates a high level of perceived stress. The Cronbach's  $\alpha$  of the CPSS is 0.78.

The Maslach Burnout Inventory (MBI) is a comprehensive, multidimensional questionnaire that was created by Susan Jackson, Michael Leiter and Christina Maslach in 1996 and has been widely used. It is a self-assessed reported questionnaire consisting of 22 items, evaluating the 3 dimensions of burnout: depersonalization (DP, 5 items), personal accomplishment (PA, 8 items) and emotional exhaustion (EE, 9 items) [11].

Ryff's Psychological Well-Being Scale. This scale was revised by Li and comprises 18 items in six dimensions (i.e., autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance) [12]. The items are rated on a six-point scale from 1 (strongly disagree), 2 (disagree), 3 (somewhat disagree), 4 (somewhat agree), 5 (agree), to 6 (strongly agree). A high score suggests a high level of psychological well-being. The Cronbach's  $\alpha$  of the scale is 0.97.

### Statistical Analysis

The collected responses were analyzed using SPSS 26.0, with measurement data denoted as  $\bar{x} \pm s$ . The data were subjected to an independent sample t test, paired sample t test, and Pearson's correlation analysis. Enumerated data were indicated by frequency and percentage, and were subjected to a  $\chi^2$  test and Fisher's exact test, in which  $P < 0.05$  and  $P < 0.01$  indicated significance, respectively. Ordinal data were processed using a rank-sum test, with  $P < 0.01$  representing the significance level.

### Quality Control

The present researchers had all participated in Balint-based group activities, possessed abundant relevant experience, were familiar with the activity process, and had received training on implementing an MBSR program. Before the experiment began, all researchers jointly received relevant training. Each researcher was requested to simulate the experimental process, ensuring that the following requirements were met: (1) The participants honestly filled out the questionnaire within a given time period; (2) the participants could ask the researcher if they have any question; and (3) the researcher did not provide any "opinion-swaying" explanations to ensure genuine questionnaire answers. Leaders of the intervention group were all state-certified second-grade psychological counselors, had passed the test for Balint-group training, and had hosted Balint groups at least three times before. To ensure effective verification of the activity's quality, a WeChat group was established for the intervention groups. The group posts comprised an introduction to Balint groups and knowledge of MBSR, to which the action plan table was attached. During the intervention activities, the present researchers switched from one video conference to another one, making sure that the group discussion did not get sidetracked. All activities for each group were recorded.

### Results

#### Sample Characteristics and Baseline Measures

As a result, the total number of the whole participants was 108. The participants included in the analysis should participate in the whole process and complete the questionnaire pre- and post-intervention. In the experimental group, two nurses withdrew from the study in the second week and the fourth week respectively, and one nurse left the study in the third week due to illness. Therefore, 53 people were finally included in the analysis in the experimental group; One participant in the control group fell ill at week 5 and did not complete the second questionnaire, so 55 people in the control group were finally included in the analysis. The CONSORT flow diagram in Fig. 1. Baseline characteristics for the two arms were shown in Table 2. No statistically significant differences were observed.

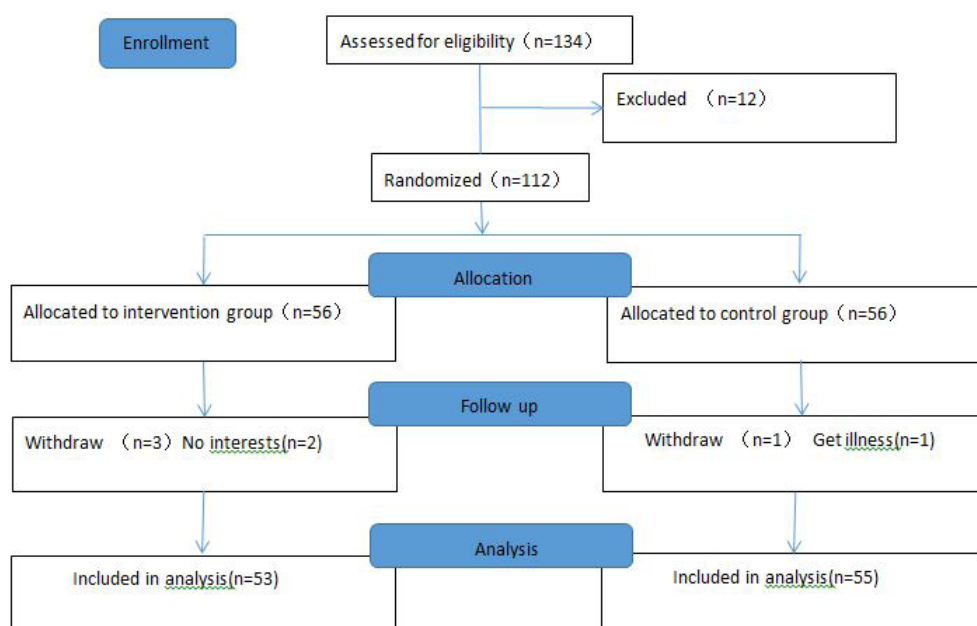


Figure 1: The CONSORT flow diagram

**Table 2: Comparison of demographic information between the intervention and control groups**

Characteristics		Intervention group(n=53)	Control group(n=55)	X <sup>2</sup>	P
Gender	Male	4	7	0.373	0.541
	Female	49	48		
Age(years)	18-25	11	13	0.805	0.669
	26-30	27	30		
	≥31	15	12		
Seniority(years)	≤5	8	7	0.164	0.921
	6-9	34	37		
	≥10	11	11		
Marital status	Married	41	44	0.212	0.645
	Single	12	11		
Job title	Primary	18	21	0.481	0.786
	Upper middle	21	23		
	Senior	14	11		
Educational attainment	Associate's degree	9	7	0.423	0.809
	Bachelor's degree	35	40		
	Master's degree	9	8		

**Table 3: Pretest correlations among all indicators between the two groups of nurses (n = 108, r)**

Variable	Mindfulness level (FFMQ)	Perceived stress (PSS)	Burnout (MBI)	Psychological well-being(SPWB)
Mindfulness level(FFMQ)	1			
Perceived stress(PSS)	-0.408	1		
Burnout(MBI)	-0.803	0.358	1	
Psychological well-being(SPWB)	0.955	-0.471	-0.810	1

Table 4 displayed the total scores of FFMQ, PSS, MBI and SPWB Sat baseline. As a result, in this questionnaire survey, both the scores for PSS (67.28±4.43 vs 67.36±1.99) for the intervention group and control group were at a very high level, this score (57-70) indicates that our participants really hurting their own mental health with extreme stress response. they need

some advice from a professional psychologist to help them reduce their perception of pressure devices and improve the quality of life. The scores for MBI for both groups were showed that, these nurses suffered from obvious burnout (72.62±3.95 vs 71.36±3.69).

**Table 4: Comparison between the two groups regarding their pre- and postintervention scores of mindfulness level, perceived stress, burnout, and psychological well-being (x±s)**

Variable	Preintervention		t	p	Postintervention		t	p
	Intervention group(n=53)	Control group(n=55)			Intervention group(n=53)	Control group(n=55)		
Mindfulness level(FFMQ)	115.53±5.49	115.80±3.52	0.354	0.724	170.83±2.93	115.59±3.51	-88.977	0.000
Perceived stress(PSS)	67.28±4.43	67.36±1.99	0.582	0.562	31.70±1.55	67.55±2.01	103.859	0.000
Burnout(MBI)	72.62±3.95	71.36±3.69	-2.062	0.042	35.53±3.34	70.64±3.05	57.303	0.000
Psychological well-being(SPWB)	52.30±3.05	52.71±2.25	0.920	0.360	87.58±2.06	53.75±3.55	-60.430	0.000

There were no significant differences in baseline between the intervention group and control group for FFMQ, PSS, MBI and SPWB. Pre intervention, the intervention and control groups did not exhibit any significant differences in mindfulness level, perceived stress, and psychological well-being scores (P > 0.05). However, the two groups scored significantly differently in burnout (P < 0.05), with the control group (71.36±3.69) scor-

ing lower than the intervention group (72.62±3.95).

**Post-intervention Changes in the Indicator Correlations between the Control and Intervention Groups**

The 55 participants analyzed in the control group showed no significant (P > 0.05) before intervention, while the scores of FFMQ and SPWB for the intervention group at post-interven-

tion was significantly higher from those at pre-intervention (i.e. 115.53±5.49 vs 170.83±2.93 for FFMQ and 52.30±3.05 vs 87.58±2.06 for SPWB; Table 4). The result suggested that the intervention could effectively improve nurses' mindfulness level and promote their psychological health.

**Table 5: Separate comparisons between the two groups regarding their preintervention mindfulness level, perceived stress, burnout, and psychological well-being scores ( $\bar{x}\pm s$ )**

Variable	Intervention group(n=53)				Control group (n=55)			
	Preintervention	Postintervention	t	p	Preintervention	Postintervention	t	p
Mindfulness level(FFMQ)	115.53±5.49	170.83±2.93	-59.823	0.000	115.80±3.52	115.59±3.51	0.303	0.763
Perceived stress(PSS)	67.28±4.43	31.70±1.55	53.999	0.000	67.36±1.99	67.55±2.01	-0.489	0.627
Burnout(MBI)	72.62±3.95	35.53±3.34	54.937	0.000	71.36±3.69	70.64±3.05	1.131	0.263
Psychological well-being(SPWB)	52.30±3.05	87.58±2.06	-78.927	0.000	52.71±2.25	53.75±3.55	-1.567	0.123

### Correlations Among Mindfulness Level, Perceived Stress, Burnout, and Psychological Well-Being

Before the intervention was implemented, the mindfulness level, perceived stress, burnout (i.e., scoring highly in emotional exhaustion and depersonalization with a low sense of achievement), and well-being of the control and intervention groups were compared. Preintervention mindfulness level was negatively correlated with perceived stress and burnout ( $P < 0.01$ ) but positively correlated with well-being ( $P < 0.01$ ). Perceived stress was positively correlated with burnout ( $P < 0.01$ ) but negatively correlated with well-being ( $P < 0.01$ ). Table 3 lists the correlations among said four indicators between the two groups prior to the intervention.

### Discussion

We consulted all the articles on mental health intervention of nurses since 1999, and found no relevant literature combining Balint group activities with MBSR, that's mean, our study is the first attempt to combine Balint group activities with other psychological interventions. Through clinical randomized controlled trials, this study intervened with nurses in the anti-epidemic front line during the pandemic in the form of remote video conference. It was found that this method can effectively reduce nurses' perceived pressure and job burnout, and improve their mindfulness level and happiness. In addition, we conducted a correlation study on the mindfulness level, job burnout, perceived stress and well-being of 108 front-line nurses fighting the pandemic before the intervention. It was found that the mindfulness level was negatively correlated with perceived stress and job burnout, and positively correlated with well-being. Among them, the correlation between mindfulness level and well-being was high ( $r = 0.955$ ; Table 3), There is a strong negative correlation between well-being and job burnout ( $r = -0.810$ ; Table 3). Therefore, we believe that MBSR can reduce job burnout by improving nurses' mindfulness and well-being. As for psychological stress, it can be alleviated through the discussion among Balint group members and the professional guidance of the group leader (a professional psychological consultant in this study). Before intervention, our research results showed that the level of perceived stress of front-line nurses fighting the pandemic was very high, and the results (Table 5) pre-and pro-

For MBI and PSS, significant decrease in intervention group were observed after 8 weeks training, while control group was also somewhat decrease no statistically significance ( $P > 0.05$ ; Table 5).

intervention result of the control group showed that ordinary psychological intervention (i.e. psychological counseling) could not effectively restore nurses' mental health in a short period of time (8 weeks).

### Effects of Public Health Emergencies on the Perceived Stress, Burnout, and Psychological Well-Being of Nurses

Because of its high infectivity and long eclipse period, COVID-19 has caused a public health emergency that has attracted global attention [13]. As one of the core members in the system combating such emergencies, nurses are a crucial human resource. Their physical and mental health must be maintained for the success of pandemic control [14]. The fight between front line nurses and the pandemic could be long because the number of new cases requiring nursing care has been increasing. Long contact with infected patients can pose a high risk to nurses and increase their physical and mental stress [15]. However, these front-line nurses do not have effective emotional regulation skills. Perceived stress refers to one's psychological reaction to difficulties in life as well as various stimulants and disadvantageous factors that threaten one's psychological health. Stress manifests externally as nervousness or a lack of control. A high level of perceived stress can cause individuals to experience negative emotions, including disappointment and despair, resulting in emotional disorders and a low sense of achievement. These factors can negatively affect the physical and psychological health of nurses and ultimately cause burnout. Well-being refers to a state in which the individual, who is guided by active emotional experiences, exhibits continuous and reasonable satisfaction with daily life and his or her performance at work. Nurses with low perceived well-being can be prone to anxiety, irritability, depersonalization, pessimism, and disappointment. Consequently, they may lose passion for their work with intensified burnout. In this study, the preintervention mean score of 108 nurses on perceived stress was positively correlated with that on burnout ( $r = 0.358$ ) and negatively correlated with that on psychological well-being ( $r = -0.471$ ); a negative correlation was confirmed between burnout and psychological well-being ( $r = -0.810$ ).



### Effect of the Program on Perceived Stress of Nurses

In the program combining Balint group-based activities with MBSR training, each session featured a specific theme, enabling the researchers to effectively implement interventions for negative emotion regulation on nurses. The nurses vented their negative emotions in the first part (i.e., the Balint group) of each activity, thereby reducing their psychological stress and weariness [16]. Subsequently, with the assistance of professional psychotherapists, the participants engaged in MBSR training to learn to cope with specific negative emotions, allowing them to increase their mindfulness level, relax, and solve problems at work caused by similar negative emotions in the future. The administered 8-week intervention program significantly reduced the nurses' perceived stress possibly because the participants, through sharing their own experiences and inner thoughts with others in the Balint group, managed to release negative emotions. Additionally, the active intervention of MBSR training strengthened the participants' mindfulness and stress resistance.

### Effect of the Program on Burnout of Nurses

The nature of nursing work has caused nurses to be prone to emotional interference regarding their occupational risk and work satisfaction. Because the COVID-19 outbreak has increased nurses' workload and stress at work, they are subject to emotional exhaustion and burnout. After the intervention program of this study was implemented, burnout scores in the intervention group significantly dropped. This was possibly because the participants found suitable solutions in the Balint group discussion and improved their mindfulness, awareness of their body and mind, and emotional regulation ability through the MBSR training. Therefore, the participating nurses could, when confronting external interference, concentrate on the present moment, maintain calmness, adopt appropriate coping strategies, and reduce negative emotions, allowing them to feel more energetic at work with an enhanced sense of achievement [1, 4].

### Effect of the Program on the Psychological Well-Being of Nurses

This study discovered that the posttest mindfulness level and well-being scores (i.e., 8 weeks later) did not significantly differ from the posttest scores in the control group. This indicated that nurses' mindfulness level and perceived well-being would not improve without any intervention. By contrast, the intervention group scored significantly higher on mindfulness levels and psychological well-being after the intervention. This was possibly because the nurses vented their negative emotions and developed empathy for those with similar experiences in the Balint group discussion; moreover, they learned to intentionally pay attention to and understand their body, thoughts, and emotions, increasing their self-compassion without self-blame and judgmental thoughts through the MBSR training. Therefore, the participants could enjoy their life and enhance their psychological well-being [17].

### Conclusion

The program combining Balint group-based activities with MBSR training effectively improved the mindfulness ability of front line nurses combating COVID-19. It helped them mitigate

perceived stress and burnout while enhancing their psychological well-being. The research results suggested that the proposed psychological intervention could also help improve the psychological health and nursing quality of front line nurses fighting against other battles (particularly major public health incidents), thereby meriting extended application.

### Limitations

While the results of the current study are informative and valuable, there are several limitations. Firstly, the participants of this study were recruited from hospitals in Two northern provinces of China, which may limit the generalization of the findings to other situations and locations (i.e. the south or northwest of China or other countries). Secondly, the current study excluded nurses with illness and those who had left their job due to pressure-related problems. Therefore, the "healthy worker effect" cannot be excluded. Thirdly, the current study did not explore possible negative aspects of the training that may arise with intervention dropouts. Fourthly the results could be somewhat subjective because this study was conducted using self-rated scales. Further research should be conducted to address said limitations [18-20].

### Declarations

#### Ethics Approval and Consent to Participate

This study was approved by the Ethical Review Committee of Jinzhou Medical University (approval number: JZMU2020001). All participants in this study signed informed consent.

#### Consent for Publication

All authors have approved the manuscript and agree with submission to BMC Nursing.

#### Competing Interests

The authors declare that there is no conflict of interests, we do not have any possible conflicts of interest.

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#### Authors' Contributions

CZ: Conceptualization, Methodology, Formal analysis, Writing - Original Draft; WB: Data Curation; ZH: Writing - Review & Editing. All authors reviewed the manuscript.

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#### Trial Registration

ChiCTR, ChiCTR2200055731. Registered 16 January 2022 - Retrospectively registered, <http://www.chictr.org.cn/edit.aspx?pid=148223&htm=4>

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