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Original Article

Clinical effectiveness of mindfulness-based music therapy on improving emotional regulation in blind older women: A randomized controlled trial

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ABSTRACT

Background: This study aimed to investigate clinical effectiveness of a structured eight-week mindfulness-based music therapy (MBMT) program on improving mood regulation in older women with blindness. This investigation compared a MBMT group with a mindfulness intervention (MI) group and a control group.

Methods: Ninety-two older females with blindness from a residential setting in Hong Kong were recruited and randomly allocated to a MBMT (n = 31), MI (n = 30), or control (n = 31) group. Psychological measurements regarding mood regulation and general mood states (namely, Difficulties in Emotion Regulation Scale [DERS], Geriatric Depression Scale [GDS], and Depression Anxiety Stress Scales-21), were taken at pretest and posttest. Outcome assessors were blinded to group assignment.

Results: Data was analyzed based on intention-to-treat basis. At posttest, DERS scores in the MBMT group (mean differences and 95% confidence interval: 12.1, 5.5 to 18.8) and the MI group (7.2, 0.5 to 13.8) were lower than that in the control group. GDS scores in the MBMT group (2.9, 1.7 to 4.0) and the MI group (1.7, 0.6 to 2.9) were lower than those in the control group. Compared with the MI group, the MBMT group improved emotional awareness sub-scores in DERS (2.1, 0.2 to 4.1) and appeared to lower depression in GDS scores (1.1, -0.0 to 2.3; p = 0.053).

Conclusion: MBMT seems more beneficial than MI alone for improving emotional regulation in older women with blindness. The combination of mindfulness and music can generate a synergetic effect by enhancing both attention and appraisal components within the emotional-regulation process.

Trial registration: ClinicalTrials.gov, NCT05583695.

1. Introduction

Mood disorders are prevalent in older populations and can make it difficult to maintain a healthy lifestyle since they are linked to low motivation and negative moods.[1] Additionally, these disruptions are linked to an increased risk of chronic illnesses including cancer and cardiovascular diseases.[2] Moreover, there are biological differences between the sexes that might cause these manifestations to vary greatly between men and women in terms of how they express their emotion.[3] In particular, women perform much worse than males on tests of neuroticism and negative affect, indicating that women are more likely to feel pressured, apprehensive, and vulnerable.[3] On the other hand, when compared to peers who do not have a visual impairment, elderly persons who are blind might demonstrate worse mental health. Age-related blindness prevents older people from receiving visual input that may be utilized to assess and analyze circumstances. As a result of perceived stigma, sight loss might also require difficult psychological changes and lead to the formation of poor self-perception.[4] Taken together, there is a strong need to find appropriate mood-regulation strategies to help older women with blindness improve their overall mental health.

Mindfulness-based interventions (MBIs) are commonly used to facilitate mood regulation. Mindfulness is defined as the purposeful cultivation of moment-to-moment awareness and acceptance of one's pleasant and unpleasant experiences/thoughts in a non-judgmental and non-reactive manner.[5] Previous meta-analyses[6,7] have demonstrated the effectiveness of MBIs for reducing depression and anxiety as well as en-

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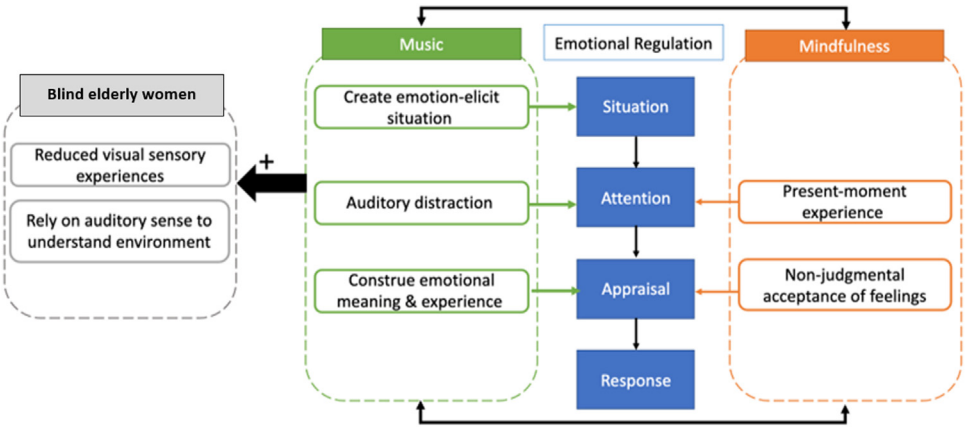

Fig. 1. Theoretical framework about the mechanism of mindfulness and music in relation to emotional regulation in blind elderly women.

hancing psychological health and well-being. However, even though previous qualitative research[8] has suggested that MBIs may be beneficial to well-being in people with visual impairments, to our best knowledge, no randomized controlled trials have examined this MBIs effect in the population with visual impairments. The use of music is another viable strategy for improving mood regulation since it may provoke emotions and ideas, and when someone pays attention to these thoughts, it may even help them comprehend their inner selves. Earlier studies have showed that music ameliorates depression[9] and improves regulation of stress via modulating autonomic nervous systems in older populations.[10,11] In order to influence behavioral changes in older people, music can specifically actively activate the auditory sensation and reward networks in the brain.[12]

Previous studies have shown that combining mindfulness practices with other interventions can be more effective than using mindfulness alone in improving sleep problems among people with depression and anxiety.[13] Therefore, combining mindfulness with music may have the potential to be an innovative approach for assisting mood regulation for older adults with blindness. Kabat-Zinn[5] suggested that listening to sound and music while performing sitting meditation is a means of raising one's awareness. It is assumed that music can function as an auditory cue that can help participants follow beat and thus focus on breathing. Integration has also been tested in relaxation sessions for palliative care patients, where the melody and rhythm of music can serve as a tool for bringing participants' awareness of themselves and sustaining their interest in ongoing participation.[14] Therefore, music can be emphasized as an ideal source of focus for mindfulness practice, especially when people with visual impairments rely heavily on auditory stimulation. Meanwhile, integrating mindfulness with music may have a synergistic impact towards boosting self-exploration and understanding, assisting participants in experiencing their emotions in the time and learning how to identify, categorize, and accept them.[9]

A theoretical framework (Fig. 1) regarding the potential mechanisms of this mindfulness-based music therapy (MBMT) on emotion regulation in blind elderly women has been proposed.[15] The emotion-regulation process occurs in a particular sequence of "situation – attention – appraisal – response".[15] The two main stages of emotional regulation may be targeted by the fundamentals of mindfulness, which include living in the present and accepting feelings without judgement. Particularly, the former helps people keep their focus on their breathing and divert it from unfavorable ideas. Whereas the latter enables people to regard their ideas and feelings as transitory phenomena rather than concrete truths, hence lowering self-blame. In terms of association between music and emotional regulation, diverse music types and rhythms can elicit different emotions and create different corresponding scenes, which pertains to the situation stage of emotional regulation. Music serves as an auditory guide to return individuals' attention to the present moment, which pertains to the attention stage. For instance, interruption of inner voices via music can prevent one from internally replaying past arguments with a spouse.[16] Additionally, the structural aspects of music, including pitch and quality, can further construe emotional experience, which targets the appraisal stage.[17]

Taken together, MBMT targets varying stages of emotional regulation and is particularly apt for older women with blindness who rely on aural cues to understand the surroundings and others' emotions. No research has yet investigated how combining mindfulness with music might enhance mood management. The present study was to examine effects of MBMT, compared with mindfulness intervention (MI) and no intervention, on emotional regulation in blind older women. It was hypothesized that the MBMT group would do better than the MI and waitlist control groups in terms of emotion regulation and mood state.

2. Methods

2.1. Designs and participants

This study adopted a three-arm randomized controlled trial (RCT) with a waitlist control design. By assuming a moderate effect size in a three-group repeated measure analysis with $\alpha = 0.05$ and statistical power = 0.80, and ρ (minimum correlation among the variables) = 0.4, the minimum sample size will be 24 for each condition.[18] Thus, a sample size of 72 will be needed. With an attrition rate of 20% is taking into consideration, a final sample size of 90 (i.e., 30 per condition) will be required. A total of 106 individuals were recruited form the Hong Kong Society of the Blind. They were assessed for eligibility and 14 of them were excluded as they did not meet the inclusion criteria or were unavailable. The flow diagram of the study is depicted in Fig. 2. Initial screening was performed using the inclusion criteria utilized by the center workers when accepting members. The inclusion criteria were as follows: (1) female; (2) blind, with visual acuity (the best eye) of 20/400 or below[19]; (3) aged 65 years or above, (4) cognitively intact (determined as a score of >12 on the Hong Kong Montreal Cognitive Assessment; HKMoCA-VI[20]), and (5) ability to speak Cantonese. Ethical approval (Registration number: RS-KHAB-2020-003) was obtained from the Hong Kong Society for the Blind. Finally, informed consent was obtained from 92 eligible and available participants which are more than the minimum requirement. After the initial baseline assessment, the participants were randomly assigned to one of the study arms using a list of computer-generated random numbers. As all the participants reside in one of the Hong Kong Society of the Blind's care homes, so only simple randomization was used for sequence generation. The use of opaque, sequentially numbered envelopes allowed for the concealment of the allocation. An automated random number generator was used to create the allocation sequence. An independent statistician who was not connected to the study created the envelopes in advance. A research assistant who was not involved in the participant's care read the next envelope in the

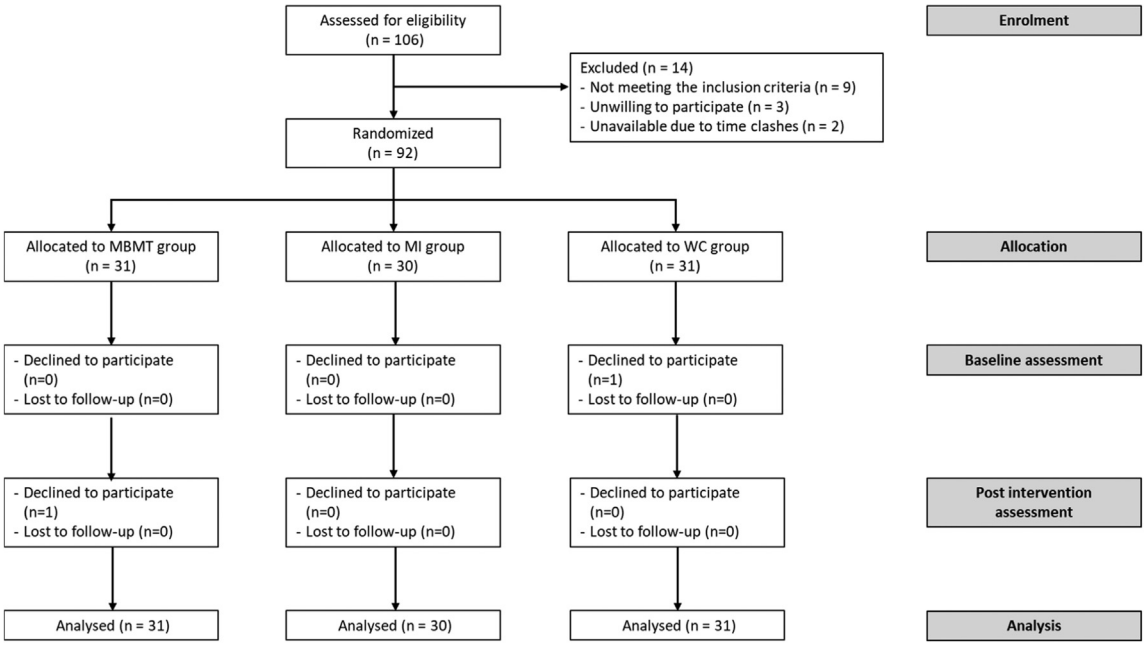

Fig. 2. Consort flow diagram of participants through the study.

series after the subject had signed up for the trial. The subject was then allocated to the proper treatment group based on the information found in the envelope. The research assistant made sure neither the subject nor the study's researchers knew the allocation sequence. Another research assistant assisted with the outcome assessment and data analysis and was unaware of the group-allocation results. Through simple randomization, participants were assigned to one of the study arms at a ratio of 1:1:1; namely, (a) MBMT, (b) MI, and (c) waitlist control group, respectively. The waitlist control group received routine care and could join either the MBMT or MI after eight weeks (post-final assessment). The study adheres to CONSORT guidelines.[21]

2.2. Screening assessments

Cognitive evaluation: As participants were required to follow simple instructions, they were first screened to ensure that they were capable of following simple one- to two-step commands. This was assessed using a specialized version of the HKMoCA-VI for the visually impaired, which has been well-validated.[20] Total scores range from 0 to 30 and are obtained by adding the scores for each component. Scores of ≥12 indicate an ability to follow simple commands.

Visual acuity: Vision was assessed using the Snellen Chart; this was in order to ensure participants met the WHO's criteria[19] for blindness: that the better eye's best-corrected visual acuity is ≤20/400. The Snellen chart is a letter acuity chart that determines clarity of distance vision; participants view the chart from a distance of 20 feet. The chart features 11 rows of capital letters, with each row containing a higher number of letters and a smaller font size than the row immediately above. Average performance is defined as "20/20 vision."

2.3. Outcome measurements

All measurements were taken at baseline (T0) and during a post-intervention assessment performed after eight weeks (T1). All assessments had been validated for the Hong Kong Chinese population and were conducted by trained researchers.

Emotional regulation: Emotional regulation was the primary outcome measure of the study, and was assessed using the Chinese version of the Difficulties in Emotion Regulation Scale (DERS).[22] The DERS is a validated 36-item measure that assesses six emotion-regulation dimensions: non-acceptance, goals, impulse, strategies, clarity, and awareness. The total score ranges from 36 to 180, with higher scores representing greater difficulty regulating participants' emotions.

Mood status: Mood status is a secondary outcome measure that reflects the efficiency of mood regulation. This was assessed using the Chinese-translated version of the Depression Anxiety Stress Scales-21 (DASS-21)[23] and the Chinese Geriatric Depression Scale (GDS).[24] The DASS-21 is a 21-item scale designed to assess depression, anxiety, and stress symptoms. It is divided into three subscales, each of which respectively corresponds to a specific negative affective state and contains seven items. Higher scores indicate more severe symptoms. The GDS is a 30-item questionnaire that asks participants to report their feelings during the past week. Total scores range from 0 to 30, with higher scores indicating more depressive symptoms; for clinical purposes, cutoff scores for mild, moderate, and severe depression have been determined.[24]

In addition to the above formal assessments, informal feedback from the participants and instructors was also obtained as potential supplementary qualitative data.

2.4. Interventions

In addition of receiving training from qualified instructors, each session of the two interventions had a comparable duration, group size, and venue. More specific, each session lasted for around an hour to an hour and a half. Participants gathered in a group setting with between 8 and 10 persons in each session. The participant was given a few simple homework to help them consolidate what they had learned between sessions. Meanwhile, the waitlist control group received, during the study period, treatment as usual and continuous follow-up care without any other kind of psychological intervention. To ensure the trustworthiness of the intervention, qualified therapists who had received appropriate training in teaching mindfulness or music therapy were invited to implement the interventions. In particular, therapists who teach mindfulness should have a foundational level of professional training in mindfulness-based interventions (for example, a one-year foundation course in teaching mindfulness-based cognitive therapy, as organized by the Oxford Mindfulness center and the Hong Kong center for Mindfulness) in addition to at least two years' experience running mindfulness-based pro-

grammes. For therapists teaching music, it is recommended that they have the necessary professional training (for example, basic and advanced training at the academy of neurology music therapy, which has been certified by the U.S. Certification Board of Music Therapy), as well as at least two years experience in providing music therapy. The fidelity of each intervention program was ensured and monitored through a random review of two of the eight sessions. Additionally, fidelity checks, based on the intended content of the respective interventions, were independently conducted by an experienced mindfulness and music therapy instructor.

2.4.1. MBMT group

The MBMT comprised eight weekly sessions that featured a combination of mindfulness and music therapy. During the mindfulness practice, the participants were guided to experience various mindful activities such as mindful breathing, integrating movement into breathing, and enhancing awareness of their own sensations. For the music components, participants engaged in various exercises that involved listening to sounds such as those of forests and old Chinese songs. They were asked to imagine themselves in particular scenarios, such as in the park or lying on a lawn in the sun and, while listening to the sounds, to concurrently focus on their breathing. To achieve integration, the participants performed graded mindful exercises with various music stimuli; this aimed to cultivate observation of one's breathing and feelings and, ultimately, to increase self-awareness and acceptance of oneself. Further details of the themes and content can be found in Table 1.

2.4.2. MI group

The intervention consisted of eight sessions per week that included both formal and informal practice. During these sessions, the participants were guided to use breathing as an anchor for sustained attention in the present moment. The entire program incorporated a body-scan technique, sitting meditation, gentle mindful movement, and other mindfulness activities linked to ordinary daily activities. The details of each session and the entire program were based on original mindfulness intervention program.[25] Slight modifications were made to the program to convert all visual cues into physical and auditory prompts in order to meet the needs of the participants. Further details of the themes and content can be found in Table 1.

2.4.3. Waitlist control group

Participants in the waitlist control group received treatment as usual during the study period.

2.5. Data analysis

Data were processed and analyzed using SPSS Statistics for Windows, version 27.0 (SPSS Inc., Chicago, IL, USA). A chi-square test and one-way analysis of variance (ANOVA) were conducted for categorical and continuous variables, respectively, to compare the between-group differences regarding demographic variables at baseline. A one-way analysis of covariance (ANCOVA) controlling for baseline scores was conducted to compare the three groups in regard to differences in post-intervention outcomes. A post-hoc *t*-test with Bonferroni correction was performed when there were significant differences among the groups. Two-tailed tests were considered statistically significant when the alpha level was 0.05 or lower.

3. Results

The demographic and clinical characteristics of the 92 participants across the three groups are presented in Table 2. The mean age of the sample was 86.0 years (standard deviation [SD]=7.7). The average years of education was approximately 3.5 years (SD=3.7). As all the participants reside in one of the Hong Kong Society of the Blind's care homes, their compliance in the project were highly monitored by the hostel staff. The overall attendance rate for the MBMT and MI groups is 98% and 97%, respectively. There were two dropouts due to physical health issues. The ANOVA and chi-square tests showed that there were no significant intergroup differences regarding the basic demographic data. In general, no serious adverse events occurred during the trial. Participants were occasionally prompted to recall certain feelings or recollections that may have been upsetting or painful to some degree; nevertheless, at times, they were also directed to appraise and reconsider their feelings and refocused to the present moment.

3.1. Treatment effects on emotional regulation

The one-way ANCOVA (Table 3) showed a significant group effect (partial eta-squared = 0.352, $p < 0.001$) on the total DERS score at the post-test, when the pre-test scores were controlled. The post-hoc analysis further identified that both the MBMT ($p < 0.001$) and MI ($p = 0.031$) groups scored significantly lower in the DERS when compared to the waitlist control group. Further scrutiny revealed that the MBMT and MI groups scored lower than the waitlist control group for two of the DERS subscales (i.e., non-acceptance with partial eta-squared = 0.297 and awareness with partial eta-squared = 0.326). Furthermore, participants in the MBMT group showed significantly lower awareness scores when compared to those in the MI group ($p = 0.028$). These findings indicate that both MBMT and MI allowed participants to better accept their emotions than the waitlist control group, with MBMT being more effective for enabling participants to become aware of their emotions than the MI group.

3.2. Treatment effects on mood status

The one-way ANCOVA (Table 3) showed a significant group effect on the total GDS score at the post-test (partial eta-squared = 0.405, $p < 0.001$). The post-hoc analysis further ascertained that both the MBMT ($p < 0.001$) and MI ($p = 0.001$) groups scored significantly lower than the waitlist control group. Participants in the MBMT group showed marginally significant lower scores than those in the MI group ($p = 0.053$). These results suggest that the MBMT group showed better improvement in depressive symptoms than the waitlist control group, and appeared to show better improvement in depressive symptoms than the MI group. Regarding DASS-21, the one-way ANCOVA (Table 3) also showed a significant group effect (partial eta-squared = 0.259, $p < 0.001$). Participants in the MBMT and MI groups achieved significantly lower scores than those in the waitlist control group. This implies that both MBMT and MI showed similar tendencies regarding improving mood status among older women with blindness. Comparisons among different treatment groups at posttest were depicted in Table 3.

4. Discussion

The results obtained in the present study support our hypothesis that participants in the MBMT group would show greater improvement in their emotional regulation and subsequent mood status than those in the MI and waitlist control groups, respectively. This outcome of integrating music with mindfulness brings new insights for services for older adults with blindness and for mental-health practice. Mindfulness was found to contribute to effective emotional regulation in both the MBMT and MI groups, as shown by a significant improvement in the emotional-regulation outcomes when compared with the waitlist control group. Furthermore, music showed a potential additional effect, as the MBMT group showed a greater drop (when compared to the MI group) in total scores for the DERS and for its awareness subscale, and a significant decrease in GDS score. The resultant emotional response within the emotion-regulation process was further reflected by the significant decrease in depressive symptoms in the MBMT group.

The mindfulness component of both the MBMT and MI clearly facilitated emotional regulation by enhancing attention levels. During the

Table 1
Themes and contents of the mindfulness-based music therapy and the mindfulness intervention.

	Mindfulness-based music therapy			Mindfulness intervention		
Session	Themes	Purposes	Contents	Themes	Purposes	Contents
1 & 2	Mindfulness of the body	Cultivation of observation and discovery of embodiment	- Introduction to mindful life savoring - Introduction to mindfulness - Breathing exercises with music stimuli and a focus on bodily sensations (heartbeat) - Body-scanning exercises with relaxing music - Reflections and conclusions	Mindful awareness	Introduction of automatic pilot and awareness	- Awareness and automatic pilot - Mindful eating - Mindful standing (Brief) - Awareness of breathing - Sitting meditation
3 & 4	Mindfulness of feelings	Connection of bodily symptoms, emotions, thoughts, and behaviors	- Introduction to emotions and emotional regulation - Revision of previous breathing exercises - Mindfulness with tactile senses (water) and music stimuli (heartbeat and silence) - Reflections on feelings and conclusions	Body and breathing	Connection of body and breathing	- Body scan - Body and breath meditation - Mindful stretching - 3 min breathing space
5 & 6	Mindfulness of mind states	Increasing self-awareness and moving towards acceptance	- Introduction to emotions and thoughts - Advanced breathing exercises with music stimuli (drums and hand chimes) and a focus on bodily senses - Reflections on thoughts that arise, remain present, and pass from the mind	Expanding awareness	Enriching awareness to surroundings and inner self	- Expanding awareness - Breathing space meditation - Sounds and thoughts meditation
7 & 8	Mindfulness of mental states	Enhancement of compassion for oneself	- Revision of previous breathing exercises - Introduction to mental state - Guided imagery and music with a focus on emotions and thoughts associated with music (classical and Chinese music) - Reflections on one's mental state and conclusions	Better self-care	Enhancement of compassion for oneself	- Befriending meditation - Loving-kindness and compassion - How can I best take care of myself? - Learning about acceptance

Table 2
Participants' demographic data.

	Control (n = 31)	MI (n = 30)	MBMT (n = 31)	F or χ^2	p
Age (years)[a]	84.1 (6.5)	88.4 (7.4)	85.5 (8.6)	2.6	0.081
Year of education[a]	4.8 (3.8)	2.9 (3.1)	2.9 (3.8)	2.8	0.066
Marriage[b]				9.4	0.154
Single	6 (19.4)	3 (10.0)	3 (9.7)		
Married	6 (19.4)	6 (20.0)	9 (29.0)		
Divorced	0 (0.0)	0 (0.0)	3 (9.7)		
Widowed	19 (61.3)	21 (70.0)	16 (51.6)		
Dependence level[b]				9.1	0.170
Independent	9 (29.0)	11 (36.7)	7 (22.6)		
Under supervision	9 (29.0)	9 (30.0)	3 (9.7)		
Partial assistance	6 (19.4)	3 (10.0)	9 (29.0)		
Total assistance	7 (22.6)	7 (23.3)	12 (38.7)		

[a] Data are expressed as mean (standard deviations). [b]Data are expressed as N (%).MI, mindfulness intervention; MBMT, mindfulness-based music therapy.

Table 3
Comparisons of outcomes across groups.

Outcomes	Control (n = 31)		MI (n = 30)		MBMT (n = 31)		F	Mean difference (95% Confidence interval) at posttest		
	Pre	Post	Pre	Post	Pre	Post		Control vs MI	Control vs MBMT	MI vs MBMT
DERS										
Total	79.0 (12.5)	84.6 (11.0)	84.1 (11.3)	77.5 (9.6)*	86.7 (12.0)	72.5 (11.1)***	23.3¶	7.2 (0.5, 13.8)	12.1 (5.5, 18.8)	5.0 (-1.7, 11.6)
Non-acceptance	11.5 (3.2)	13.4 (3.2)	12.8 (3.5)	11.2 (3.0)***	13.1 (3.3)	10.1 (2.9)***	18.1¶	2.3 (0.4, 4.2)	3.4 (1.5, 5.3)	1.1 (-0.8, 3.0)
Goals	11.8 (3.9)	12.2 (3.8)	12.1 (3.3)	11.93 (3.2)	12.3 (3.9)	11.3 (3.1)	1.4	0.2 (-1.9, 2.4)	0.9 (-1.3, 3.0)	0.6 (-1.5, 2.8)
Impulse	11.5 (2.8)	11.7 (3.2)	12.2 (2.7)	11.3 (2.7)	12.9 (3.4)	10.9 (3.2)	2.1	0.4 (-1.5, 2.4)	0.8 (-1.1, 2.8)	0.4 (-1.5, 2.3)
Strategies	17.4 (4.4)	18.7 (4.4)	18.5 (4.1)	17.2 (4.2)	19.3 (3.7)	16.9 (4.1)	2.9	-1.5 (-1.1, 4.2)	1.8 (-0.8,4.5)	0.3 (-2.4, 3.0)
Clarity	11.1 (2.3)	11.7 (3.0)	12.5 (3.00)	11.00 (2.5)	12.4 (3.1)	10.6 (2.6)	5.3	0.7 (-1.0, 2.4)	1.1 (-0.6, 2.8)	0.4 (-1.3, 2.1)
Awareness	15.6 (3.4)	16.9 (3.1)	16.0 (3.8)	14.9 (2.9)***	16.7 (3.8)	12.8 (3.3)***,†	20.8¶	2.0 (0.1, 4.0)	4.1 (2.2, 6.1)	2.1 (0.2, 4.1)
GDS	10.1 (2.4)	10.3 (2.1)	10.3 (1.8)	8.6 (1.8)***	10.8 (1.7)	7.5 (1.6)***	29.3¶	1.7 (0.6, 2.9)	2.9 (1.7, 4.0)	1.1 (-0.0, 2.3)
DASS-21										
Total	23.6 (3.2)	24.7 (7.3)	22.2 (5.7)	17.6 (4.8)***	23.0 (6.0)	17.3 (6.5)***	15.1¶	7.1 (3.2, 11.1)	7.4 (3.5, 11.4)	0.3 (-3.7, 4.3)
Depression	7.1 (2.8)	7.8 (2.3)	7.8 (3.1)	5.6 (2.3)***	8.2 (3.1)	5.0 (2.9)***	23.2¶	2.2 (0.6, 3.8)	2.8 (1.2, 4.4)	0.6 (-1.0, 2.2)
Anxiety	6.1 (3.1)	6.8 (3.6)	5.6 (3.3)	4.1 (3.0)**	6.0 (3.2)	4.7 (2.5)*	6.3#	2.7 (0.8, 4.6)	2.1 (0.2, 4.0)	-0.6 (-2.5, 1.3)
Stress	10.0 (3.3)	10.1 (5.5)	8.8 (4.2)	7.9 (3.1)	8.8 (3.4)	7.6 (5.0)	1.7	2.2 (-0.7, 5.2)	2.5 (-0.4, 5.5)	0.3 (-2.6, 3.2)

Post-hoc comparison:.
* $p < 0.05$ compared with Control.
** $p < 0.01$ compared with Control.
*** $p < 0.001$ compared with Control.
† $p < 0.05$ MI vs. MBMT.
# $p < 0.01$.
¶ $p < 0.001$.
DASS-21, Depression Anxiety and Stress Scale-21; DERS, Difficulties in Emotion Regulation Scale; GDS, Geriatric Depression Scale; MI, mindfulness intervention; MBMT, mindfulness-based music therapy.

attentional stage of emotional regulation, participants were guided to focus on their present-moment experiences. Consistent with previous findings, mindfulness was found to help the participants sustain attention on their own breath and, thus, reduce attention on their negative thoughts.[26,27] Meanwhile, music showed a potential add-on effect to the mindfulness. In the music therapy, different emotion-eliciting situations were created during the emotional-regulation stage. Eerola[28] suggested that music of different genres can induce different types of emotions; thus, playing sounds with various melodies and rhythms, such as typhoon sounds, traditional Cantonese songs, and old radio-broadcasting audio clips, could induce different emotions within the participants. Subsequently, music was found to play a role in auditory distraction, which enabled the participants to maintain their attention on their current experiences. Changes in acoustic elements, including volume and tempo, also helped increase the participants' awareness of their mood.[14] Qualitative observation from instructors suggested that, when compared to the MI group, the participants in the MBMT group were more attentive when listening to sounds as they sat still, stopped chatting with each other, and remained silent. These behaviors accord with previous research findings that music can help the brain sustain attention.[29]

Moreover, the mindfulness element in the MBMT and MI can help participants achieve non-judgmental acceptance of feelings, as reflected by the significantly greater drop these groups showed in the score for the DERS – non-acceptance subscale when compared to the waitlist control group. Specifically, participants in both the MBMT and MI groups were guided to acknowledge the presence of their negative emotions and to perform non-judgmental self-visualization. In other words, during the eight-week sessions the participants learned to adopt an attitude of nonjudgmental acceptance regarding their thoughts and to pay attention to their current experiences without attempting to resist or change them. The participants felt that, when they were fully engaged in the practice, they were able to gain a sense of releasing judgment and maintaining focus on the present moment.[30] In addition, when comparing the MBMT and MI groups in regard to differences in the scores for the DERS – non-acceptance subscale, we found a marginally significant drop for the former group (F = 3.75, p = 0.058), which indicated that music has a very high potential for implementing an add-on effect on mindfulness. As such, music can evoke emotional meaning and experiences in participants, which may be linked to their memory; participants reported recalling random joyful or sad moments when they heard a traditional Cantonese pop song or old radio-broadcasting audio clips.

They learned to appreciate the trigger of situation-specific emotions,[31] and were also guided to appraise and reappraise their emotions. Such practice can gradually enhance their overall emotional regulation via acceptance. Consistent with previous research findings,[32] the current results showed that reappraisal and acceptance can be considered adaptive strategies for emotional regulation.

As the above findings show, enhancement of attention and appraisal components within the emotional-regulation process can be achieved through the synergistic effect of mindfulness and music. According to the Mindfulness-to-Meaning Theory,[33] individuals can cease their habitual and automatic reactions to present-moment experiences by focusing on momentary situations that can feature both positive and negative facets. Broadened attention can then help individuals regulate their emotions more effectively by helping them reappraise given situations with a focus on the positive aspects. The awareness level can then be heightened by repeating these attention and reappraisal processes. Finally, individuals can learn to generalize in order to find meaning in specific situations and improve their corresponding emotional regulation.[33] In addition, according to the Monitor-and-Acceptance Theory,[34] individuals can reduce their affective reactivity and activate the need to regulate their emotions through the acceptance process, in which they can apply an accepting and nonjudgmental stance towards momentary and upcoming feelings. In this vein, the participants in the MBMT group were guided to shift their attention to specific stimuli, such as one's own breath or situation-specific emotions as triggered by music, in order to become aware of their momentary sensations instead of thinking about past or future events. Therefore, this may have been the reason for the MBMT group's significant improvement in the total DERS score and in the score for the awareness subscale.

This study had several limitations. First, despite the fact that a comparison of MBMT and MI in this study can provide useful information for investigating the add-on effect of music to mindfulness, the lack of a music-only control group may undermine our conclusions regarding the idiosyncratic effect of music within its synergetic combination with mindfulness. Second, only a small sample was recruited in this study, comprising a group of motivated participants from a single center; therefore, the findings cannot be considered representative of the wider spectrum of older adults with blindness. Third, there is no standardized assessment for measuring the effects of music; future research should consider methods of quantifying the different characteristics of music. Fourth, the inclusion criteria for this study did not take emotional dysregulation or unfavorable emotional states into account. As a result, ceiling effects might possibly undermine this study. Future research may have updated the inclusion criteria to include people with a wider range of emotional experiences or challenges with emotion regulation, in order to expand the variety of emotional states in the sample and lower the possibility of ceiling effects. Finally, the present study findings are only generalizable to older women with blindness; the effect of such interventions on older men with blindness remains unknown. Thus, it is worth expanding the application of MBMT to a wider population.

There is an emerging concern regarding deteriorating mood in older adults with blindness. This study can provide insights for health-care professionals who are caring for older adults with blindness with mood problems. Mindfulness is a commonly used approach for older people with mood problems, but very little research has investigated its effect on older women with blindness. Our findings have proven the effectiveness of mindfulness practice and found a possible add-on effect of music in regard to emotional regulation, meaning this research may provide practitioners with a new treatment modality for helping older adults with blindness. Music adds an auditory component to mindfulness practice that can compensate for the visual limitations of people with blindness. Our findings also imply that the use of different senses (specifically, the auditory sense) can better arouse attention and appraisal in older adults with blindness, and ultimately foster better emotional regulation and mood status. Despite some limitations, the present study contributes to practice concerning mental health and older adults by showing, when compared with MI, the positive effects of MBMT and the potential add-on effects of music on emotional regulation in older women with blindness. The MBMT approach can encourage patients with blindness to accept their own distress and negative emotions, leading to enhanced emotional regulation and subsequent mood. Before beginning a RCT, it is usually necessary to confirm the intervention of interest using research methodologies like case report/case series or before-after studies. The potential efficacy and viability of the present intervention, however, were only identified after thorough review of the body of earlier studies. Even though there may be problems with conducting a RCT without first validating it, the careful research design, which incorporates appropriate randomization and blinding techniques, should significantly advance our understanding of the intervention's efficacy and offer insightful information about the intervention's initial impact.

CRediT authorship contribution statement

Sunny H.W. Chan: Conceptualization, Methodology, Validation, Formal analysis, Writing – review & editing, Supervision. **Meryl Y.C. Cheung:** Methodology, Writing – original draft. **Armstrong T.S. Chiu:** Conceptualization, Resources, Project administration, Funding acquisition. **Mimi H.T. Leung:** Methodology, Writing – original draft. **Michael C.C. Kuo:** Validation, Visualization. **Donald Y.C. Yip:** Formal analysis, Data curation, Writing – original draft. **Carole C.Y. Hui:** Investigation, Writing – original draft. **Sally W.I. Kam:** Investigation, Writing – original draft. **King Yeung:** Resources, Project administration, Funding acquisition. **Doreen S.P. Mui:** Resources, Project administration, Funding acquisition. **Shu-Mei Wang:** Investigation, Data curation, Writing – review & editing, Supervision. **Calvin C.K. Yip:** Validation, Visualization.

Conflict of interests

The authors declare that they have no conflicts of interest.

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Ethical statement

This research was reviewed and approved by the Hong Kong Society for the Blind (Registration number: RS-KHAB-2020–003). Informed consent was obtained from all participants.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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