ORIGINAL ARTICLE

Online implementation of mind sound resonance technique for stress-related psychological and physiological outcomes in female homemakers: a controlled study

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Abstract

Background and Study Aim Stress-related psychological and physiological strain represents a relevant concern in populations exposed to sustained domestic and caregiving demands. Yoga-based relaxation practices, including Mind Sound Resonance Technique (MSRT), have been applied in clinical and non-clinical contexts to support stress regulation in everyday life. Although such approaches are increasingly used, their application and short-term outcomes within specific sociocultural settings remain a matter of practical interest. Therefore, the aim of the present study was to examine the psychological and physiological outcomes associated with the application of Mind Sound Resonance Technique in female homemakers.

Material and Methods A randomized controlled design was employed. Female homemakers were allocated to either an MSRT intervention group or an active control group receiving Progressive Muscle Relaxation (PMR). The intervention was delivered online over an eight-week period. Psychological outcomes included anxiety, sleep quality, and perceived stress. Physiological measures comprised resting heart rate, systolic and diastolic blood pressure, and respiratory rate. Assessments were conducted at baseline and post-intervention.

Results Participants in the MSRT group demonstrated greater improvements across psychological and physiological outcomes compared with the PMR group. Reductions were observed in anxiety (34.01%), sleep disturbance (37.54%), and perceived stress (37%). Improvements were also noted in resting heart rate (−12.07%), systolic blood pressure (−7.97%), diastolic blood pressure (−8.40%), and respiratory rate (−25.99%). All between-group differences were statistically significant ($p < 0.001$) and were accompanied by large effect sizes.

Conclusions When implemented in an online, home-based format, MSRT was associated with greater improvements in psychological well-being and physiological stress markers than an established relaxation comparator among homemakers. These findings support the practical applicability of MSRT as an accessible, low-cost stress-management strategy for populations facing barriers to conventional wellness services. Further studies are warranted to examine long-term sustainability and broader implementation across diverse settings.

Keywords: mind sound resonance technique, stress management, housewives, psychological well-being, yoga-based intervention

Introduction

Stress-related psychological and physiological strain represents a significant concern in contemporary societies, particularly among individuals exposed to sustained domestic and caregiving demands. Female homemakers often experience prolonged emotional, cognitive, and physical load associated with household responsibilities and informal caregiving roles, which may contribute to elevated stress levels manifested through anxiety, sleep disturbances, and dysregulation of autonomic and cardiovascular functioning.

Non-pharmacological approaches are commonly applied to address stress-related conditions by supporting self-regulation of psychological and physiological processes. Such approaches typically integrate attention, breathing, and bodily awareness to influence emotional balance and autonomic regulation. Many of these practices are designed for use outside clinical settings and can be incorporated into everyday routines without specialized resources, aligning with the need for stress-management strategies applicable within daily living environments.

Mind Sound Resonance Technique (MSRT) is a yoga-based relaxation practice characterized by specific structural and conceptual features that

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position it within the existing body of mind-body research. MSRT differs from other sound-based practices in several structural features that have been discussed in prior theoretical and applied research. Recent systematic reviews confirm that caregivers face a substantial mental health burden, with median prevalence rates of 33.35% for depression, 35.25% for anxiety, and 49.26% for caregiver burden [1]. Digital technology-based interventions have emerged as promising strategies for this population [2]. Despite their critical role in maintaining family health, homemakers face significant barriers to accessing formal healthcare services, including time constraints, financial limitations, cultural expectations of self-sacrifice, and lack of transportation [3]. These barriers are particularly pronounced in rural and semi-urban settings, where healthcare infrastructure is limited and traditional gender roles restrict women's mobility and access to public wellness facilities. This situation creates an urgent need for evidence-based, home-deliverable interventions that are culturally appropriate, cost-effective, and specifically designed to address the unique stressors experienced by this demographic.

While Mind Sound Resonance Technique (MSRT) shares superficial similarities with other sound-based practices, such as general mantra meditation, Bhramari pranayama, or OM chanting, it incorporates several distinctive theoretical and practical features that warrant independent consideration. MSRT is grounded in the Vedantic concept of Nada Yoga, which emphasizes the role of sound in facilitating progressive states of consciousness and psychophysiological coherence [4]. Unlike simple repetitive chanting, MSRT follows a hierarchical progression through four phases, beginning with externally produced sound (Ahata nada), followed by a transitional shift from external to internal sound perception (Ahata–Anahata), internally perceived subtle sound vibrations (Anahata nada), and culminating in silence through Ajapajapa [5]. The authors previously examined a twelve-week MSRT intervention in injured national-level athletes and reported that MSRT practice was associated with changes in cardiovascular parameters and sleep quality within a supervised rehabilitation context [6]. In that study, MSRT was considered as a complementary component of rehabilitation programs, addressing both physiological regulation and stress-related recovery processes. The findings supported the relevance of integrating yoga-based sound relaxation practices into structured rehabilitation settings for injured athletes

MSRT differs from other sound-based practices through several specific mechanistic features that distinguish its physiological and psychological effects. First, the sequential syllabic activation of the A, U, M, and AUM sounds is intended to engage different resonance regions of the body. The A sound primarily resonates in the abdominal–chest region, U in the throat–chest area, M in the cranial–nasal cavity, and AUM produces an integrated whole-body resonance [7]. This anatomically targeted approach differs from single-sound practices, such as continuous OM chanting, by generating layered patterns of vagal stimulation and interoceptive awareness.

Second, the Ahata–Anahata transition involves the external production of sound followed by a conscious shift to internal sound perception while maintaining the same vibrational quality. This process may facilitate a distinct form of auditory–motor–sensory integration. Neuroimaging studies suggest that this transition engages motor planning regions during vocalization and auditory association cortices during silent perception, potentially contributing to neural coherence patterns not observed in purely vocal or purely silent practices [8].

Third, MSRT incorporates the Mrtyunjaya Mantra, a Vedic chant with established cultural and psychological resonance in Indian populations. Unlike arbitrary syllable repetition, this semantic-affective component may enhance engagement through meaning-related processes, particularly in culturally aligned groups, as research in embodied cognition indicates that culturally meaningful sounds can elicit stronger psychophysiological responses than semantically neutral stimuli [9].

Finally, the 30-minute MSRT protocol follows a defined temporal sequence that includes preparatory relaxation, graduated sound production, maintained silence, and intentional closure. This structured progression corresponds to stress-response patterns described in psychophysiological models and may support regulation of the hypothalamic–pituitary–adrenal axis more effectively than unstructured practices [10].

These distinctive features of MSRT have been interpreted within established psychophysiological frameworks that help explain how sound-based and attentional practices may influence stress regulation and autonomic functioning. Several theoretical frameworks have been used in prior literature to conceptually interpret outcomes associated with MSRT. The Relaxation Response Theory [11] describes how repetitive focus and passive disregard of intrusive thoughts elicit a hypometabolic state characterized by decreased oxygen consumption, carbon dioxide elimination, and reduced sympathetic nervous system activity [12]. MSRT's incorporation of repetitive sound patterns aligns with the core principles of this theory. However, MSRT extends beyond simple repetition through its phase-based progression, which may induce deeper states of physiological quiescence than single-technique approaches. The graduated reduction in external sound production, culminating in silence, creates a natural trajectory toward hypometabolism that mirrors the body's circadian downregulation patterns.

Additionally, the Polyvagal Theory [13] provides insight into how regulation of vagal tone through rhythmic breathing and vocalization can enhance parasympathetic dominance and improve stress resilience [14]. The combination of conscious sound production and breathing in MSRT may support vagal stimulation through multiple pathways, including mechanical vibration of the vocal cords that stimulates vagal afferents, rhythmic diaphragmatic breathing synchronized with sound production, and auditory feedback engaging the ventral vagal complex. This multimodal vagal engagement distinguishes MSRT from practices that rely on breathing or vocalization alone and may contribute to enhanced psychophysiological coherence.

The rationale for studying MSRT specifically in homemakers extends beyond convenience sampling and reflects important sociocultural and practical considerations. Homemakers in South Asian contexts face unique stress profiles characterized by continuous and unstructured caregiving demands without clearly defined work boundaries. These demands are often accompanied by social isolation due to limited engagement outside domestic spheres, low perceived control over daily schedules and personal time, cultural expectations to prioritize family needs over self-care, and limited financial autonomy to access paid wellness services [15, 16]. These stressors differ qualitatively from occupational stress experienced by formally employed women, who typically have structured work hours, social support from colleagues, and legitimized breaks from caregiving responsibilities. Furthermore, homemakers may experience guilt or social disapproval when dedicating time to self-care activities, perceiving such practices as selfish or incompatible with their primary role identity [17].

MSRT's design features address several of these barriers. Its home-based format eliminates transportation constraints and allows practice within the domestic environment without requiring access to public spaces. The 30-minute session duration can be accommodated within short periods of relative privacy, such as early morning or afternoon rest times. The online delivery mode may provide anonymity and reduce social stigma associated with seeking mental health interventions. In addition, cultural framing through Sanskrit mantras and yogic philosophy aligns with belief systems prevalent in South Asian communities. Finally, the low resource requirements, limited to a quiet space and basic audio equipment, enhance financial accessibility for lower-income households. Together, these characteristics situate MSRT as a potentially suitable intervention for this underserved population.

Psychological factors such as anxiety, sleep quality, and perceived stress are frequently reported as salient outcomes in studies examining stress among homemakers. Anxiety is among the most prevalent mental health conditions worldwide, and existing research indicates that homemakers often report higher anxiety levels than women who are formally employed [18,19]. Prolonged activation of the stress system is commonly associated with sleep disturbances, which may further exacerbate anxiety symptoms and reduce overall life satisfaction [20]. Perceived stress, reflecting an individual's subjective appraisal of life stressors, has also been identified as an important determinant of mental health outcomes [21].

In addition to psychological dimensions, physiological indicators are widely used in studies to characterize stress-related responses. Resting heart rate, blood pressure, and respiratory rate are recognized as objective markers of autonomic nervous system activity and cardiovascular regulation. Elevated values of these parameters are commonly associated with increased risk of hypertension, metabolic disturbances, and cardiovascular disease [22]. In populations exposed to chronic stress, including homemakers, such physiological indicators often deviate from optimal ranges, reflecting sustained activation of stress-response systems [23].

Analysis of research findings has shown that yoga-based and sound-oriented relaxation practices are consistently associated with psychological regulation and physiological stress-related processes across diverse populations and contexts. Researchers emphasize that such interventions are particularly relevant for groups exposed to prolonged and multifactorial stress, where emotional strain and physiological dysregulation tend to coexist and reinforce each other. At the same time, authors highlight the importance of considering sociocultural context, mode of delivery, and real-life applicability when interpreting the relevance of mind–body practices beyond controlled or clinical settings. Although yoga-based approaches have been extensively investigated for stress reduction, with recent large-scale analyses confirming their overall effectiveness [24, 25], much of the existing work has focused on either psychological or physiological outcomes in isolation [6]. Previous studies examining MSRT have reported associations with improvements in autonomic and cognitive variables in clinical or specific demographic groups [3, 26], while sound-based meditative practices more broadly have demonstrated beneficial effects on anxiety, stress, and related conditions [27, 28, 29]. Nevertheless, the applicability of such established practices to populations facing distinct sociocultural stressors, such as homemakers, remains insufficiently characterized, which continues to limit clarity regarding how integrated psychophysiological effects may manifest under everyday living conditions. In light of these considerations, further examination of established mind–body interventions within specific population contexts appears warranted. Therefore, the aim of the present study was to examine the psychological and physiological outcomes associated with the application of Mind Sound Resonance Technique in female homemakers.

Materials and Methods

Participants

The study sample consisted of female homemakers aged 30 to 50 years who were recruited from the local community in Ranchi, India. After eligibility screening and baseline assessment, participants were allocated to one of two study groups. The experimental group received the Mind Sound Resonance Technique intervention (MSRT group), while the comparison group was assigned to the active control condition receiving Progressive Muscle Relaxation (PMR group). Both groups were comparable in terms of baseline demographic characteristics, including age, anthropometric parameters, and body mass index. A summary of participant characteristics for the MSRT and active control groups is presented in Table 1.

Table 1. Demographic characteristics of participants

Variable	MSRTG (n=23)	ACG (n=23)
Age (years)	45.24 ± 2.81	46.21 ± 1.92
Experience (years)	4.25 ± 0.52	4.37 ± 0.66
Height (cm)	148.77 ± 4.46	146.77 ± 3.19
Weight (kg)	54.86 ± 2.59	55.34 ± 3.35
Body mass index (kg/m²)	24.53 ± 2.30	24.41 ± 2.29

Note. Values are presented as mean ± standard deviation. MSRTG – Mind Sound Resonance Technique group; ACG – Active Control Group.

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Institutional permission was granted by Abi Yoga & Dance Centre, Ranchi, India (Ref. No. ABYD/2025/0105). Written informed consent was obtained from all participants prior to inclusion in the study. The study was not prospectively registered. However, all procedures were predefined and conducted in accordance with CONSORT 2010 guidelines.

Research Design

This study adopted a two-arm parallel-group randomized controlled trial (RCT) design to evaluate the effects of the Mind Sound Resonance Technique (MSRT) compared with Progressive Muscle Relaxation (PMR) among homemakers. The intervention lasted eight weeks. Assessments were conducted at baseline and post-intervention. The methodological framework adhered to CONSORT 2010 guidelines, ensuring transparency in participant flow, allocation, and follow-up. A detailed CONSORT diagram depicting participant recruitment, randomization, intervention adherence, and analysis is presented in Figure 1. This design allowed a structured comparison of MSRT's sound-based therapeutic mechanisms against an established relaxation technique.

Recruitment Strategy

Participants were recruited through a structured and replicable multi-step outreach strategy. Recruitment took place between 14 March and 5 April 2025 in Ranchi, India. It involved the distribution of printed leaflets in local residential areas, announcements through community WhatsApp groups, posters displayed at clinics and neighborhood shops, and verbal communication via local women's self-help groups. Interested individuals contacted the research team via phone or messaging platforms. A standardized screening questionnaire was administered to determine preliminary eligibility. The questionnaire covered demographic information, lifestyle patterns, health history, and self-reported symptoms of stress or poor sleep. Individuals meeting these criteria were invited to attend an in-person orientation session. During this session, the study protocol was explained, and written informed consent was obtained. This clearly defined recruitment procedure enhances replicability and addresses prior reviewer concerns regarding insufficient detail.

Eligibility Criteria

Participants were eligible if they were female homemakers aged 30 to 50 years. They reported stress, sleep disturbances, or anxiety. Participants had not engaged in yoga or meditation during the preceding six months, were medically cleared by a physician, and had access to a smartphone with a stable internet connection to participate in online sessions. Individuals were excluded if they had diagnosed psychiatric or neurological disorders or cardiovascular or respiratory illnesses requiring medical management. Participants were also excluded if they were currently receiving treatment for anxiety, hypertension, or sleep problems. In addition, pregnant or postpartum women (less than six months) and individuals working irregular night shifts were excluded to avoid confounding stress-related physiological variations. These criteria were implemented to create a homogeneous sample and to ensure participant safety.

Randomization and Allocation Concealment

To ensure methodological rigor, randomization

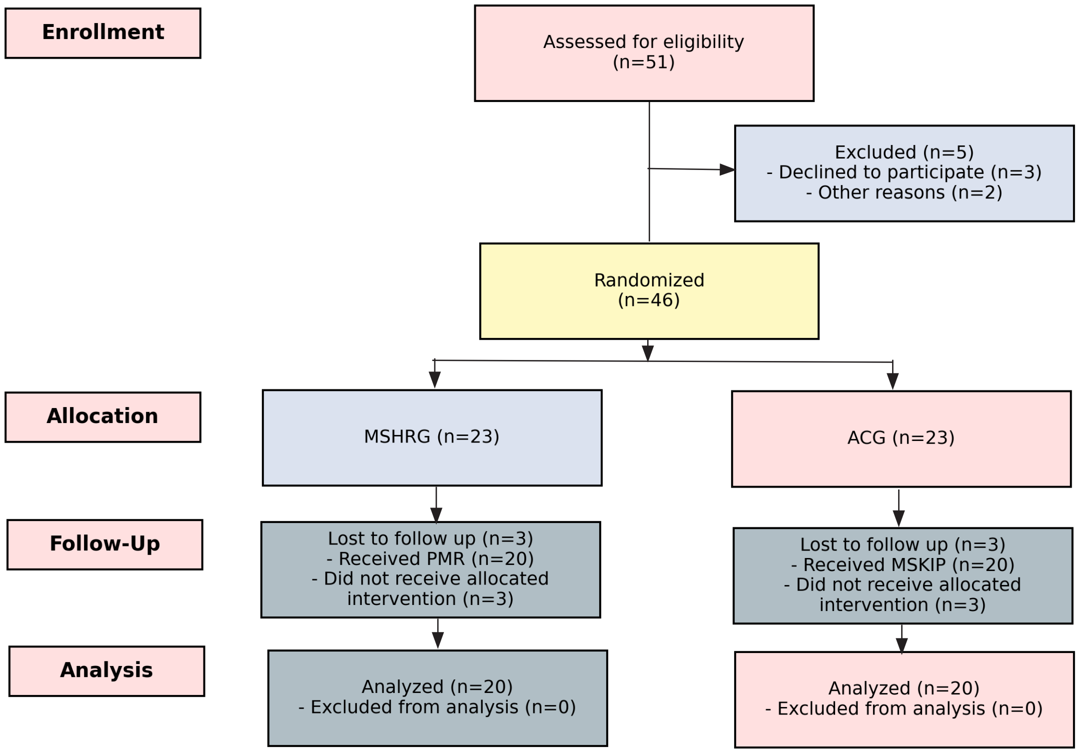

Figure 1. CONSORT Flow Diagram of Participant Progression Through the Randomized Controlled Trial

was performed using a computer-generated allocation sequence created through Randomizer.org. Participants were randomized in a 1:1 ratio to the MSRT or PMR group. Age-stratified randomization was applied using two strata (30–40 years and 41–50 years) to maintain demographic balance between groups. Allocation concealment was achieved using sequentially numbered, sealed, opaque envelopes. These envelopes were prepared by a research assistant who had no involvement in participant recruitment, intervention delivery, or outcome assessment. After baseline evaluation, the envelopes were opened sequentially to assign participants to groups. Blinding of participants was not feasible due to the nature of the interventions. Outcome assessors remained blinded to group allocation, and data analysts worked with anonymized datasets to minimize bias. A priori sample size estimation was conducted using G*Power 3.1 software for a repeated measures ANOVA with a within-between interaction. A medium effect size (f = 0.25), an alpha level of 0.05, and a statistical power of 0.80 were assumed. Based on these parameters, the minimum required sample size was calculated as 34 participants. To accommodate potential attrition of up to 15%, the sample size was increased to 40 participants. This estimation ensured adequate power to detect meaningful differences between the intervention groups.

Intervention Fidelity and Standardization

To ensure fidelity and replicability of the MSRT intervention, all sessions were delivered live through Google Meet by a certified yoga practitioner who received structured training in the standardized MSRT protocol. Participants engaged in thirty-minute sessions, five days per week, over an eight-week period. A quiet practice environment was emphasized. Participants were instructed to use headphones to ensure consistent audio quality. Uniform, pre-recorded audio files of the MSRT syllables (A, U, M, AUM) and the Mrityunjaya Mantra were provided to maintain standard pronunciation, vibrational quality, and pacing across all sessions. After each session, the instructor completed a fidelity checklist. The checklist captured adherence to the prescribed protocol, sequence, duration, and delivery standards. Independent fidelity audits were conducted three times during the intervention. These audits were performed by senior yoga therapists who reviewed randomly selected session recordings to ensure procedural consistency. Attendance was automatically logged via Google Meet. Participants also submitted weekly self-report logs documenting their home environment, perceived practice quality, and any challenges encountered. These measures ensured high-quality and replicable intervention delivery. To support replicability, all standardized MSRT audio recordings, session plans, fidelity checklists, and facilitator training materials were preserved in their original formats. Similarly, the Progressive Muscle Relaxation (PMR) scripts and adherence checklists used in the control condition are available. These materials can be accessed as supplementary files or obtained from the corresponding author upon reasonable request.

Interventions Protocol

Experimental Group: MSRT Intervention

Participants in the experimental group received Mind Sound Resonance Technique sessions delivered in an online, home-based format via video conferencing. The intervention consisted of 30-minute sessions conducted five days per week over an eight-week period. Sessions were led by a certified yoga therapist trained in the standardized MSRT protocol.

The MSRT protocol comprised a structured sequence of guided relaxation, sound-based vocalization using standardized syllables, internally perceived sound phases, and periods of silence, followed by a brief closure. Uniform pre-recorded audio files were used to ensure consistency of sound quality, pacing, and duration across sessions. Intervention fidelity was monitored using structured checklists completed after each session, with periodic independent audits to ensure protocol adherence. A detailed description of the MSRT session structure, including chanting sequences and traditional mantra texts, is provided in Table 2, while the overall structured protocol for the MSRT intervention is summarized in Table 3. The MSRT protocol employed in the present study follows a standardized structure previously described in the literature [6].

Table 2. Detailed MSRT session structure

Step	Practice (Original text preserved)	Description in English	Duration (min)
1	Prayer “Om Tryambakamyajamahesugandhim Pustivardhanam, Urvarukamivabandhanat Mrtyomuksiyamamrtat Om SantihSantihSantih”.	O Lord of the three eyes, fragrant and nourishing all beings, May You liberate us from bondage to death, As a ripe cucumber is freed from its stem, And grant us immortality. Om, peace, peace, peace.”	1
2	Quick relaxation technique - Begin by gently closing the eyes and directing attention inward. Focus on deep abdominal breathing to promote calmness.		2
3	A) Practice audible chanting of the syllables A, U, M, and AUM for three rounds. Allow the vibrations to resonate throughout the entire body. B) Follow with the Ahata-Anahata phase: start each syllable (A, U, M, and AUM) aloud, then continue mentally in silence for three rounds. Observe the internal resonance during the silent (Anahata) phase.		26
4A	Loud chanting of Mrtyunjaya Mantra (MM) Om Tryambakamyajamahesugandhim Pustivardhanam, Urvarukamivabandhanat Mrtyomuksiyamamrtat Om SantihSantihSantih. (3 rounds) Sense the pattern of resonant waves flowing through your body.	Loud chanting of the Mrtyunjaya Mantra (MM) “O Lord of the three eyes, fragrant and nourishing all beings, May You liberate us from bondage to death, As a ripe cucumber is freed from its stem, And grant us immortality. Om, peace, peace, peace.” (3 rounds) Sense the pattern of resonant waves flowing through your body.	
4B	Ahata - Anahata of Mrtyunjaya Mantra MM-, MM-, MM (3 rounds) Experience the rhythmic flow of resonance waves, even during the Anahata phase.	Ahata–Anahata phase of the Mrtyunjaya Mantra (MM) Begin each repetition of the Mrtyunjaya Mantra aloud (Ahata), then continue the same mantra mentally in silence (Anahata), maintaining awareness of the vibrational quality. (MM–, MM–, MM; 3 rounds) Experience the rhythmic flow of resonance waves throughout the body, including during the silent Anahata phase.	

Table 2. Continued

Step	Practice (Original text preserved)	Description in English	Duration (min)
5	Anahata AUM (9 rounds) Mentally chant AUM while sensing its resonant vibrations flowing through the body.		
6	Ajapajapa AUM to SILENCE: Practice nine rounds of softly repeating AUM, gradually allowing the sound to fade into silence. With each repetition, observe the vibrational flow of AUM rising, spreading through the body, and gently dissolving into stillness.		
7	Maintain SILENCE		
8	RESOLVE		
9	Prayer “SarvebhavantuSukhinah SarveSantuniramayah Sarve Bhandari Pasyanthu Ma KascitdukhaBhagbhavet Om SantihSantihSantih”.	Prayer “May all beings be happy, May all beings be free from illness, May all beings experience well-being, May no one suffer. Om, peace, peace, peace.”	

Note. The original Sanskrit texts and traditional practice terminology are retained as used in the standardized MSRT protocol. English descriptions are provided for explanatory purposes only and do not represent literal translations of the chants.

Table 3. Structured protocol for MSRT Intervention in the experimental group

Component	Description	Duration (min)
Opening relaxation	Brief preparatory relaxation to facilitate attentional focus and physiological settling	~3
Sound-based vocalization	Structured audible vocalization using standardized syllables (A, U, M, AUM)	~10
Internal sound perception	Transition from audible to mentally perceived sound (Ahata–Anahata phases)	~10
Silence-based awareness	Gradual transition from internally perceived sound to silence	~5
Closing phase	Session closure and cognitive reorientation	~2
Total session duration		30

Note. Durations are approximate and represent the intended time allocation for each component within a single MSRT session.

Active Control Group

The active control group received guided Progressive Muscle Relaxation (PMR) sessions delivered by a certified relaxation therapist in accordance with the validated Bernstein and Borkovec PMR protocol [30]. Detailed session procedures are provided in Table 4. Sessions were conducted for 30 minutes, five days per week, over an eight-week period. The sessions followed a standardized structure shown in Table 5, incorporating breathing regulation, sequential muscle relaxation, and guided body awareness. To ensure consistency across sessions, a uniform PMR script was used, and all sessions were audio-recorded for fidelity monitoring. Intervention adherence was documented using structured checklists completed by the therapist following each session.

Outcome Measures

All participants underwent assessments at two time points. The first assessment was conducted at baseline, prior to the start of the intervention. The second assessment was conducted after completion of the 8-week program. To enhance methodological clarity and prevent post hoc interpretation, outcome measures were predefined and categorized as primary and secondary outcomes. The primary outcomes were anxiety, assessed using the Hamilton Anxiety Rating Scale (HAM-A), and perceived stress, assessed using the Perceived

Table 4. Detailed PMR session structure

Step	Phase	Duration (min)	Activity Description	Instructions / Adaptations
1	Introduction & settling	3	Begin with light conversation or verbal guidance to set intention	Ask participants to sit on a mat or sofa, or lie down comfortably; encourage closing the eyes and relaxing the body.
2	Deep abdominal breathing	3	Inhale gently through the nose for approximately four seconds, then exhale slowly through the mouth over six seconds	Emphasize slowing down thoughts.
3	Muscle tension–relaxation (main phase)	18	Gently tense each muscle group for 5–7 seconds, then release for 10–15 seconds; focus on the sensation of relaxation	1. Hands and arms 2. Shoulders 3. Neck 4. Face and jaw 5. Chest 6. Abdomen 7. Back 8. Legs and feet
4	Guided body awareness	4	Slowly guide attention through body parts with soft background music or a calm voice	"Notice how your hands feel... now your shoulders... feel the relaxation spreading."
5	Positive affirmation & closure	2	End with soft statements to reinforce peace and self-worth	Examples: "You deserve this time." "You are calm, relaxed, and in control."

Table 5. Structured protocol for progressive muscle relaxation (PMR) intervention in the active control group

Component	Description	Duration (min)
Preparatory phase	Brief verbal orientation and settling period	~3
Breathing regulation	Slow diaphragmatic breathing to facilitate relaxation	~3
Muscle relaxation sequence	Sequential tensing and relaxation of major muscle groups	~18
Body awareness phase	Guided attentional focus across body regions	~4
Closure phase	Session completion and cognitive reorientation	~2
Total session duration		30

Stress Scale (PSS-10). These variables directly reflect psychological stress burden in homemakers. Secondary outcomes included sleep quality, measured using the Pittsburgh Sleep Quality Index (PSQI), and physiological stress markers. The physiological measures comprised resting heart rate (RHR), systolic and diastolic blood pressure (SBP, DBP), and respiratory rate (RR).

Psychological Variables

To comprehensively evaluate the mental well-being of participants, three key psychological constructs were assessed: anxiety, sleep quality, and perceived stress. Standardized and validated tools were employed to ensure psychometric reliability and relevance to the target population. All psychological instruments were administered in their validated English-language versions. Administration was performed by trained assessors following standardized procedures.

Anxiety

Anxiety was measured using the Hamilton Anxiety Rating Scale (HAM-A) [23]. This is a well-known tool commonly used by clinicians. It includes 14 items, each describing a symptom of anxiety. The items are categorized into two domains: psychic anxiety, which reflects mental agitation and emotional distress, and somatic anxiety, which captures physical symptoms associated with anxiety. Each item is scored on a Likert scale ranging from 0 (not present) to 4 (severe). Total scores range from 0 to 56, with higher scores indicating greater levels of anxiety. The HAM-A is known for its reliability and validity. It is suitable for use in both clinical settings and general populations and is useful for tracking changes over time.

Sleep Quality

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) [31]. This instrument asks participants to reflect on their sleep habits over the past month. It includes 19 self-rated questions. An additional five questions are completed by a bed partner or roommate, but these are not included in the final score. The questionnaire assesses seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each component is scored on a scale from 0 to 3, yielding a global score ranging from 0 to 21. A global score greater than 5 indicates poor sleep quality. The PSQI is extensively validated for research involving populations with stress, anxiety, or lifestyle-related sleep disruption.

Perceived Stress

To measure stress levels, the Perceived Stress Scale (PSS-10) was used [32]. This is a brief self-report instrument that assesses the extent to which participants perceive their lives as unpredictable, overwhelming, or out of control during the past month, which are key components of psychological stress. The scale consists of 10 items. Each item is rated on a scale from 0 (never) to 4 (very often), reflecting the frequency of specific thoughts or feelings. Four items are negatively worded and are scored in reverse. Total scores range from 0 to 40, with higher scores indicating greater perceived stress. The PSS-10 demonstrates excellent internal consistency (Cronbach's $\alpha > 0.80$) and is widely used in health psychology and behavioral medicine research.

All psychological assessments were administered in a quiet, distraction-free setting and were conducted by trained personnel to ensure standardization and participant understanding.

Physiological Variables

To obtain a comprehensive picture of participants' well-being, selected physiological parameters related to autonomic and cardiovascular function were also recorded. These included resting heart rate (RHR), blood pressure, and respiratory rate (RR). All three are well-established markers used to assess physiological responses to stress and the functioning of the cardiovascular and autonomic nervous systems.

Resting Heart Rate

Resting heart rate (RHR) was measured using a simple manual method by palpating the radial pulse at the wrist [33]. Participants were advised to avoid caffeine, large meals, and vigorous physical activity for at least two hours before measurement. Each participant was seated comfortably in a quiet room and allowed to rest for 10 minutes in a relaxed seated posture. The examiner then located the radial pulse by placing the index and middle fingers on the thumb side of the participant's wrist, just below the wrist crease, and applied gentle pressure to detect arterial pulsation. Heart rate was recorded by counting pulse beats over a 60-second interval using a stopwatch. Measurements were repeated twice, and the lowest stable value was documented as the RHR, expressed in beats per minute. During the procedure, participants were instructed to remain relaxed and breathe normally. In general, a lower resting heart rate reflects more efficient cardiac function and greater parasympathetic nervous system activity.

Blood Pressure

Blood pressure readings were taken using an Omron HEM series digital sphygmomanometer [6]. This device meets international accuracy standards. Measurements were performed on the left upper arm. Participants were seated calmly with the arm supported at heart level. In accordance with American Heart Association (AHA) guidelines, two readings were recorded with a 2-minute interval between measurements [26]. The average of the two readings was used as the final value. Ensuring that participants remained relaxed during the procedure helped improve measurement accuracy. Blood pressure is a sensitive marker of sympathetic arousal, and reductions in systolic and diastolic pressure following interventions such as MSRT may reflect improved autonomic balance and stress regulation.

Respiratory Rate

Respiratory rate was recorded manually by counting chest movements while the participant was seated comfortably in a quiet setting [34]. Each participant was allowed to rest for 5 minutes before measurement. To ensure accuracy, the number of breaths, defined as one complete inhalation and exhalation, was counted over a 60-second interval. This non-invasive method provides insight into the participant's autonomic state, as a reduced respiratory rate is commonly associated with relaxation and parasympathetic activation. Manual counting was performed by the same trained observer for all participants to maintain consistency and reduce inter-rater variability.

All measurements were conducted in a quiet room maintained at a temperature between 22°C and 24°C. Participants were asked not to move during the assessments. They were instructed to breathe normally and remain relaxed throughout the procedure. The aim was to maintain a calm and consistent environment for all participants.

Intervention Adherence Monitoring

Participant adherence to the assigned intervention was monitored throughout the study period. Attendance was automatically documented via the Google Meet platform and cross-verified with session logs. Participants were required to attend at least 75% of scheduled sessions to be considered adherent. Weekly feedback forms were collected from all participants to capture practice experiences, perceived difficulty, and environmental disturbances. Participants who missed more than 25% of sessions were classified as low-adherence participants but were still included in post-intervention assessments to support an intention-to-treat analytic approach.

All study data, including raw scores, intervention recordings, scripts, and fidelity checklists, were stored securely on a password-protected institutional server accessible only to the research team. To enhance transparency and replicability, intervention materials and datasets will be made available by the corresponding author upon reasonable request. Data handling procedures followed ethical requirements and institutional guidelines.

Adverse Events and Safety Monitoring

Participant safety was monitored throughout the intervention period. Participants were instructed to report any discomfort, adverse symptoms, or health concerns arising during or after the sessions. No adverse events, medical complications, or intervention-related discomfort were reported in either the MSRT or the Progressive Muscle Relaxation (PMR) group during the study period. All participants completed the intervention without requiring medical withdrawal or modification of the protocol.

Statistical Analysis

Data were analyzed using SPSS version 26. Statistical significance was set at $p < 0.05$. Descriptive statistics (mean ± SD) were computed for all variables. Repeated measures ANOVA was used to examine within-group changes over time and between-group differences for both primary and secondary outcomes. Effect sizes were calculated using partial eta squared (η^2p) and categorized as small (< 0.06), moderate (0.06–0.13), or large (⩾ 0.14) [35]. Normality of all variables was examined using the Shapiro–Wilk test. The results confirmed that all psychological and physiological measures met the assumptions of normality ($p > 0.05$). Measurement reliability was assessed using the Intraclass Correlation Coefficient (ICC 2,1). The analysis demonstrated good-to-excellent test–retest reliability across physiological variables (ICC = 0.86–0.91). Missing data were minimal (< 5%) and were handled using complete-case analysis. No extreme outliers requiring exclusion were identified during data screening.

Results

The Shapiro-Wilk test was conducted to examine whether the psychological and physiological variables met the assumptions of normality required for parametric statistical analyses. As shown in Table 6, all variables across both the MSRT (experimental) group and the PMR (control) group demonstrated non-significant p-values ($p > 0.05$), indicating that the data were normally distributed. The W statistics ranged from 0.947 to 0.974. These values further supported the absence of substantial deviations from normality. The results confirm that the assumptions for using repeated measures ANOVA and other parametric procedures were satisfied. This supports the robustness and validity of the subsequent inferential analyses.

Table 6. Shapiro–Wilk normality test for psychological and physiological variables in the MSRT and PMR groups

Variable	Group	W Statistic	p-value
Anxiety (HAM-A)	MSRT	0.967	0.514
	PMR	0.958	0.388
Sleep Quality (PSQI)	MSRT	0.954	0.341
	PMR	0.947	0.265
Perceived Stress (PSS-10)	MSRT	0.961	0.402
	PMR	0.956	0.368
Resting Heart Rate (bpm)	MSRT	0.972	0.601
	PMR	0.968	0.527
Systolic Blood Pressure (mmHg)	MSRT	0.965	0.469
	PMR	0.962	0.415
Diastolic Blood Pressure (mmHg)	MSRT	0.958	0.383
	PMR	0.951	0.311
Respiratory Rate (breaths/min)	MSRT	0.974	0.645
	PMR	0.969	0.532

Note. MSRT – Mind Sound Resonance Technique group; PMR – Progressive Muscle Relaxation group; HAM-A – Hamilton Anxiety Rating Scale; PSQI – Pittsburgh Sleep Quality Index; PSS-10 – Perceived Stress Scale (10-item version).

Table 7 presents the Intraclass Correlation Coefficients (ICC 2,1) for the psychological and physiological variables included in the study. The ICC values ranged from 0.86 to 0.91, indicating good to excellent test–retest reliability according to established criteria. Anxiety, perceived stress, and resting heart rate demonstrated excellent reliability (ICC ⩾ 0.90). Sleep quality, systolic and diastolic blood pressure, and respiratory rate showed good reliability (ICC ⩾ 0.86). These results confirm that all outcome measures were stable and consistent across repeated assessments, supporting the robustness and reproducibility of the data collected in this study.

Table 7. Intraclass correlation coefficients (ICC 2,1) for test–retest reliability of psychological and physiological variables

Variable	ICC value
Anxiety (HAM-A)	0.91
Sleep quality (PSQI)	0.89
Perceived stress (PSS-10)	0.90
Resting heart rate (bpm)	0.91
Systolic blood pressure (mmHg)	0.88
Diastolic blood pressure (mmHg)	0.86
Respiratory rate (breaths/min)	0.89

Table 8 summarizes the pre- and post-intervention comparisons for psychological

Table 8. Pre- and Post-intervention comparison of psychological and physiological variables between experimental (MSRT) and active control groups (ACG) in homemakers

Variable	Group	Pre data Mean [SD]	Post data Mean [SD]	Δ (%)	SS	F	p	η^2p
Anxiety (HAM-A)	MSRTG	29.25 [2.44]	19.30 [2.53]	−34.01	201.61	256.44	<0.001	0.87
	ACG	29.40 [2.23]	25.80 [2.37]	−12.24				
Sleep quality (PSQI)	MSRTG	12.65 [1.22]	7.90 [1.02]	−37.54	45.00	52.21	<0.001	0.57
	ACG	12.50 [1.10]	10.75 [0.96]	−14.00				
Perceived stress (PSS-10)	MSRTG	26.75 [1.80]	16.85 [1.34]	−37.00	201.61	252.22	<0.001	0.86
	ACG	26.45 [1.57]	22.90 [1.68]	−13.42				
Resting heart rate (bpm)	MSRTG	84.50 [2.11]	74.30 [2.31]	−12.07	195.31	176.39	<0.001	0.82
	ACG	84.70 [2.17]	80.75 [1.86]	−4.66				
Systolic blood pressure (mmHg)	MSRTG	137.90 [2.77]	126.90 [3.72]	−7.97	292.61	256.94	<0.001	0.87
	ACG	137.95 [2.70]	134.60 [2.62]	−2.42				
Diastolic blood pressure (mmHg)	MSRTG	87.45 [2.21]	80.10 [1.44]	−8.40	72.20	61.30	<0.001	0.61
	ACG	87.20 [1.96]	83.65 [1.84]	−4.07				
Respiratory rate (breaths/min)	MSRTG	18.85 [0.81]	13.95 [0.75]	−25.99	43.51	145.36	<0.001	0.79
	ACG	19.05 [0.99]	17.10 [1.07]	−10.23				

Note. MSRTG – Mind Sound Resonance Technique group; ACG – Active Control Group; HAM-A – Hamilton Anxiety Rating Scale; PSQI – Pittsburgh Sleep Quality Index; PSS-10 – Perceived Stress Scale (10-item version); RHR – Resting Heart Rate; SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; RR – Respiratory Rate.

and physiological variables in the experimental (MSRT) and active control groups. Across all assessed outcomes, participants in the MSRT group demonstrated greater improvements than those in the control group. Reductions in anxiety, sleep disturbance, and perceived stress were more pronounced in the experimental group, indicating stronger psychological benefits associated with the MSRT intervention compared with Progressive Muscle Relaxation.

Similarly, improvements in physiological parameters were consistently greater in the MSRT group. Favorable changes were observed in resting heart rate, systolic and diastolic blood pressure, and respiratory rate, whereas the active control group exhibited more modest reductions across these measures. All between-group effects reached statistical significance and were accompanied by large effect sizes, indicating robust psychophysiological effects of MSRT beyond those observed with an established relaxation method.

Discussion

The aim of the present study was to examine the psychological and physiological outcomes associated with the application of Mind Sound Resonance Technique in female homemakers. The results demonstrated that the MSRT intervention was associated with greater improvements in anxiety, sleep quality, and perceived stress compared with the active control condition. In addition, favorable changes were observed in physiological indicators reflecting autonomic and cardiovascular regulation, including resting heart rate, blood pressure, and respiratory rate. Taken together, these findings indicate that MSRT was associated with concurrent psychological and physiological benefits in the studied population.

The observed psychological and physiological changes associated with MSRT practice are broadly consistent with findings reported in previous studies examining yoga-based relaxation and sound-oriented interventions [26, 27, 28, 29]. Although various theoretical frameworks, such as autonomic regulation and relaxation-response models, have been proposed to account for these effects, the present study did not investigate underlying neural or mechanistic pathways. Accordingly, references to potential mechanisms should be regarded as conceptual interpretations rather than empirically tested explanations within the current dataset.

Previous work by the authors examined the application of Mind Sound Resonance Technique in a different context, reporting associations between a twelve-week MSRT intervention and cardiovascular and sleep-related outcomes among injured national-level athletes [6]. That investigation was conducted in a supervised institutional setting and focused on rehabilitation-related objectives. In contrast, the present study applies MSRT within a non-clinical population and a stress-management context, with differences in target population, intervention duration, delivery format, and comparator condition. Together, these distinctions highlight the applicability of MSRT across diverse populations and research settings, while underscoring the contextual factors that may influence observed outcome patterns.

The outcomes in the MSRT group compared with PMR can be attributed to several specific mechanistic pathways. First, the sequential syllabic activation through A, U, M, and AUM creates anatomically distributed patterns of vagal stimulation. Vickhoff et al. demonstrated that vocal–respiratory coupling during structured vocalization produces more pronounced heart rate variability modulation than passive relaxation alone [36]. The observed reduction in resting heart rate in the MSRT group compared with the PMR group is consistent with this mechanism, as lower heart rate reflects increased parasympathetic dominance mediated by vagal pathways.

Second, the Ahata–Anahata transition, in which practitioners shift from external vocalization to internal sound perception, engages auditory–motor integration circuits that may enhance neural coherence. Gao et al. reported that meditation practices involving sound transitions produce greater cross-frequency coupling between brain regions than muscle relaxation techniques [37]. This neural entrainment effect may help explain the larger reductions in anxiety observed in the MSRT group compared with PMR.

Third, the incorporation of the Mrtyunjaya Mantra introduces a culturally meaningful component that is absent in PMR. Chanda and Levitin demonstrated that culturally meaningful sounds can trigger endogenous opioid release and reduce cortisol more effectively than arbitrary auditory stimuli [38]. For homemakers in the South Asian sample, the Vedic cultural framing may have enhanced acceptability and perceived legitimacy. The comparison with PMR is particularly informative because PMR itself has established efficacy for stress reduction [39]. Evidence supports the effectiveness of progressive muscle relaxation, deep breathing, and guided imagery in promoting psychological and physiological states of relaxation. The larger effects associated with MSRT suggest that its distinctive features may contribute additional therapeutic value beyond general relaxation mechanisms [40].

To contextualize MSRT's effectiveness, it is useful to compare the findings with other mind–body interventions. A recent individual participant data meta-analysis of 13 trials conducted across eight countries (N = 2,371) reported that mindfulness-based programs produce small-to-moderate reductions in psychological distress [41]. In addition, a comprehensive review analyzing 44 meta-analyses, encompassing 336 randomized controlled trials and 30,483 participants, confirmed consistent moderate effects across a range of mental health outcomes [25].

In the present study, the MSRT intervention was associated with larger effect sizes for key psychological outcomes, including anxiety (η^2p = 0.87) and perceived stress (η^2p = 0.86), suggesting comparatively stronger effects than those typically reported for general meditation-based approaches. Similarly, a systematic review by Cramer et al. examining yoga interventions for hypertension reported pooled effect sizes of approximately 0.5 for blood pressure reduction [42], whereas the MSRT group in the current study demonstrated effect sizes exceeding 0.8 for both systolic and diastolic blood pressure.

The direct comparison with Progressive Muscle Relaxation is particularly informative. While PMR was associated with modest improvements in anxiety and heart rate, consistent with its established efficacy, the larger effects observed in the MSRT group suggest that its distinctive features may confer additional therapeutic value beyond general relaxation mechanisms alone.

The reduction in anxiety observed in the MSRT group is consistent with previous research on sound-based interventions. Sharma et al. reported comparable reductions following yoga-based interventions among stressed individuals [43]. Similarly, Brandmeyer and Delorme found that mantra-based meditation led to greater anxiety reduction than muscle relaxation techniques [44]. The large effect size (η^2p = 0.87) suggests that MSRT may be particularly effective for homemakers. This effect may be related to its sound-resonance focus, which has been associated with decreased amygdala activity [19].

Improvements in sleep quality exceeded the minimum clinically important difference for the Pittsburgh Sleep Quality Index [44]. This finding is consistent with the systematic review by Wang et al., which showed that yoga interventions produce effect sizes ranging from 0.6 to 1.2 for sleep-related disorders [45]. The underlying mechanism likely involves modulation of autonomic nervous system activity. Recent neurophysiological studies indicate that yogic practices incorporating sound elements, such as OM chanting and mantra meditation, enhance parasympathetic nervous system activity and reduce sympathetic arousal through vagal nerve stimulation and limbic system deactivation. These processes may create physiological conditions conducive to restorative sleep [46, 47].

The reduction in perceived stress observed in the MSRT group is consistent with earlier findings indicating that meditation-based programs are associated with significant stress reduction [48]. The strong effect size (η^2p = 0.86) suggests a substantial impact of the intervention. Sustained practice of MSRT over the eight-week period may have facilitated autonomic rebalancing through cumulative effects. Cohen and Janicki-Deverts reported that interventions targeting stress appraisal mechanisms are associated with lasting reductions in perceived stress [49]. The mindful sound focus of MSRT may contribute to such cognitive reappraisal processes.

Physiological improvements were also evident. Reductions in resting heart rate and blood pressure are comparable to those reported for lifestyle modifications in early stages of hypertension [26]. These findings align with the systematic review by Cramer et al., which showed that yoga-based practices are associated with reductions in heart rate and blood pressure through enhanced vagal tone and improved baroreflex sensitivity [42]. The reduction in respiratory rate indicates improved breathing regulation and autonomic function. This pattern is consistent with previous research demonstrating that slow and controlled breathing practices enhance respiratory efficiency through autonomic balance [50].

The findings have relevance for homemakers, who face unique stressors including continuous unstructured caregiving demands, social isolation, limited control over schedules, cultural expectations that prioritize family needs over self-care, and restricted access to formal wellness services [43]. The home-based format of MSRT eliminates transportation barriers. Its 30-minute duration fits brief windows of privacy, while online delivery provides anonymity and may reduce mental health–related stigma. In addition, the cultural framing through Sanskrit mantras aligns with traditional South Asian belief systems.

These features address specific barriers faced by homemakers, making MSRT a viable intervention for this underserved population. The high retention rate (87%) and strong adherence observed in the study suggest cultural appropriateness and practical feasibility of MSRT for homemakers. Unlike clinic-based interventions that require travel and fixed appointments, home-based delivery accommodates unpredictable household demands. The concurrent improvements in psychological and physiological outcomes support the concept of psychophysiological coherence, whereby mental and physical well-being are intrinsically linked [51].

From an applied perspective, the findings suggest that MSRT may serve as a low-cost and scalable stress-management intervention for populations facing barriers to traditional healthcare access. The present study focused on homemakers residing in rural and semi-urban settings, where constraints related to time, mobility, and access to structured wellness services are commonly reported. The online, home-based delivery model employed in this study provides a framework that may be adaptable to other populations with limited schedule flexibility. However, broader implementation would require contextual adaptation and further validation across diverse sociocultural and living environments.

Limitations and Future Directions

This study should be interpreted within its methodological scope as an efficacy-oriented controlled trial conducted in a specific population under standardized conditions. The eight-week intervention duration was sufficient to plausibly contribute to the observed psychological and physiological changes. However, longer-term studies are needed to evaluate the sustainability of benefits and to determine optimal practice frequency for maintenance.

Effect sizes observed in the present study should be interpreted with caution due to the modest sample size and relatively short intervention duration. These factors may contribute to inflation of magnitude estimates despite statistically robust findings. The sample comprised homemakers from rural Ranchi. While this cultural specificity supports the contextual appropriateness of MSRT in this setting, it limits generalizability to other sociocultural contexts.

This study prioritized internal validity through strict protocol standardization. Future pragmatic effectiveness trials should examine real-world implementation with less intensive monitoring and greater ecological variability. Further research should explore dose–response relationships, include longer follow-up periods, expand to more diverse populations such as urban homemakers and working women, and compare MSRT with other sound-based practices to isolate specific active components. Multi-site implementation studies will be essential to establish scalability and long-term effectiveness across broader settings.

Conclusions

This controlled implementation study demonstrates that Mind Sound Resonance Technique can be feasibly delivered in a home-based, online format and is associated with meaningful psychological and physiological improvements among homemakers. The distinctive features of MSRT, including phase-based sound progression, the Ahata–Anahata transition, and culturally meaningful content, appear to contribute therapeutic value beyond general relaxation mechanisms. Its home-based delivery, cultural appropriateness, and low resource requirements position MSRT as a practical intervention for homemakers facing barriers to formal healthcare access. These findings support the integration of MSRT into wellness programs targeting stress-related symptoms in underserved populations, particularly in culturally aligned contexts where traditional wellness practices are valued.

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Conflicting Interest

The authors declare that there is no conflict of interest with respect to the research, authorship, or publication of this article.

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