International Journal of Otorhinolaryngology and Head and Neck Surgery
Ekka N et al. Int J Otorhinolaryngol Head Neck Surg. 2026 Dec;12(6):987-995
https://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20264282

Original Research Article

A study of body-mind relationship on voice by using mindfulness based stress reduction on muscle tension dysphonia subjects

Namrata Ekka[1], Indranil Chatterjee[1], Somsubhra Chatterjee[2], Susmi Pani[3]*

[1]AYJNISHD, RC, Kolkata, West Bengal, India
[2]College of Medicine and Sagore Dutta Hospital, Kolkata, West Bengal, India
[3]Tamralipto Government Medical College and Hospital, East Midnapore, West Bengal, India

Received: 19 September 2026
Revised: 16 October 2026
Accepted: 02 November 2026

***Correspondence:**
Dr. Susmi Pani,
E-mail: bueemimiaslp@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Muscle tension dysphonia (MTD) is a functional voice disorder associated with excessive laryngeal muscle tension and psychological factors such as stress, affecting voice production. Mindfulness-based stress reduction (MBSR) and circumlaryngeal massage (CLM) target these psychological and physiological components, respectively. Aim was to compare the effectiveness of MBSR, CLM, and combined MBSR+CLM in individuals with MTD.
Methods: A comparative quasi-experimental pre-test-post-test study was conducted on 30 adults with MTD, equally divided into MBSR, CLM, and MBSR+CLM groups. Outcome measures included the Five Facet Mindfulness Questionnaire (FFMQ), mindful attention awareness scale (MAAS), dysphonia severity index (DSI), and GRBASI.
Results: All interventions produced significant improvements. The combined MBSR+CLM group showed the greatest effect (Cohen's d=2.58), followed by MBSR (d=2.28) and CLM (d=1.44). MBSR primarily enhanced mindfulness, while CLM improved laryngeal function. The combined intervention achieved the most consistent improvements across physiological, acoustic, perceptual, and psychosocial outcomes.
Conclusions: Integrating MBSR with CLM provides a comprehensive and effective approach for managing MTD by addressing both psychological stress and laryngeal muscle tension.

Keywords: Muscle tension dysphonia, Mindfulness-based stress reduction, Circumlaryngeal massage, Voice therapy, FFMQ

INTRODUCTION

Voice is a multidimensional phenomenon that reflects not only laryngeal function but also an individual's physical, psychological, and emotional state. Effective voice production depends on the coordinated interaction of respiration, phonation, resonance, and articulation, while psychological factors such as stress, anxiety, and emotional well-being significantly influence vocal quality.[1,2] Individuals with voice disorders frequently experience increased stress, physical discomfort, reduced quality of life, and social isolation.[3,4]

MTD is one of the most common functional voice disorders and is characterized by excessive laryngeal and extralaryngeal muscle tension without structural pathology.

Patients typically present with hoarseness, vocal fatigue, throat discomfort, and increased effort during phonation. Persistent hyperfunctional voice use may eventually result in secondary structural lesions such as vocal nodules or polyps.[5] Various classification systems describe supraglottic compression and abnormal laryngeal muscle activity associated with MTD.[6-8]

The body-mind relationship plays a central role in the development and persistence of MTD. Psychological stress, anxiety, emotions, and maladaptive cognitive patterns can increase muscle tension around the larynx, while chronic voice problems negatively affect emotional well-being and social functioning.[9-11] This bidirectional interaction highlights the need for holistic management that addresses both physical and psychological contributors to dysphonia.

Assessment of MTD combines non-instrumental methods, including detailed case history and laryngeal palpation, with instrumental evaluations. Although palpation is widely used to identify excessive muscle tension, it remains subjective and lacks standardized, highly reliable rating systems.[12,13]

Management primarily involves voice therapy, particularly manual circumlaryngeal therapy, which reduces excessive laryngeal muscle tension and improves voice quality.[14,15] Because psychological factors often contribute to MTD, integrating counseling, education, and stress-management strategies enhances treatment outcomes.[16]

MBSR, developed by Kabat-Zinn, has emerged as a promising complementary intervention.[17] The structured eight-week program incorporates mindfulness meditation, body scanning, gentle yoga, and mindful awareness to reduce stress, improve emotional regulation, and enhance body awareness. Higher mindfulness is associated with lower perceived stress, improved vitality, and healthier responses to chronic stress.[18,19] Although research specifically examining MBSR in MTD remains limited, preliminary evidence suggests that mindfulness may reduce voice-related distress, physical tension, and symptom severity while improving vocal functioning and overall well-being.[20-22] These findings support adopting a holistic body-mind approach for managing MTD alongside conventional voice therapy.

The objective of this study was to compare the effects of CLM, MBSR, and their combined application (CLM+MBSR) on mindfulness, objective and perceptual voice quality, and maintenance of treatment effects in adults with primary MTD.

METHODS

Inclusion and exclusion criteria

Inclusion criteria were adults aged 20-50 years with primary MTD, at least secondary-level education, and willingness to provide informed consent. Exclusion criteria were structural laryngeal pathology or a voice disorder attributable to a cause other than primary MTD.

The original manuscript did not specify any additional exclusion criteria; the eligibility criteria should therefore be checked against the original study protocol before submission.

The present study employed a comparative, quasi-experimental research design to evaluate the effectiveness of three interventions for individuals with primary MTD: CLM, MBSR, and a combined CLM+MBSR approach. Purposive sampling was used, and although the estimated sample size was 45, the study included 30 participants (10 per group), achieving an acceptable statistical power of 80%. The research was conducted over two months at the Ali Yavar Jung National Institute of Speech and Hearing Disabilities (AYJNISHD), Kolkata. Participants were aged between 20 and 50 years, had completed at least secondary education, and met predefined inclusion and exclusion criteria to ensure a homogeneous sample.

Outcome measures included both subjective and objective assessments. Mindfulness was evaluated using the MAAS and the FFMQ. Voice quality was objectively assessed using the DSI, which incorporates maximum phonation time (MPT), highest fundamental frequency (F0-high), lowest intensity (I-low), and Jitter (%). Perceptual voice quality was assessed using the GRBASI scale, with particular emphasis on the GRADE (G) parameter representing overall dysphonia severity.

The research procedure consisted of nine sequential phases: obtaining ethical approval and informed consent, collecting baseline data using self-report questionnaires, objective acoustic assessment, and perceptual voice evaluation, followed by therapeutic intervention, monitoring, post-treatment assessment, one-month follow-up, data compilation, and statistical analysis. Ethical clearance was obtained from the institutional Research Advisory Committee, and informed consent was secured from all participants before data collection commenced.

Therapeutic intervention differed across groups. Group 1 received CLM following Roy et al which focused on reducing excessive laryngeal muscle tension through manual manipulation of the hyoid bone and thyroid cartilage while reinforcing improved vocal production. Group 2 participated in an eight-week MBSR program based on Kabat-Zinn, comprising body scan meditation, mindful breathing, sitting meditation, mindful movement (yoga), walking meditation, group discussions, an all-day silent retreat, and integration of mindfulness into daily life. Group 3 received a combination of CLM and MBSR. All interventions followed a blended model, with the first session conducted offline by the clinician and subsequent sessions performed at home under online supervision through Google Meet.

Participants were reassessed immediately after completing therapy and again one month later to determine the maintenance of treatment effects. Data were securely stored, coded, and compiled before statistical analysis. Descriptive statistics summarized participant characteristics and outcome measures. Since

the Shapiro-Wilk test indicated non-normal data distribution, non-parametric analyses were employed. The Kruskal-Wallis test and Mann-Whitney U test were used for between-group comparisons, while the Friedman test and Wilcoxon signed-rank test examined within-group changes across baseline, post-treatment, and follow-up assessments. Statistical significance was established at $p<0.05$ and $p<0.01$ using SPSS version 20.

RESULTS

The study was aimed to determine body-mind relationship on voice by using Mindfulness based stress reduction (MBSR) course in subjects with muscles tension dysphonia. Extensively studying all the items and the result were furnished based on objectives and hypothesis. This study included 30 participants having mean ages ranged from 20 to 50 years (mean=47.3±15.33), divided into three groups: Group 1-MTD subjects receiving CLM, group 2-MTD subjects receiving MBSR, and group 3-MTD subjects receiving a combination of CLM and MBSR.

Table 1 presents the overall Friedman test analysis for MAAS, FFMQ, DSI, and GRADE scores across the Pre-test, Post-test, and Maintenance (MTNC) phases. Significant differences were observed for all outcome measures ($p<0.01$). MAAS scores increased from a mean of 46.53 at pre-test to 79.33 at post-test and remained higher than baseline at MTNC (62.17), indicating sustained improvement in mindful awareness. Similarly, FFMQ scores showed significant improvement following the intervention, with slight reductions at MTNC while remaining above pre-test levels. DSI scores improved markedly from a mean of 0.02 at pre-test to 5.61 at post-test and were largely maintained at MTNC (4.25), reflecting sustained enhancement in voice quality. GRADE scores decreased from 1.97 at pre-test to 0.53 at post-test, indicating reduced dysphonia severity, although scores increased during MTNC. Overall, the findings demonstrate that the intervention produced significant improvements across all outcome measures over time.

Table 2 presents the overall pairwise comparisons using the Wilcoxon Signed Rank test for MAAS, FFMQ, DSI, and GRADE scores across the pre-test, post-test, and maintenance (MTNC) phases. Significant differences were observed for MAAS, FFMQ, and DSI across all pairwise comparisons ($p<0.01$). MAAS scores increased significantly from pre-test to post-test and remained significantly higher than baseline at MTNC despite a slight decline. Similarly, FFMQ scores improved significantly following the intervention, with maintenance scores remaining above pre-test levels. DSI scores also showed significant improvement from pre-test to post-test, with most gains retained at MTNC. For GRADE, scores decreased significantly from pre-test to post-test ($p<0.01$), indicating reduced dysphonia severity. No significant difference was found between the pre-test and MTNC phases ($p>0.05$), whereas post-test and MTNC scores differed significantly ($p<0.01$), suggesting partial loss of the immediate treatment effect.

Table 3 compare the CLM+MBSR, CLM, and MBSR groups across various variables. The results revealed significant group differences in FFMQ, MAAS, GRADE, and DSI at specific stages of intervention-pre, post and MTNC. For the FFMQ, a statistically significant difference was observed at the pre-intervention phase ($\chi^2(2)=7.156$, $p<0.01$) and at the MTNC phase ($\chi^2(2)=19.946$, $p<0.01$), indicating that participants in the CLM+MBSR group exhibited higher mean scores followed by CLM and MBSR groups. For the MAAS the significant differences were found at the post intervention stage ($\chi^2(2)=7.038$, $p\leq0.05$) and maintenance stage ($\chi^2(2)=19.567$, $p<0.01$). The CLM+MBSR group reported higher mean score compared to the other two groups. Regarding GRADE, significant group differences emerged at the post-intervention phase ($\chi^2(2)=6.554$, $p<0.05$) and maintenance stages ($\chi^2(2)=15.663$, $p<0.01$). For the DSI the significant differences were observed at the post-intervention ($\chi^2(2)=10.154$, $p<0.01$) and maintenance stages ($\chi^2(2)=19.134$, $p<0.01$). The CLM+MBSR group exhibited higher mean ranks, suggesting better improvement in DSI compared to CLM and MBSR alone.

Overall, the findings indicated that the combined CLM+MBSR intervention produced more consistent and sustained improvements in all the variables-FFMQ, MAAS and GRADE to either intervention administered independently.

The results revealed statistically significant differences in both the DSI and GRBASI ratings among the three intervention groups (CLM, MBSR, and CLM+MBSR). The Kruskal-Wallis analysis indicated highly significant values for DSI ($\chi^2=10.154$, $p=0.006$ posttest; $\chi^2=19.134$, $p<0.001$ maintenance) and GRBASI Grade ($\chi^2=6.554$, $p=0.038$ post-test; $\chi^2=15.663$, $p<0.001$ maintenance). These findings demonstrate that the combined CLM + MBSR group exhibited the greatest improvement in both perceptual and instrumental voice measures. Therefore, the null hypothesis (4.3.1) which stated “There is no significant difference in DSI parameters and GRBASIrating”, was rejected. There is no significant difference in MAAS and FFMQ rating. Significant group differences were found in the mindful attention and awareness scale (MAAS) and FFMQ.

scores following intervention. The Kruskal–Wallis results showed significant effects for MAAS ($\chi^2=7.038$, $p=0.030$ post-test; $\chi^2=19.567$, $p<0.001$ maintenance) and FFMQ ($\chi^2=19.946$, $p<0.001$ maintenance). Large Cohen’s d values for these measures (ranging≈0.95-1.70) further support meaningful improvements in mindfulness and awareness. Consequently, the null hypothesis (4.3.2) which stated that “There is be no significant difference in MAAS and FFMQ rating”, was rejected, indicating that the interventions produced statistically significant

differences in mindfulness outcomes, with the CLM + MBSR group showing superior effects.

Integrated analysis of all dependent variables revealed consistent, significant improvements across perceptual, instrumental, and self-rating measures. Post-hoc comparisons and large effect sizes confirm that the CLM + MBSR group achieved the greatest and most sustained gains. The overall χ^2 values (ranging from 6.554 to 19.946, $p<0.05$ to $p<0.001$) indicate strong treatment effects. Hence, the null hypothesis (4.3.3) which stated that "There is no significant difference in DSI parameters", GRBASI, MAAS and FFMQ rating", was rejected, affirming that significant differences exist among the groups in all assessed parameters.

In Table 4, the pairwise comparison showed that the combined CLM+MBSR group performed significantly better than the individual CLM and MBSR groups across several variables, especially during the post intervention and MTNC phases. Specifically, for the variables FFMQ, MAAS, and DSI, significant with $p<0.01$ differences were consistently found between CLM+MBSR and the other two groups, particularly in MTNC phase, indicating long-term positive effect of combined intervention. Differences between CLM and MBSR alone were generally non-significant ($p>0.05$) across most variables, showing that both had comparable individual effects.

In Table 5, the overall effect size was determined by averaging the effect sizes of all outcome measures (FFMQ, MAAS, DSI, and GRADE) for each intervention group. The combined CLM+MBSR group demonstrated the greatest therapeutic effect (d=2.58), indicating a huge improvement across both psychological and vocal outcomes. The MBSR group also produced a huge effect (d=2.28), reflecting substantial gains in mindfulness along with significant improvements in voice function. The CLM group showed a very large effect (d=1.44), suggesting that CLM effectively improves vocal performance by reducing laryngeal muscle tension, although its benefits are enhanced when combined with mindfulness training. According to Sawilowsky's effect size benchmarks, both the CLM+MBSR and MBSR interventions achieved huge effects, while CLM demonstrated a very large effect. Overall, the findings indicate that the combined CLM+MBSR approach provides the most comprehensive and effective treatment for individuals with MTD.

Table 1: Friedman test-overall of MAAS, FFMQ, DSI, GRADE scales.

Scale	Test	Minimum	Maximum	Mean	SD	Median	Mean rank	χ^2	P value
MAAS	Pretest	28.00	61.00	46.53	8.62	47.50	1.08	55.00	0.000**
	MTNC	35.00	90.00	62.17	15.53	60.00	2.00		
	Post	60.00	96.00	79.33	9.78	80.00	2.92		
FFMQ	Pretest	34.00	99.00	66.63	19.10	66.00	1.00	58.615	0.000**
	MTNC	50.00	178.00	104.83	32.77	99.00	2.05		
	Post	93.00	188.00	139.30	17.23	136.50	2.95		
DSI	Pretest	-4.50	2.79	0.02	1.68	0.25	1.03	54.28	0.000**
	MTNC	0.16	13.00	4.25	2.60	4.00	2.07		
	Post	0.27	14.00	5.61	2.67	5.20	2.90		
GRADE	Pretest	1.00	3.00	1.97	0.72	2.00	2.47	26.81	0.000**
	MTNC	0.00	8.00	3.00	2.85	3.00	2.27		
	Post	0.00	2.00	0.53	0.68	0.00	1.27		

* Indicates significant at $p<0.05$ **Indicates significant at $p<0.01$.

Table 2: Wilcoxon signed rank test-overall of MAAS, FFMQ, DSI, GRADE scales.

Scale	Test	Minimum	Maximum	Mean	SD	Median	Mean rank	Z	P value
MAAS	Pre	28.00	61.00	46.53	8.62	47.50	0.00	4.783	0.000**
	MTNC	35.00	90.00	62.17	15.53	60.00	13.00	4.544	0.000**
	Post	60.00	96.00	79.33	9.78	80.00	15.50	4.783	0.000**
FFMQ	Pre	34.00	99.00	66.63	19.10	66.00	0.00	4.783	0.000**
	MTNC	50.00	178.00	104.83	32.77	99.00	15.50	4.544	0.000**
	Post	93.00	188.00	139.30	17.23	136.50	14.00	4.785	0.000**
DSI	Pre	-4.50	2.79	0.02	1.68	0.25	0.00	4.783	0.000**
	MTNC	0.16	13.00	4.25	2.60	4.00	15.97	4.742	0.000**
	Post	0.27	14.00	5.61	2.67	5.20	13.60	4.188	0.000**
GRADE	Pre	1	3	1.97	0.72	2.00	15.00	-	-
	MTNC	0	8	3.00	2.85	3.00	19.20	1.536	0.124
	Post	0	2	0.53	0.68	0.00	4.50	-	-

*Indicates significant at $p<0.05$** Indicates significant at $p<0.01$.

Table 3: Comparison between groups-(CLM+MBSR, CLM and MBSR) for variables: Kruskal-Wallis test (n=10).

Variables	Groups	Minimum	Maximum	Mean	SD	Median	Mean rank	χ2	P value
FFMQ_PRE	CLM+MBSR	55.00	99.00	79.10	±17.25	79.50	21.35	7.156	0.028*
	CLM	34.00	99.00	63.70	±18.77	58.00	13.95		
	MBSR	38.00	87.00	57.10	±15.57	52.50	11.20		
FFMQ_POST	CLM+MBSR	130.00	180.00	147.40	±15.16	147.50	20.65	5.299	0.071
	CLM	93.00	155.00	130.90	±16.11	133.00	12.20		
	MBSR	128.00	188.00	139.60	±17.78	136.50	13.65		
FFMQ_MTNC	CLM+MBSR	120.00	178.00	144.50	16.40	143.00	25.50	19.946	0.000**
	CLM	50.00	115.00	88.60	19.43	97.00	11.95		
	MBSR	55.00	100.00	81.40	12.74	80.00	9.05		
MAAS_PRE	CLM+MBSR	38.00	57.00	48.30	5.79	49.50	16.65	0.531	0.767
	CLM	33.00	56.00	46.90	8.18	46.00	15.95		
	MBSR	28.00	61.00	44.40	11.41	45.50	13.90		
MAAS_POST	CLM+MBSR	70.00	91.00	81.40	7.83	82.00	17.45	7.038	0.030*
	CLM	60.00	85.00	72.60	7.99	72.00	9.60		
	MBSR	68.00	96.00	84.00	10.18	87.50	19.45		
MAAS_MTNC	CLM+MBSR	68.00	90.00	80.50	8.06	80.00	25.50	19.567	0.000**
	CLM	40.00	60.00	54.10	6.19	55.50	11.00		
	MBSR	40.00	60.00	54.10	6.19	55.50	10.00		
GRADE_PRE	CLM+MBSR	1	3	2.00	0.47	2.00	15.95	0.147	0.929
	CLM	1	3	2.00	0.47	2.00	15.85		
	MBSR	1	3	2.00	0.47	2.00	14.70		
GRADE_POST	CLM+MBSR	0	1	0.20	0.42	0.00	11.70	6.554	0.038**
	CLM	0	1	0.20	0.42	0.00	14.40		
	MBSR	0	1	0.20	0.42	0.00	20.40		
GRADE_MTNC	CLM+MBSR	0.00	5.00	1.40	1.90	0.50	10.85	15.663	0.000**
	CLM	0.00	5.00	1.40	1.90	0.50	11.35		
	MBSR	0.00	5.00	1.40	1.90	0.50	24.30		
DSI_PRE	CLM+MBSR	-4.50	1.53	0.12	1.70	0.27	17.40	1.013	0.603
	CLM	-4.50	1.53	0.12	1.70	0.27	13.45		
	MBSR	-4.50	1.53	0.12	1.70	0.27	15.65		
DSI_POST	CLM+MBSR	5.00	14.00	7.82	3.06	7.00	22.65	10.154	0.006**
	CLM	5.00	14.00	7.82	3.06	7.00	11.30		
	MBSR	5.00	14.00	7.82	3.06	7.00	12.55		
DSI_MTNC	CLM+MBSR	5.00	13.00	6.77	2.91	5.10	25.25	19.134	0.000**
	CLM	5.00	13.00	6.77	2.91	5.10	9.25		
	MBSR	5.00	13.00	6.77	2.91	5.10	12.00		

*Indicates significant at p<0.05** Indicates significant at p<0.01.

Table 4: Pairwise comparison of groups (CLM+MBSR, CLM, CLM+MBSR, MBSR and CLM, MBSR) test.

Variables	Z	P value	Z	P value	Z	P value
FFMQ_PRE	1.9013	0.057	2.536	0.011*	0.722	0.470
FFMQ_POST	2.1254	0.034*	1.782	0.075	0.380	0.704
FFMQ_MTNC	3.7868	0.000**	3.785	0.000**	1.100	0.271
MAAS_PRE	0.2288	0.819	0.644	0.520	0.570	0.569
MAAS_POST	2.1360	0.033*	-0.644	0.520	2.350	0.019*
MAAS_MTNC	3.7954	0.000**	3.794	0.000**	0.382	0.702
GRADE_PRE	0.0000	1.000	0.377	0.706	0.281	0.779
GRADE_POST	0.9512	0.342	2.359	0.018*	1.728	0.084
GRADE_MTNC	0.1620	0.871	3.408	0.001**	3.327	0.001**
DSI_PRE	0.9460	0.344	0.493	0.622	0.605	0.545
DSI_POST	2.8596	0.004**	2.587	0.010*	0.345	0.730
DSI_MTNC	3.8215	0.000**	3.642	0.000**	0.953	0.340

*Indicates significant at p<0.05** Indicates significant at p<0.01.

Table 5: Overall effect size (Cohen's d).

Groups	Overall effect size (Cohen's d)
CLM+MBSR	2.58
CLM	1.44
MBSR	2.28

DISCUSSION

The present study investigated the effectiveness of CLM, MBSR, and their combined application (CLM+MBSR) in individuals with Primary MTD. The rationale for integrating these interventions was based on the understanding that MTD is a multifactorial disorder involving both physiological abnormalities, such as excessive laryngeal muscle tension, and psychological factors including stress, anxiety, and maladaptive attentional patterns.[23] The study hypothesized that combining a body-oriented therapy with a mind-based intervention would produce superior therapeutic outcomes by addressing both components of the disorder simultaneously.

The findings support the concept of voice as a psychophysiological phenomenon in which vocal function is influenced by the dynamic interaction between bodily mechanisms and cognitive-emotional processes. Participants receiving CLM demonstrated significant improvements in mindfulness (MAAS and FFMQ), objective voice quality (DSI), and perceptual voice quality (GRADE). These improvements can be explained by the reduction of excessive laryngeal muscle tension, enhanced proprioceptive and interoceptive awareness, improved respiratory-phonatory coordination, and restoration of more efficient vocal fold vibration.[24-27] However, although gains remained above baseline during follow-up, slight reductions suggested that CLM alone may not adequately address the psychological mechanisms responsible for long-term maintenance of MTD symptoms.[25,28]

The observed increase in mindfulness following CLM may also be attributed to neurophysiological mechanisms associated with massage therapy. Previous studies have shown that manual therapy increases vagal activity, decreases sympathetic arousal, lowers cortisol levels, and promotes the release of serotonin, dopamine, endorphins, and gamma-aminobutyric acid (GABA), thereby facilitating relaxation, emotional regulation, and present-moment awareness.[29-31] Enhanced body awareness and interoception further contribute to improved mindfulness and vocal self-monitoring.[32,33]

Participants receiving MBSR demonstrated significant improvements in mindfulness, DSI, and GRADE scores across the assessment periods. These findings support previous evidence that mindfulness enhances attentional control, emotional regulation, and awareness of bodily sensations while reducing psychological stress and maladaptive muscular tension.[17,18,34,35] Through improved recognition of automatic tension patterns, participants were better able to regulate laryngeal muscle activity and adopt healthier vocal behaviors. Physiologically, mindfulness promotes parasympathetic activation, reduces cortisol secretion, improves respiratory efficiency, and optimizes phonatory control, contributing to enhanced voice quality.[36-38] Although previous studies have demonstrated improvements in mindfulness, stress, and Voice Handicap Index following mindfulness interventions, few investigations have evaluated objective acoustic outcomes such as DSI or perceptual measures such as GRADE in individuals with MTD.[39] The present findings therefore help address an important gap in the literature.

The combined CLM+MBSR intervention produced the most substantial improvements across all outcome measures, including MAAS, FFMQ, DSI, and GRADE. This superior outcome can be explained by the complementary mechanisms of the two interventions. CLM directly reduces excessive laryngeal muscle tension, restores optimal laryngeal positioning, and improves vocal biomechanics, whereas MBSR addresses stress, emotional dysregulation, maladaptive attention, and habitual tension through enhanced body awareness and mindfulness practice.[17,27,40-42] Together, these interventions simultaneously target both peripheral muscular dysfunction and central psychophysiological mechanisms, resulting in greater improvements and better maintenance of treatment gains than either intervention alone.

Comparison among the three intervention groups further demonstrated that although CLM and MBSR independently improved vocal and psychological outcomes, the combined intervention yielded the most consistent and durable improvements during follow-up. CLM primarily produced immediate biomechanical benefits by reducing muscular hyperfunction and improving phonatory efficiency, while MBSR reinforced these gains through improved self-awareness, emotional regulation, and long-term modification of habitual tension patterns.[43-45]

These findings support a multidimensional rehabilitation model in which physiological and psychological interventions complement one another.

Effect size analysis further confirmed the superiority of the combined intervention. The CLM+MBSR group demonstrated the largest overall therapeutic effect, followed by the MBSR group and the CLM group. These findings indicate that while CLM effectively reduces laryngeal muscle tension and improves vocal biomechanics, and MBSR effectively enhances mindfulness and stress regulation, their integration produces synergistic benefits by simultaneously addressing the muscular, behavioral, and psychological dimensions of MTD.[46,47]

Overall, the present study provides strong evidence supporting a holistic body-mind approach for the management of MTD. Integrating CLM with MBSR resulted in greater improvements in mindfulness, vocal quality, and phonatory function than either intervention alone. These findings reinforce contemporary recommendations advocating multidisciplinary treatment models for MTD and suggest that combining physiological voice therapy with mindfulness-based interventions can produce broader, more sustained, and clinically meaningful rehabilitation outcomes. Future randomized controlled studies with larger sample sizes and longer follow-up periods are recommended to confirm these findings and establish standardized multimodal treatment protocols.

Implications of the study

The findings support the biopsychosocial model of MTD, demonstrating that both physiological muscle tension and psychological factors contribute to the disorder. The superior outcomes of the combined CLM and MBSR intervention indicate that integrating body-oriented and mind-based therapies provides more comprehensive and sustainable rehabilitation than either approach alone. The study emphasizes the need for speech-language pathologists to incorporate mindfulness and stress-management techniques into routine voice therapy. Furthermore, enhancing mindfulness, interoceptive awareness, emotional regulation, and self-regulation may improve long-term vocal health, reduce symptom recurrence, and enhance overall quality of life for individuals with MTD.

Limitations

The study has several limitations. The relatively short intervention period and one-month follow-up limited the assessment of the long-term effectiveness of the interventions, particularly the sustained benefits of MBSR. Individual differences in participants' stress levels, lifestyle, and coping strategies were not controlled and may have influenced treatment outcomes. Additionally, psychological outcomes were measured solely using self-report questionnaires, which are subject to response bias and social desirability, potentially affecting the accuracy of participants' reported mindfulness and emotional well-being.

Future directions for research

Future research should employ larger randomized controlled trials (RCTs) to validate the effectiveness of CLM, MBSR, pharmacological management, and their combined use across diverse populations and clinical settings. Studies should investigate the integration of mindfulness with established voice therapy approaches such as resonant voice therapy (RVT), vocal function exercises (VFE), semi-occluded vocal tract exercises (SOVT), accent method, biofeedback therapy, breathing and relaxation techniques, and cognitive behavioural therapy for various voice disorders.

Long-term follow-up studies are needed to evaluate the durability of treatment outcomes and the role of continued mindfulness practice. Future research should also examine individual factors influencing treatment response and develop standardized clinical guidelines and training protocols to facilitate the routine integration of mindfulness into voice therapy and multidisciplinary management of voice disorders.

CONCLUSION

The present study demonstrated that MTD is a multifactorial disorder influenced by both physiological and psychological factors. CLM effectively reduced laryngeal muscle tension, resulting in improved voice quality, DSI, and perceptual GRBASI ratings, although its impact on mindfulness was limited. MBSR significantly enhanced mindfulness, emotional regulation, and self-awareness while also improving vocal outcomes by reducing stress-related muscle tension. The combined CLM+MBSR intervention produced the greatest improvements across all outcome measures, highlighting the synergistic benefits of integrating body-oriented and mind-based therapies. These findings support a biopsychosocial approach to MTD management, emphasizing that addressing both physical tension and psychological stress leads to more comprehensive and sustained recovery. Although further studies with larger samples and longer follow-up are needed, the results provide strong evidence that combining CLM with MBSR offers a promising and holistic treatment strategy for individuals with MTD.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Boone DR, McFarlane SC, Von Berg SL, Zraick RI. The Voice and Voice Therapy (9th ed.). Pearson. 2014.
2. Stemple JC, Roy N, Klaben BG. Clinical Voice Pathology: Theory and Management (5th ed.). Plural Publishing. 2014.

3. Verdolini K, Rosen CA, Branski RC. Classification Manual for Voice Disorders-I. Lawrence Erlbaum Associates. 2008.
4. Roy N, Merrill RM, Gray SD, Smith EM. Voice disorders in the general population: Prevalence, risk factors, and occupational impact. Laryngoscope. 2005;115(11):1988-95.
5. Baker J, Ben-Tovim DI, Butcher A, Esterman A, McLaughlin K. Development of a modified diagnostic classification system for functional voice disorders with psychological and muscular tension components. J Voice. 2007;21(1):129-46.
6. Roy N, Bless DM. Personality traits and psychological factors in functional voice disorders. J Voice. 1990;4(2):151-60.
7. Morrison MD, Rammage LA. Muscle misuse voice disorders: Description and classification. Acta Oto-Laryngologica, Supplement. 1989;458:428-34.
8. Van Lawrence V, Koufman JA. The otolaryngologic manifestations of stress and anxiety. Otolaryngologic Clinics of North America. 1999;32(5):815-23.
9. Taylor SE. Health Psychology (8th ed.). McGraw-Hill. 2010.
10. Misono S, Meredith L, Peterson CB, Frazier PA. New perspective on stress and quality of life in patients with voice disorders. J Voice. 2014;28(5):631-7.
11. Ali A, et al. Psychological factors and quality of life in Muscle Tension Dysphonia. J Voice. 2022;
12. Angsuwarangsee T, Morrison M. Extrinsic laryngeal muscular tension in patients with voice disorders. J Voice. 2000;14(3):333-43.
13. Mathieson L, et al. Reliability of palpation in assessing laryngeal tension. J Voice. 2002.
14. Roy N, Bless DM, Heisey D. Manual circumlaryngeal therapy for functional dysphonia: An evaluation of short- and long-term treatment outcomes. J Voice. 1996;11(3):321-31.
15. Mathieson L, Hirani SP, Epstein R, Baken R, Wood G, Rubin JS. Laryngeal manual therapy: A preliminary study. J Voice. 2007;23(3):353-66.
16. Nguyen-Feng VN, Frazier PA, Liu Y, Feddema E, Wils B, Nikcevich E, et al. Online Intervention for Muscle Tension Dysphonia: A Pilot Randomized Clinical Trial. JAMA Otolaryngol Head Neck Surg. 2025;151(4):351-9.
17. Kabat-Zinn J. Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness (Revised ed.). Bantam Books. 2013.
18. Brown KW, Ryan RM. The benefits of being present: Mindfulness and its role in psychological well-being. J Personality Social Psychol. 2003;84(4):822-48.
19. McEwen BS. Protective and damaging effects of stress mediators. N Eng J Med. 1998;338(3):171-9.
20. Brown S. Mindfulness interventions in voice disorders. J Voice. 2023.
21. Wang Y, et al. Mindfulness-based interventions for voice disorders: A systematic review. J Voice. 2023;
22. Zajac DJ, et al. Mindfulness and rehabilitation outcomes in functional voice disorders. J Voice. 2022;
23. Rammage L, Morrison M, Nichol H. Muscle misuse voice disorders. J Otolaryngol. 1987;
24. Roy N, Leeper HA. Effects of manual circumlaryngeal therapy in functional dysphonia. J Voice. 1993;7(3):242-9.
25. Roy N, Bless DM, Heisey D. Manual circumlaryngeal therapy and functional dysphonia: An evaluation of short- and long-term treatment outcomes. J Voice. 1997;11(3):321-31.
26. Van Lierde KM, De Bodt M, Dhaeseleer E, Wuyts F, Claeys S. The treatment of muscle tension dysphonia: a comparison of two treatment techniques by means of an objective multiparameter approach. J Voice. 2010;24(3):294-301.
27. Mathieson L, et al. Manual laryngeal therapy and voice outcomes. J Voice. 2009.
28. Behrman A. Facilitating behavioral change in voice therapy: The relevance of motivational interviewing. Am J Speech-Language Pathol. 2006;15(3):215-25.
29. Field T. Massage therapy research review. Compl Therap Clin Pract. 2014;20(4):224-9.
30. Porges SW. The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-Regulation. W. W. Norton. 2011.
31. Streeter CC, et al. Effects of yoga versus walking on mood, anxiety, and brain GABA levels. J Alternat Complementary Med. 2010;16(11):1145-52.
32. Mehling WE, Cynthia P, Jennifer JD, Mike A, Elizabeth B, Anita S. The Multidimensional Assessment of Interoceptive Awareness (MAIA). PLoS ONE. 2011;6(11):e48230.
33. Farb NAS, Segal ZV, Anderson AK. Mindfulness meditation training and interoceptive awareness. Curr Opinion Psychol. 2015;28:1-6.
34. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney, L. Using self-report assessment methods to explore facets of mindfulness. Assessment. 2006;13(1):27-45.
35. Creswell JD. Mindfulness interventions. Ann Rev Psychol. 2017;68:491-516.
36. Tang YY, Ma Y, Wang J. Short-term meditation improves attention and self-regulation. Proceedings National Academy Sci. 2009;104(43):17152-6.
37. Carlson LE, Speca M, Faris P, Patel KD. One-year follow-up of mindfulness-based stress reduction outcomes. Brain Behavior Immunity. 2007;21(8):1038-49.
38. Sapir S. Voice Disorders. Plural Publishing. 2006.
39. Brown CK, Vazquez J, Metz SM, McCown D. Effects of an eight-week mindfulness course in individuals with voice disorders. J Voice. 2026;40(2):518.e13-24.
40. Roy N, Bless DM. Manual circumlaryngeal therapy for functional dysphonia. J Voice. 11998;2(4):483-96.
41. Siegel DJ. The Mindful Brain. W. W. Norton. 2007.
42. Craig AD. How do you feel? Interoception: The

sense of the physiological condition of the body. Nature Rev Neurosci. 2002;3(8):655-66.
43. Brown S. Mindfulness-based rehabilitation in functional voice disorders. J Voice. 2024;
44. Dehqan A, Ballard KJ. Positive Effects of Manual Circumlaryngeal Therapy in the Treatment of Muscle Tension Dysphonia (MTD): Long Term Treatment Outcomes. J Voice. 2019;33(6):866-871.
45. Barsties V, Latoszek B, et al. Multidisciplinary management of muscle tension dysphonia. J Voice. 2024;
46. Van Houtte E, Van Lierde K, Claeys S. The pathophysiology and treatment of muscle tension dysphonia: A review. J Voice. 2011;25(2):202-7.
47. Roy N, Bless DM. Muscle tension dysphonia and its management. Curr Opinion Otolaryngol Head Neck Surg. 2000;8(3):160-4.

Cite this article as: Ekka N, Chatterjee I, Chatterjee S, Pani S. A study of body-mind relationship on voice by using mindfulness based stress reduction on muscle tension dysphonia subjects. Int J Otorhinolaryngol Head Neck Surg 2026;12:987-95.