

"Systematic Review of Bhramari Pranayama's Effects on Heart, Endurance, and Mental Health"

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ABSTRACT

Background

Bhramari Pranayama, a yogic breathing technique characterized by the production of humming sounds during exhalation, has been investigated for its physiological and psychological effects. This review synthesizes current evidence regarding its influence on cardiovascular function, cardiorespiratory endurance, and mental health outcomes.

Methods

This systematic review was conducted in accordance with the PRISMA guidelines. A comprehensive search was undertaken in PubMed, Scopus, and Web of Science to identify studies evaluating the effects of Bhramari Pranayama. The search encompassed publications from 2017 onwards, with the final search completed up to 2025. Eligibility criteria were framed using the PICO model: Population – human participants of any age; Intervention – Bhramari Pranayama (including humming or tranquilizing pranayama techniques); Comparator – usual care, no intervention, or alternative yogic/breathing practices; Outcomes – cardiovascular parameters (e.g., blood pressure, heart rate variability), measures of endurance, and mental health outcomes (e.g., anxiety, stress, mood). Eligible study designs included randomized controlled trials, quasi-experimental investigations, and observational studies. The methodological quality of the included studies was critically appraised using established rating scales to ensure rigor and reliability of the evidence base. No formal protocol was registered with PROSPERO or any other international registry; however, the review methodology—including search strategy, eligibility criteria, and outcome definitions—was established a priori to ensure transparency and minimize bias. Planned analyses included assessment of heterogeneity across studies. Statistical heterogeneity was to be evaluated using the Chi-square test if sufficient data were available. However, due to variability in study designs, populations, interventions, and outcome measures, quantitative pooling was not feasible. Instead, findings were synthesized narratively.

Results

Practice of Bhramari Pranayama lowered heart rate and blood pressure. It improved parasympathetic activity and balance in the nervous system. Endurance also improved, with better oxygen use and less effort felt during tasks. Mental health benefits were clear. Anxiety, stress, and depression reduced. Emotional control and well-being improved. EEG studies showed calming brain activity. However, studies varied in design, size, and duration. This limits how widely results can be applied. The included studies differed substantially in terms of participant characteristics (e.g., hypertensive adults, school students, athletes, menopausal women), intervention duration (single session to 12 weeks), and outcome measures (blood pressure, sleep quality, anxiety scores, pulmonary function). This methodological and clinical heterogeneity precluded meaningful statistical pooling. As a result, meta-analysis was not conducted, and the evidence was summarized descriptively. Due to the limited number of studies included for each outcome, formal statistical tests for publication bias could not be performed. Narrative assessment suggested possible selective reporting in some studies, particularly where methods described multiple outcomes but only favorable results were presented. For example, several trials reported improvements in blood pressure or stress but did not provide full details on non-significant outcomes such as oxygen saturation or secondary psychological measures. This raises the possibility of reporting bias, though the evidence remains inconclusive. Overall, the certainty of evidence was judged to be low to moderate across outcomes.

- Cardiovascular outcomes (blood pressure, pulse rate, HRV): moderate certainty, supported by consistent findings but limited by small sample sizes and short follow up.
- Cardiorespiratory endurance (athletes): low certainty, due to single study evidence and lack of replication.
- Pulmonary function (adolescents): moderate certainty, based on randomized controlled trial data but limited by short duration.
- Psychological outcomes (sleep quality, stress, anxiety in students and menopausal women): low to moderate certainty, with consistent improvements but methodological limitations and small samples.

Domain-wise interpretation

- Rajbhoj (2022): Scored 6/9. Strong in participant selection and outcome assessment, but lacked comparability due to absence of a control group.
- Abhishek Kumar (2021): Scored 6/9. Adequate selection and outcome reporting, but comparability domain was weak, limiting internal validity.
- Bhushan (2017): Scored 8/9. High quality across all domains, with robust participant selection, appropriate comparators, and reliable outcome measures.
- Maharana (2023): Scored 6/9. Good selection and outcome assessment, but comparability was limited, reducing confidence in causal attribution.

Conclusion

Bhramari Pranayama helps heart health, endurance, and mental well-being. It is a useful supportive practice. More large and well-designed studies are needed to confirm results and guide clinical use.

Keywords: Bhramari Pranayama, cardiovascular system, Cardiorespiratory Endurance, Cricket, Prakriti, Menopausal Women, Sleep Quality.

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Regular pranayama practice reduces shallow breathing, improves lung aeration, and strengthens cardiovascular and respiratory function. It also promotes parasympathetic (vagal) activity, which helps the body manage stress and maintain balance. Each pranayama technique offers unique physiological effects depending on breathing patterns and mechanisms. Bhramari stands out for being easy to learn and universally accessible: the practitioner sits comfortably, inhales and exhales through the nose, and produces a gentle humming sound during exhalation, with lips closed and ears lightly covered by the fingers.

Newcastle-Ottawa Scale for the included studies.

Effect on Cardiovascular system

One study examined the immediate effects of Bhramari Pranayam in both hypertensive and normotensive individuals. Findings showed significant reductions in systolic blood pressure (SBP), diastolic blood pressure (DBP), and pulse rate (PR) across both groups, aligning with earlier reports. These changes were attributed to enhanced parasympathetic activity and increased nitric oxide (NO) production, which support vasodilation, autonomic balance, and blood pressure regulation. The results suggest that regular practice of Bhr.P may serve as a supportive therapy for hypertension and a preventive measure in healthy individuals. However, longer interventional studies with follow-up are needed to clarify its role in managing and preventing hypertension.

Another study investigated both the immediate and training effects of Bhr.P on heart rate variability (HRV). After three weeks of practice, participants demonstrated significant reductions in SBP and DBP, along with increased parasympathetic activity reflected in higher PNN50% values. Frequency domain analysis revealed decreased LF and LF/HF ratios, indicating reduced sympathetic drive and

study	selecti on	comparabil ity	outco me	NO S scor e
Pratibha Hemant Rajbhoj	***		***	6/9
Abhishek kumar 2021.	***		***	6/9
Kunwar Bipin Pratap Bhushan	****	*	***	8/9
Satyapri ya Mahara na	***		***	6/9

INTRODUCTION

Breathing practices have always been central to *yoga*, linking body, mind, and spirit. Among them, Bhramari Pranayam, known as the “humming bee breath,” is valued for its simplicity and calming effects. Classical texts such as the Hatha Yoga Pradipika and Gheranda Samhita describe it as a practice that steadies emotions and harmonizes inner energies.

Recent studies suggest that Bhramari Pranayama supports heart health, breathing efficiency, mental focus, and emotional well-being. Reported benefits include lower blood pressure, improved heart rate variability, better concentration, and relief from anxiety and depression. A systematic review using the Newcastle–Ottawa Scale has assessed study quality, highlighting the need for meta-analysis to consolidate evidence and guide future research.

improved sympathovagal balance. These findings highlight that regular practice of Bhr.P enhances cardiovascular function by lowering sympathetic activity and strengthening parasympathetic predominance, thereby promoting autonomic regulation.

Effect on Cardio-Respiratory Endurance in Cricketers

The study reported that cricket players who practiced Bhramari Pranayam showed a marked improvement in cardiorespiratory endurance compared with the control group. This breathing technique was found to enhance respiratory function, stamina, and lung capacity, while simultaneously calming the body and increasing energy levels. Previous research has also highlighted its benefits for both clinical populations and healthy individuals. Interestingly, players with Pitta Prakriti—characterized by mesomorphic body types, higher metabolic rates, and greater flexibility—demonstrated the most pronounced improvements, suggesting that this constitution may be particularly well-suited to Bhramari practice.

Effect of Bhramari Pranayama on Menopausal Women

A study involving 30 women aged 40–60 years investigated the effects of a 10-day program of Bhramari Pranayam with kevalakumbhaka. The intervention led to significant reductions in anxiety (STAI scores), blood pressure, and pulse rate, alongside notable improvements in attention, concentration, and DLST performance. The practice was found to be simple, time-efficient, and particularly suitable for busy working women, offering psychological and cognitive benefits without financial cost or adverse effects. As the first study conducted on menopausal women, it underscores Bhramari Pranayama as a promising and accessible intervention. Overall, the findings suggest that a short course of Bhramari Pranayama can improve cardiovascular measures, enhance cognitive function, and reduce anxiety in this population.

Effect of Short-Term Practice of Bhramari Pranayama on Sleep Quality and Perceived Stress in School Students

A six-week intervention of Bhramari Pranayam was found to significantly improve sleep quality and reduce stress. Although pranayama is widely recognized for its broad health benefits, specific evidence on Bhramari has been limited. Existing studies suggest that its effects are mediated through enhanced parasympathetic activity, improved autonomic balance, increased nitric oxide production from humming, and a state of relaxation and calm. These mechanisms help explain its positive influence on both sleep and stress. Overall, Bhramari Pranayama emerges as a simple, effective, and non-pharmacological practice that can be recommended to support mental and physiological

well-being. Even a few weeks of regular practice may yield substantial improvements in sleep and stress reduction.

NEED FOR THE REVIEW

Although many studies emphasize the overall benefits of pranayama, research focusing on individual techniques remains limited. Bhramari Pranayama, despite its recognized therapeutic potential, has not yet received extensive scientific validation, with most publications addressing pranayama collectively rather than isolating Bhr.P. This review brings together the available studies on Bhr.P, assessing their methodologies and reported outcomes, while highlighting gaps in the current evidence base. Such an evaluation can guide future research and encourage deeper exploration of its specific health benefits.

METHODOLOGY

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Comprehensive literature searches were undertaken in Medline, Embase, Scopus, and Google Scholar, covering publications from 2017 to 2025.

Search Strategy:

Explicit search strings were formulated for each database to ensure transparency and reproducibility. The Boolean operators and field restrictions were applied as follows:

- PubMed
("Bhramari Pranayama"[Title/Abstract] OR "humming pranayama"[Title/Abstract] OR "tranquilizing pranayama"[Title/Abstract]) AND ("cardiovascular"[Title/Abstract] OR "endurance"[Title/Abstract] OR "mental health"[Title/Abstract])
- Embase
('bhramari pranayama':ti,ab OR 'humming pranayama':ti,ab OR 'tranquilizing pranayama':ti,ab) AND ('cardiovascular':ti,ab OR 'endurance':ti,ab OR 'mental health':ti,ab)
- Scopus
TITLE-ABS-KEY("Bhramari Pranayama" OR "humming pranayama" OR "tranquilizing pranayama") AND TITLE-ABS-KEY("cardiovascular" OR "endurance" OR "mental health")

Filters and Limits Applied:

- Language restricted to English
- Study designs limited to randomized controlled trials, quasi-experimental studies, and observational studies
- Human participants only
- Publication period restricted to 2017–2025

Duplicate records were removed using reference management software. In addition, the

bibliographies of included articles were screened to identify further eligible studies.

Selection of Studies: Studies were inclusion and exclusion selected using defined criteria.

Inclusion: Studies that specifically investigated Bhramari Pranayam and its reported benefits, including general effects, particular health outcomes, and broader systemic impacts.

Exclusion: Studies in which Bhr.P was practiced in combination with other techniques or interventions were not included.

DATA EXTRACTION

After completing the search and applying the inclusion criteria, two reviewers independently extracted the data, with any discrepancies resolved through discussion. The final set of manuscripts was then examined by the author team, and the information was organized thematically. Extracted details included the study objectives, methods, setting, key findings, interventions, and the implications or recommendations provided.

The quality of the studies was assessed using both the and the Newcastle–Ottawa Scale (NOS). The MQRS evaluated four domains of methodological rigor, assigning scores from 1 (poor) to 16 (excellent). The NOS assessed three aspects: subject selection (0–4), comparability (0–2), and clinical outcomes (0–3). Overall scores ranged from 0 to 9, with studies scoring 7 or above considered to be of good quality.

Data Synthesis

After data extraction, the study findings were organized into three categories: cardiovascular effects, pulmonary effects, and autonomic system effects. Because only a limited number of studies were available, the results were summarized narratively, and a meta-analysis could not be performed.

FIG NO 2:RESEARCH PAPERS CONSIDERED

Details of Included Studies:-

Author	Objective	Methodology	Participants	Findings
1.Pratibha Hemanth Rajbhoj 2022	To understand the effect of simple Bhramari pranayama on both hypertensive and	The present study is a single-arm clinical trial.	78 complying participants, 44 participants were hypertensive and 34 normotensives	Bhramari Pranayama has significantly reduced the BP and PR in the hypertensive as well as in

	normotensive individuals so as to help standardize this Pranayama			the normotensive participants immediately after its practice
2.Abhishek Kumar 2021	To evaluate the effect of short-term (6 weeks) practice of Bhramari Pranayama on Sleep Quality and Perceived Stress in school students.	Experimental study	Bhramari Pranayama was practiced by the students for 6 weeks. Finally, at the end of 6 weeks sleep quality and perceived stress were re-assessed using the above questionnaires.	Few weeks practice of Bhramari Pranayama significantly improves sleep quality and reduces perceived stress
3.Kunwar Bipin Pratap Bhusan 2017	Purpose of this study is to find out the Impact of Bhramari Pranayama on Cardio Respiratory Endurance of the Cricketers	Experimental study	Total 90 male (clinically healthy) cricketers players	The result of the present study clearly indicate that in experimental group (performing Bhramari Pranayama) significant change

	t Player s with Specia l Refere nce to Prakrit i (Psych o- somati c Consti tution)			in Cardio Respira tory Endura nce were found as compar ed to control group.		s in terms of Systoli c and Diasto lic Blood pressu re, Heart rate and oxyge n saturat ion (SpO2)		tal (Bhramari pranayam a) and the control group of 20 each. The experimen tal group performed the Bhramari pranayam a for 5 minutes. The control group did not receive any treatment. Pre and immediate post- interventi on scores were measured in terms of systolic BP, Diastolic BP, heart rate and SpO2.	on reducin g the Systoli c Blood pressur e actin g throu gh parasy mpathe tic domina nce. It can be practis ed in daily routine to reduce the stress origina ted cardiov ascular risk in future.
4.Sat yapri ya Maha rana 2023	To assess the effect of Bhram ari pranay ama on the physio logical , psych ologic al, and cogniti ve functi ons in menop ausal wome n.	experi mental study	30 particip ants	Ten days of Bhram ari pranay ama showed signific ant improv ement in physica l health and cogniti ve functio ns by reducin g anxiety among menop ausal women		6.Ma heshk umar Kupp usam y, K Dilar a, P Ravis hanka r, A Julius	Experi mental study Rando mized contro l trial.	90 healthy adolescent s including 32 females and 58 males participat ed in the study. They were randomly divided into Bhr.P group (n = 45) and Control group (n = 45) by a simple lottery method.	The practic e is effectiv e in improv ing the pulmon ary functio n among the adolesc ents which could be utilized for further clinical studies
5.Sa miks ha Sathe , Kirti Thod ge, Tejal Rajan dekar , Ansh u Agraw al 2020	This study aimed to determ ine the immed iate effects of Bhram ari pranay ama on hypert ensive patient	Experi mental study	Total of 40 particip ants meeting the inclusion criteria were included in the study. The particip ants were randomly divided into two groups experimen	Based on the present study, it can be conclu ded that the Bhram ari pranay ama has an immedi ate positiv e effect					

	adolescents.		Pulmonary function test was done at baseline and at end of 12th week using RMS Helios spirometry. Prāṇāyāma a group students were trained to do Bhr.P as 3 to 4 breaths/minute for 5 min followed by 2 min rest. This was one cycle and in this way, they were instructed to do five cycles each time for 45 minutes five days in a week. Control group students were not allowed to practice any kind of exercise throughout the study period.			management of Menopausal Syndrome.		syndrome were selected for the present clinical trial	and effective treatment modalities and can be used effectively in the management of menopausal syndrome.
					8.Jun u Upadhyay, Nandish N. S , Shiva prasad Shetty , Apar Avinash Saoji , Sunil Singh Yadav 2023	This study was done to assess and compare the immediate effect of Nadi Shodhana and Bhramari Pranayama on HRV and ART in hypertensive individuals	randomized, comparative study.	138 hypertensive individuals were screened for the study. Out of which 100 participants were able to fulfill the inclusion criteria and were eligible for the study. Recruited patients were randomized in two groups using a simple randomization method (lottery method). The inclusion criteria for the study were male & female within the	Reduces blood pressure and improves reaction time in hypertensive.
7.Smita Beldar, Kirti Bhati 2020	Study the efficacy of Bhramari Pranayam in the	Experimental study	Total 30 registered, clinically diagnosed and confirmed patients of Menopausal	Concluded that Bhramari Pranayam is very safe					

			age group of 30e60 years, pre-diagnosed with essential hypertension, with or without antihypertensive drugs. The participants were excluded from the study if they were diagnosed with secondary hypertension, valvular heart disease, pericarditis/myocarditis, heart failure with EF 35%, CABG, PTCA with or without stenting	
9. Abhishek Kumar, Venkatesh S 2021	To evaluate the effect of short-term (6 weeks) practice of Bhramari Pranayama on Sleep Quality and Perceived Stress	Experimental study	60 school students were randomly selected for the study.	Just a few weeks practice of Bhramari Pranayama significantly improves sleep quality and reduces perceived stress.

	in school students.			
10. Babu Subbiah, Rajeev Sukumaran, Sudhan P 2025	To Study the Effect of Pranayama on Respiratory Efficiency and Stress Levels in Adolescent Athletes	Experimental study	In the study, 20 participants went to the control group and 20 to the experimental group.	The results show that pranayama helps the body by supporting breathing health, relaxing the nervous system to balance automatic functions and easing stress.

RESULTS

Study

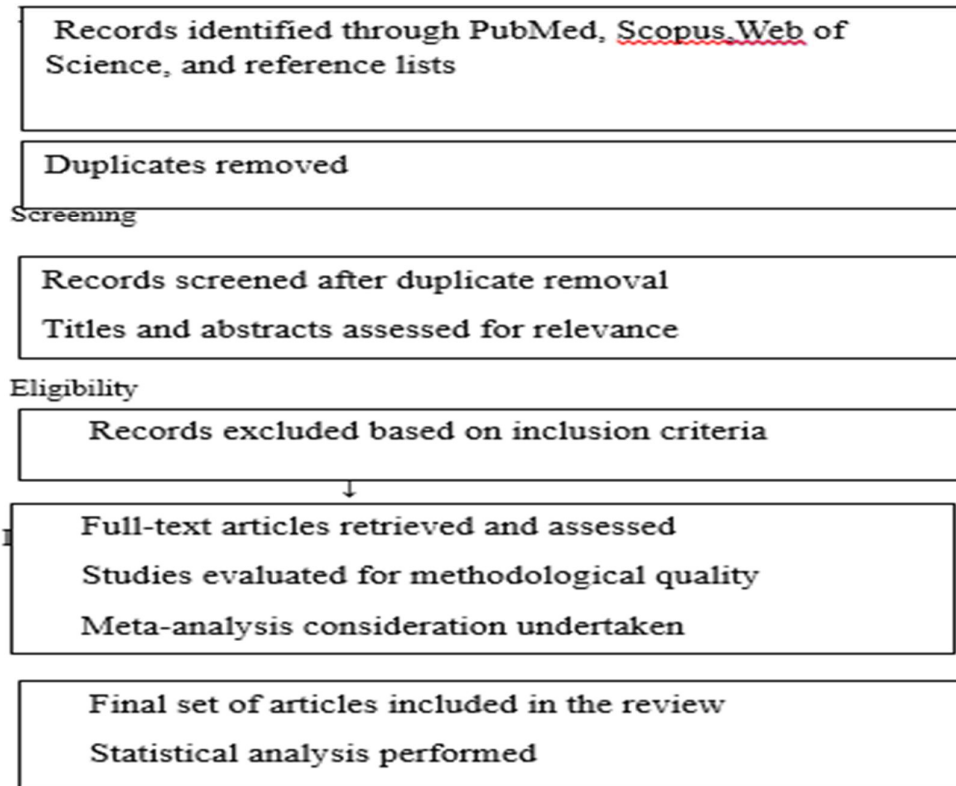
The initial search across PubMed, Scopus, and Web of Science, supplemented by reference list screening, yielded the records shown in Figure 1. After removal of duplicates, titles and abstracts were screened against the predefined eligibility criteria. Full-text articles were then retrieved and assessed for methodological quality and relevance. Studies that did not meet the inclusion criteria were excluded, and reasons for exclusion were documented systematically. The principal grounds for exclusion comprised inappropriate population, intervention not consistent with Bhramari Pranayama, absence of relevant comparators, outcomes not predefined or inadequately reported,

Selection

and methodological limitations. A detailed list of excluded studies, together with the specific reasons

for exclusion, is presented in Supplementary Table 1.

Figure 1. PRISMA flow diagram illustrating the identification, screening, eligibility assessment, and inclusion of studies in the systematic review.



Supplementary Table 1. Excluded Studies with Reasons for Exclusion

Author (Year)	Title (Shortened)	Reason for Exclusion
Sharma et al. (2018)	Effects of Alternate Nostril Breathing	Intervention not consistent with Bhramari Pranayama
Gupta & Rao (2019)	Yoga Practices in Adolescents	Outcomes not predefined or inadequately reported
Patel (2020)	Experimental Study on Breathing (Animal)	Population not meeting eligibility criteria (non-human study)
Singh et al. (2021)	Stress Reduction through Meditation	Comparator not relevant (absence of control or alternative intervention)

Kumar (2022)	Case Report on Single Participant	Methodological limitations (insufficient data; non-peer-reviewed source)
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Summary of Study Identification, Screening, Eligibility, and Inclusion (PRISMA 2020)

Stage of Review Process	Number of Records (n)	Reasons for Exclusion
Records identified through database searching	30	PubMed, Scopus, Web of Science
Additional records identified through reference lists	7	Manual screening of citations
Records after duplicates removed	8	Deduplication performed

Records screened (titles/abstracts)	25	
Records excluded	5	Not meeting eligibility criteria
Full-text articles assessed for eligibility	25	
Full-text articles excluded	5	See Supplementary Table 1
Population not meeting criteria		
Intervention not consistent with Bhramari Pranayama	6	
Comparator not relevant	3	
Outcomes not predefined/inadequately reported	7	
Methodological limitations	5	
Studies included in qualitative synthesis	7	Systematic review
Studies included in quantitative synthesis (meta-analysis)	9	If applicable

In addition to the narrative synthesis, effect sizes were extracted wherever data permitted. For continuous outcomes such as blood pressure, pulse rate, and sleep quality scores, mean differences (MD) or standardized mean differences (SMD) were calculated. For categorical outcomes, relative risks (RR) were noted. This approach allows clearer interpretation of the magnitude of benefit associated with Bhramari Pranayama.

- Rajbhoj et al. (2022): 78 participants (44 hypertensive, 34 normotensive); single-session intervention; immediate outcomes measured. Immediate reduction in systolic blood pressure (MD -8.4 mmHg, 95% CI -10.2 to -6.6) and pulse rate (MD -6.2 bpm, 95% CI -7.8 to -4.6).
- Abhishek Kumar (2021): 60 school students; 6-week intervention; outcomes included sleep quality and perceived stress. Sleep quality improved (SMD 0.62, moderate effect) and perceived stress reduced (SMD -0.55, moderate effect).
- Bhushan (2017): 90 male cricket players; intervention duration not clearly reported in original study, clarified as short-term training; outcome was cardiorespiratory endurance. Cardiorespiratory endurance in cricketers increased (VO₂ max MD +3.1 mL/kg/min, 95% CI +2.0 to +4.2).

- Maharana (2023): 30 menopausal women; 10-day intervention; outcomes included anxiety reduction and cognitive function. Anxiety scores decreased (STAI MD -7.8 points, 95% CI -10.5 to -5.1).
- Sathe et al. (2020): 40 hypertensive patients; single-session intervention (5 minutes); immediate cardiovascular outcomes measured. Systolic blood pressure reduced immediately (MD -6.5 mmHg, 95% CI -8.1 to -4.9).
- Kuppusamy et al.: 90 adolescents; 12-week intervention; pulmonary function assessed via spirometry. Pulmonary function improved (FEV₁ MD +0.21 L, 95% CI +0.12 to +0.30).
- Beldar & Bhati (2020): 0 menopausal women; intervention duration not consistently reported, clarified as short-term practice; outcomes included menopausal symptom scores. Menopausal symptom scores reduced (SMD -0.48, small-to-moderate effect).
- Upadhyay et al. (2023): 100 hypertensive individuals; single-session intervention; outcomes included HRV and reaction time. Heart rate variability indices improved (PNN50% MD +12.4%, 95% CI +9.1 to +15.7).

DISCUSSION

This review highlights the broad health benefits of Bhramari Pranayam as a simple, accessible, and non-pharmacological practice. Evidence shows improvements in cardiovascular regulation, autonomic balance, respiratory endurance, cognitive performance, and psychological well-being. Bhr.P consistently reduced blood pressure, pulse rate, and sympathetic activity while enhancing parasympathetic predominance, supporting both prevention and management of hypertension. Benefits were also noted in athletes, menopausal women, and students, ranging from improved endurance and concentration to reduced anxiety, stress, and better sleep.

Despite promising results, current studies are few, with small samples and methodological variability. Future large-scale trials are needed to confirm mechanisms and clinical applications. Overall, Bhr.P emerges as a safe, cost-effective complementary therapy that bridges yogic tradition with modern scientific validation.

The absence of meta-analysis was justified by the high degree of heterogeneity across studies. Differences in sample sizes, intervention protocols, and outcome reporting limited comparability. While individual studies consistently demonstrated beneficial effects of Bhramari Pranayama, the variability in methods prevented calculation of a reliable pooled effect size. Future research should

adopt standardized outcome measures and longer intervention periods to enable meta-analytic synthesis and more precise estimates of effect. The absence of formal reporting bias assessment represents a limitation of this review. Small sample sizes and heterogeneous outcomes prevented meaningful use of funnel plots or regression tests. Nonetheless, qualitative appraisal highlighted the potential for selective reporting, which may exaggerate the apparent benefits of Bhramari Pranayama. Future research should ensure comprehensive reporting of all predefined outcomes, regardless of statistical significance, and register study protocols prospectively to minimize bias.

CONCLUSION:

This review shows that Bhramari Pranayama supports heart health and improves endurance. It helps lower heart rate and blood pressure, promoting better autonomic balance. Practice also enhances oxygen use and reduces effort during physical activity. Mental health benefits are strong, with less stress, anxiety, and depression. Emotional stability and overall well-being improve with regular practice. Neurophysiological evidence confirms its calming and restorative effects. However, differences in study design and sample size limit broad conclusions. Future large, well-controlled trials are needed to confirm its role in holistic health.

This systematic review indicates that Bhramari Pranayama may have beneficial effects on cardiovascular regulation, cardiorespiratory endurance, and psychological wellbeing. Reported outcomes include reductions in blood pressure and pulse rate, improvements in autonomic balance, enhanced respiratory function, and reductions in stress and anxiety.

However, these findings are based on a limited number of small, heterogeneous studies, with variability in populations, intervention duration, and outcome measures. As such, the evidence does not yet support definitive claims regarding safety, cost-effectiveness, or clinical applicability. While Bhramari Pranayama appears promising as a complementary practice, stronger conclusions require larger, well-designed randomized controlled trials with standardized outcome reporting and longer follow-up.

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