

REVIEW ARTICLE

Therapeutic Effects of Pranayama on Human Health: An Umbrella Review of Systematic Reviews and Meta-analyses

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ABSTRACT

Background: Pranayama, or yogic breathing, has attracted growing clinical interest as a low-cost adjunct in cardiovascular, respiratory, and mental health care. Systematic reviews on its effects have accumulated rapidly but vary in how they define pranayama and isolate it from other yoga components, leaving the evidence fragmented. This umbrella review synthesizes the existing systematic reviews and meta-analyses to map pranayama's effects on human health.

Methods: Five databases were searched from inception to January 2026. Methodological quality was assessed with AMSTAR-2, certainty of evidence with GRADE, and primary-study overlap with the corrected covered area index.

Results: Sixteen systematic reviews covering over 130 primary studies and approximately 7,000 participants were included across six domains. AMSTAR-2 ratings showed two moderate, five low, and nine critically low reviews; none achieved high confidence. Cardiovascular meta-analyses reported reductions in systolic (mean difference [MD] -7.06 mmHg) and diastolic blood pressure (MD -3.43 mmHg), though pranayama was pooled with other yoga techniques. In pediatric asthma, yoga-inclusive interventions improved peak expiratory flow rate (MD 4.86%). Favorable effects were reported for depression and anxiety in adults and for perceived stress and anxiety in adolescents. No outcome reached moderate or higher GRADE certainty; most were very low. Adverse events were rarely monitored.

Conclusion: Pranayama demonstrates directionally consistent benefits across multiple domains, but evidence certainty remains very low, largely because pranayama cannot be isolated from multi-component interventions. High-quality pranayama-isolated trials with standardised techniques, active comparators, and adverse event reporting are urgently needed.

1. INTRODUCTION

Pranayama, an integral element of yoga, is among the oldest documented health practices in continuous use. The term is derived from two Sanskrit words: Prana, the vital life force that pervades all living entities, and ayama, meaning control or extension. As codified within the eight-limb framework of classical Indian yoga, its earliest detailed description appears in Patanjali's Yoga Sutras (c. 200 BCE), where pranayama is identified as the fourth limb (anga) and described

as the conscious lengthening and refinement of the inhalation (puraka), exhalation (recaka) and breath retention (kumbhaka).^[1] Mediaeval Hatha texts, principally the Hatha Yoga Pradipika and Gheranda Samhita, expanded this canonical foundation into a taxonomy of specific techniques, including Nadi Shodhana, Bhramari, Bhastrika, Kapalabhati, Shitali, Sitkari, Ujjayi, Surya Bhedana, and Chandra Bhedana. These practices continue to form the recognised vocabulary of contemporary pranayama practice.^[2]

Some of these techniques differ in their physiological intent. Nadi Shodhana, or alternate-nostril breathing, is held to harmonize activity between the cerebral hemispheres and to promote mental clarity and calmness; Kapalabhati is a stimulating practice that enhances

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lung capacity and arousal; Bhramari, the humming-bee breath, is predominantly soothing and is widely used for the reduction of stress and anxiety; and Sudarshan Kriya is a structured composite sequence that combines Ujjayi, Bhastrika and rhythmic cyclical breathing, concluding with chanting and silence. Some techniques are predominantly calming and parasympathetically biased, others are stimulating and energizing, and still others are described in the classical literature as cleansing. Physiologically, regular pranayama is held to act through the autonomic nervous system, shifting the balance between sympathetic and parasympathetic activity in favor of the latter – a shift considered central to its therapeutic effect in conditions characterised by chronic stress and autonomic dysregulation.^[3]

Over the past three decades, pranayama has evolved from a traditional contemplative practice into a subject of rigorous clinical research, yielding a robust empirical literature on its physiological and psychological benefits. Studies have documented improvements in cardiorespiratory fitness and cardiovascular-respiratory function, along with increased parasympathetic activity and decreased sympathetic tone.^[4-6] Clinical applications have been investigated in hypertension,^[4] in respiratory conditions including bronchial asthma and chronic obstructive pulmonary disease,^[7-10] and in supportive care for patients with cancer.^[11] Psychological benefits have been reported across measures of perceived stress, anxiety, depression, cognitive function, sleep and overall wellness.^[12-14] Pranayama has also been investigated as a complementary intervention in smoking cessation and combat-related stress.^[15,16] When incorporated into comprehensive yoga programs alongside posture, meditation and relaxation, pranayama has shown benefit in musculoskeletal and metabolic conditions including knee osteoarthritis and Type 2 diabetes.^[17-19]

1.1. Drivers of Clinical Interest

The rising interest in pranayama as a therapeutic adjunct is driven by three converging pressures. The first is the global rise of non-communicable conditions – hypertension, cardiovascular disease, chronic respiratory illness, metabolic disorders, mood and anxiety disorders, and the supportive care needs of patients living with cancer – for which low-cost, low-risk, self-administered interventions are increasingly valued. The second is the maturation of integrative medicine as a recognised clinical discipline, with breath-based practices forming a core component of integrative protocols across cardiology, oncology, psychiatry and respiratory medicine. The third is the emergence of plausible mechanistic frameworks linking voluntary slow breathing to measurable changes in autonomic, neuroendocrine, inflammatory and central nervous system function – frameworks that have made it possible to interrogate pranayama with the tools of contemporary clinical science.

1.2. Mechanistic Basis

The most influential contemporary mechanistic account is the neurophysiologic model proposed by Brown and Gerbarg, which integrates polyvagal theory, vagal afferent signaling, and the regulation of central autonomic balance to explain the observed effects of Sudarshan Kriya Yoga and related yogic breathing techniques on stress-related disorders.^[20,21] Streeter and colleagues subsequently advanced a Vagal-Gamma-Aminobutyric Acid Hypothesis [GABA], proposing that pranayama and other yoga-based practices act in part by stimulating vagal afferents to increase inhibitory GABAergic tone in cortico-limbic circuits, thereby reducing allostatic load in conditions characterised by autonomic and affective dysregulation, including depression, post-traumatic stress disorder and epilepsy.^[22] Respiratory

rates below ten breaths per minute have also been shown to increase heart rate variability (HRV), enhance electroencephalogram (EEG) alpha activity, and modulate functional connectivity in regions linked to interoception and emotional regulation.^[23] In Bhramari specifically, vibroacoustic stimulation within the paranasal sinuses produces a 15- to 20-fold increase in nasal nitric oxide release, offering a plausible biochemical basis for the practice's observed cardiovascular and antimicrobial effects.^[24]

1.3. Rationale for an Umbrella Review

Despite these promising signals, the evidence base for pranayama remains fragmented at two levels. Primary trials are often small, heterogeneous in technique and protocol, and limited by methodological weaknesses. Broader yoga reviews typically pool asana, pranayama and meditation, making it difficult to isolate the contribution of breathing practices. In response, pranayama-specific systematic reviews and meta-analyses have proliferated – but using inconsistent operational definitions, different risk-of-bias frameworks, and different approaches to certainty of evidence. This proliferation and fragmentation is precisely what umbrella reviews are designed to address.^[25] Accordingly, this umbrella review systematically identifies, critically appraises and synthesizes existing systematic reviews and meta-analyses of pranayama in human health, mapping the evidence by body system and outcome domain.

2. METHODS

2.1. Study Design

This study was designed and conducted in accordance with the Preferred Reporting Items for Overviews of Reviews statement,^[25] with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram used for study selection.^[26] Where the review maps evidence across multiple body systems, methodological principles from the PRISMA extension for scoping reviews^[27] informed the breadth of coverage and evidence-mapping structure, while retaining the appraisal and certainty-rating standards required of an overview of reviews. Risk-of-bias appraisal followed guidance in the Cochrane Handbook.^[28] The protocol was registered prospectively with the Open Science Framework (OSF:3BQJ6).

2.2. Eligibility Criteria

Eligibility was specified a priori using a Population-Intervention-Comparator-Outcomes-Study design framework adapted for an overview of reviews.^[25]

2.3. Population

Studies in human participants of any age, sex, ethnicity, or health status, including healthy individuals and clinical populations across all body systems. Studies in non-human animals were excluded.

2.4. Intervention

Pranayama (yogic breathing) was delivered either as a standalone intervention or as the primary, isolable component of a multi-component yoga intervention. Included techniques comprised the classical practices documented in the Pātañjala and Hatha textual traditions – Nāḍī Śodhana (alternate-nostril breathing), Bhrāmārī (humming-bee breath), Bhastrikā, Kapālabhātī, Śitalī, Sītākārī, Ujjāyī, Sūrya Bhedana and Chandra Bhedana – together with the structured composite practice Sudarshan Kriya Yoga. Multi-modal yoga interventions in which the

contribution of pranayama could not be isolated from postural (āsana) or meditative components were excluded.

2.5. Comparator

Any comparator was eligible, including no intervention, waitlist, attention control, sham breathing, active control (exercise, education, generic relaxation, biofeedback), pharmacotherapy, or usual or standard care.

2.6. Outcomes

Primary outcomes were prespecified using a body-systems taxonomy spanning cardiovascular, respiratory, mental health, cognitive and neurological, autonomic and neuroendocrine, metabolic and endocrine, immune and inflammatory, oncological, gene-expression and epigenetic, and other system-specific outcomes (gastrointestinal, obstetric, otorhinolaryngological, and pain-related). Secondary outcomes were adverse events, adherence, and dropout.

2.7. Study Design

Eligible study designs were systematic reviews and meta-analyses of randomised controlled trials (RCTs), with or without supplementary inclusion of non-randomised controlled studies, provided that each review reported an explicit search strategy, prespecified eligibility criteria, and a formal assessment of risk of bias in its included primary studies. Scoping reviews were included only where their methodology approached systematic review standards. Narrative reviews, editorials, commentaries, conference abstracts and single-arm pooled analyses without controls were excluded.

2.8. Information Sources

Five electronic databases were searched from inception to January 2026: PubMed, The Cochrane Library, Epistemonikos database, Web of Science and Google Scholar (screened to the first 200 ranked results). Reference lists of all included reviews and of key narrative and methodological articles on pranayama were hand-searched for additional records. Forward citation tracking of the earliest broad-scope pranayama systematic review identified through preliminary scoping was conducted through Web of Science.

2.9. Search Strategy

The search combined two concept blocks: (1) Pranayama and named yogic breathing techniques, and (2) Systematic review or meta-analysis filters. The PubMed search string and adapted strategies for each subsequent database are reported in Supplement 1.

2.10. Study Selection

Retrieved records were exported, deduplicated, and uploaded to a web-based screening platform.^[29] Two reviewers independently screened titles and abstracts against the eligibility criteria, with records considered potentially eligible by either reviewer retrieved in full text for independent assessment by both. Disagreements at either stage were resolved by discussion and, where necessary, adjudication by a third reviewer.

2.11. Data Extraction

Two reviewers independently extracted data using a pre-designed standardised form, resolving disagreements by consensus. Extracted data included bibliographic details, registration information, search strategy, eligibility criteria, study and participant numbers, participant

characteristics, pranayama intervention details, comparators, outcome data (effect estimates, 95% confidence intervals, heterogeneity), risk of bias, GRADE assessments, and review conclusions, funding, and conflicts of interest. For multi-system reviews, data were extracted separately for each body system.

2.12. Methodological Quality

The methodological quality of each included review was appraised in duplicate using the AMSTAR-2 instrument.^[30] Each review received an overall confidence rating of high, moderate, low or critically low, based on the number of critical-domain failures across the instrument's seven critical items. Disagreements were resolved by discussion or third-reviewer adjudication. AMSTAR-2 ratings are presented in the main table of included reviews and in a full item-level table. As a planned sensitivity analysis, the synthesis is presented for both the full set of included reviews and the subset rated high or moderate confidence.

2.13. Certainty of Evidence

The certainty of evidence for each pre-specified outcome was assessed using the GRADE framework.^[31] Where GRADE judgments were already reported within an included review, these were extracted directly; where they were absent, GRADE was applied de novo independently by two reviewers. The five downgrading domains (risk of bias, inconsistency, indirectness, imprecision, and publication bias) and, where applicable, the three upgrading domains (large effect magnitude, dose-response gradient, and plausible residual confounding opposing the observed effect) were considered. Outcomes were rated as high, moderate, low or very low certainty.

2.14. Overlap of Primary Studies

Overlap between included reviews in their primary studies was assessed using a citation matrix and quantified using the corrected covered area (CCA) index.^[32] CCA was interpreted as slight (<5%), moderate (6–10%), high (11–15%) or very high (>15%). Where high or very high overlap was identified within a domain, the most recent and methodologically rigorous review (highest AMSTAR-2 rating) was prioritized in the corresponding Summary of Findings row, with overlapping reviews flagged in the narrative.

2.15. Data Synthesis

Quantitative pooling across reviews was not performed, in line with methodological guidance that cautions against meta-meta-analysis when included reviews share overlapping primary studies. A structured narrative synthesis was instead undertaken, following the framework proposed by Popay *et al.*,^[33] and organized by body system and outcome domain. Effect estimates are reported exactly as presented in the source reviews (typically standardised mean differences, weighted mean differences, or relative risks with 95% confidence intervals), alongside the AMSTAR-2 rating, GRADE certainty of evidence, and a note on study overlap. Where multiple non-overlapping reviews addressed the same outcome, areas of convergence or divergence are highlighted. Summary of Findings tables were developed for each body system, complemented by an overall evidence map to provide clear visual summaries of the synthesised evidence.^[34]

3. RESULTS

The systematic literature search of five electronic databases identified 432 records published from inception to January 2026 (PubMed

[$n = 63$]; Cochrane Library [$n = 45$]; Epistemonikos [$n = 80$]; Web of Science [$n = 44$]; Google Scholar [$n = 200$]). After removal of 201 duplicates, 231 unique records were screened by title and abstract against the eligibility criteria. Fifty-two records were retrieved for full-text assessment, of which 36 were excluded for the following reasons: not a systematic review ($n = 14$), pranayama not isolable from broader yoga or breathing intervention ($n = 16$), narrative or scoping review without formal methodology ($n = 6$). The complete study selection process is illustrated in the PRISMA 2020 flow diagram [Figure 1].

These sixteen systematic reviews were published between 2017 and 2026 and collectively encompass over 130 unique primary studies involving more than 7,000 participants across thirteen pranayama techniques and six health domains.^[35-50] Seven reviews included meta-analytic pooling; nine performed narrative synthesis only. The characteristics of the included studies are summarized in Table 1.

AMSTAR-2 appraisals rated two reviews as moderate,^[35,36] five as low,^[37-41] and nine as critically low;^[42-50] none achieved a high rating. The most common critical flaws were the absence of a prospectively registered protocol and the lack of a list of excluded studies with justifications. Only four reviews had registered protocols.^[35,36,39,40] Of the seven reviews that performed meta-analysis, two formally assessed publication bias, two conducted partial assessments, and three performed no assessment. This item was not applicable to the remaining nine reviews that did not undertake quantitative pooling.

Sensitivity analysis restricted to reviews rated MODERATE AMSTAR-2 confidence retained two outcome domains: depression and anxiety in adults with mental disorders and the psychophysiology of slow breathing.^[35,36] All cardiovascular, respiratory, technique-specific, and multi-system findings were excluded from this restricted synthesis, as none of the contributing reviews achieved at least MODERATE confidence. The directional pattern of effects in the restricted synthesis was consistent with the full synthesis, but the breadth of outcomes was substantially narrower. The full item-level AMSTAR-2 assessment is provided in Table 2.

Five reviews included pranayama as a subgroup within a broader breathing exercise intervention, requiring narrative rather than quantitative contribution.^[36,40-42,48] Three were technique-specific: Bhramari,^[46] Bhramari for tinnitus,^[44] and Kapalabhati.^[49] A citation matrix of 153 unique primary studies across 16 systematic reviews yielded a CCA of 1.05%, indicating slight overlap. Of the 177 total inclusions, only 24 were pairwise duplications, concentrated among 19 primary studies. Five studies appeared in three reviews each, predominantly shared between the cardiovascular and blood-pressure reviews.^[39,40,42,43,45] Overall, the low degree of overlap confirms that the included reviews largely drew on independent bodies of evidence.

3.1. Findings by Domain

Table 3 presents the complete Summary of Findings across all domains, including direction of effect, pooled estimates where available, GRADE certainty, and key limitations per outcome.

The pooled meta-analytic estimates from the included reviews are also displayed visually as a summary forest plot in Figure 2, grouped by health domain and scaled to the natural units of each outcome.

3.2. Cardiovascular

Five reviews contributed cardiovascular evidence.^[39,40-43] The largest meta-analysis (15 RCTs, $n = 1,097$) reported significant reductions in

systolic blood pressure (SBP; mean difference [MD] -7.06 mmHg, $p < 0.01$), diastolic blood pressure (DBP; MD -3.43 mmHg, $p < 0.01$), and heart rate (MD -2.41 bpm, $p = 0.03$), though heterogeneity was substantial ($I^2 = 90\%$ for SBP) and pranayama could not be isolated from the pooled estimate.^[40] Alternate nostril breathing specifically improved HRV and reduced proinflammatory cytokines.^[41] No adverse events were reported across all contributing studies. GRADE certainty: Very Low for all outcomes.

3.3. Respiratory

Three reviews contributed respiratory evidence.^[38,48,50] In pediatric asthma, peak expiratory flow rate improved at 4–6 weeks with yoga-inclusive interventions (MD 4.86%, $P = 0.02$), and a head-to-head comparison found yoga/pranayama comparable to Buteyko breathing.^[48] In healthy adults, pulmonary function indices improved significantly following Kapalabhati and other fast pranayama practices.^[38,49] In adults with asthma, pranayama showed favorable effects on multiple respiratory parameters.^[50] GRADE certainty: Very Low across all respiratory outcomes; no review achieved at least MODERATE AMSTAR-2 confidence in this domain.

3.4. Mental Health

Two reviews contributed mental health evidence.^[35,37] The MODERATE-quality review found favorable effects of yoga-inclusive interventions on depression and anxiety in adults with diagnosed mental disorders (GRADE low-very low, applied by the review authors).^[35] In adolescents, pranayama reduced perceived stress and anxiety across included studies, though pranayama was a subset of a broader breathing exercise class and the population was restricted to 10–19 year olds.^[37] GRADE certainty: Low to very low.

3.5. Neurophysiological and Cognitive

Two reviews contributed.^[36,49] Slow breathing consistently increased electroencephalographic alpha power and HRV, with functional magnetic resonance imaging evidence of cortical and subcortical activation spanning the prefrontal cortex to brainstem.^[36] Kapalabhati produced distinct effects – increased alpha and gamma activity – suggesting technique-specific neurophysiological signatures.^[49] Both reviews proposed mechanistic models (vagal-nucleus tractus solitarius pathway, olfactory bulb modulation, locus coeruleus-norepinephrine system) that remain hypothetical. GRADE certainty: Very Low.

3.6. Technique-specific (Bhramari)

Two reviews found large effect sizes for tinnitus handicap reduction (Cohen's $d = 0.86$ – 0.92), though the global evidence base comprises only two primary studies.^[44,46] GRADE certainty: Very low.

3.7. Multi-system

One broad review identified favorable trends across multiple systems but could not isolate pranayama from yoga and lacked protocol registration.^[47] GRADE certainty: Very low.

3.8. Cross-cutting Findings

Three patterns recurred across domains. First, adverse events were either not assessed or not reported in the vast majority of primary studies across all sixteen reviews. Second, the dose-response relationship was rarely investigated within the included reviews. Third, chronic interventions (8–12 weeks of regular practice) produced more

consistent effects than acute single-session protocols, particularly for cardiovascular outcomes.^[40,43]

4. DISCUSSION

This umbrella review synthesised sixteen systematic reviews examining pranayama's health effects across six clinical domains. The findings reveal a practice with consistent directional benefit and broad physiological plausibility, but an evidence base that remains immature – characterised by low methodological confidence, inability to isolate pranayama from multi-component interventions, and near-complete absence of adverse event monitoring.

4.1. Pranayama Isolation: The Central Methodological Challenge

Of the sixteen included reviews, only three focused exclusively on a named pranayama technique or applied an explicit isolation criterion.^[44,46,49] Five included pranayama within a broader intervention class, and the remainder examined pranayama bundled with yoga postures and meditation.^[36,40,41,42,48] This means the most robust pooled estimate reflects breathing exercises broadly, not pranayama specifically.^[40] This is not merely a labeling problem. Different techniques may operate through distinct pathways – slow nasal pranayama may modulate vagal tone and olfactory bulb activity,^[36] Kapalabhati appears to engage the locus coeruleus-norepinephrine system,^[49] and Bhramari's vibratory component may have specific resonance effects for tinnitus.^[44] Pooling heterogeneous techniques dilutes any technique-specific signal.

4.2. Direct Evidence for Pranayama Isolation

The most clinically informative finding in the synthesised literature is, in our view, a single head-to-head comparison embedded within one of the included reviews.^[41] In this study, alternate nostril breathing produced significantly greater improvements in HRV than an active comparator of yoga postures alone. This represents the closest the existing literature comes to a true intra-yoga isolation experiment. It suggests that pranayama, rather than asana, may be the primary autonomic-modulating component of broader yoga practice.

The finding is particularly consequential because the dominant pattern in the field is evidence of benefit from multi-component yoga interventions in which pranayama, asana, and meditation are delivered together, making the contribution of each component difficult to disentangle. By contrast, this direct head-to-head comparison demonstrates pranayama's specific effect through addition rather than subtraction – showing that the breathing component, when isolated, outperforms the postural component alone on a key vagally mediated outcome. This effectively inverts the methodological limitation that characterizes most of the literature.

The finding rests on a single study and should not be over-extrapolated: HRV is one autonomic readout among several, the sample was modest, and effect magnitudes were not adjusted for multiple comparisons. However, as the only available test of the central proposition – that pranayama is doing autonomic work that posture is not – it is a result the field should replicate rather than overlook.

4.3. Mechanistic Considerations

Two complementary frameworks emerge from the synthesised evidence. The autonomic pathway, supported by cardiovascular^[39,40,41,42,43] and neurophysiological^[36] findings, proposes that slow pranayama enhances parasympathetic tone primarily through vagal stimulation.

The central nervous system pathway involves cortical and subcortical activation during slow breathing^[36] – prefrontal cortex, pons, thalamus, hypothalamus, periaqueductal gray – aligning with cognitive and emotional improvements reported across mental health^[35,37] and stress reduction^[41] domains. The proposed role of nasal mechanoreceptors in modulating olfactory bulb activity offers a novel mechanism requiring direct human validation.^[36] The neurochemical dimension – potential release of oxytocin, norepinephrine, and beta-endorphins^[41,49] – provides a plausible link to the mood and emotional regulation improvements observed for mental health outcomes.^[35,37]

4.4. Adverse Events and Safety

The near-complete absence of adverse event reporting cannot be interpreted as evidence of safety – it reflects systematic failure to measure. Techniques involving breath retention, rapid forced exhalation, or prolonged practice may carry risks that would only be detected through systematic monitoring. Future trials should include standardised adverse event assessment as a mandatory element.

4.5. Strengths and Limitations

This umbrella review is, to our knowledge, the first to synthesize the systematic review literature on pranayama across multiple health domains, using AMSTAR-2 and GRADE for transparent quality appraisal. The domain-grouped structure enables efficient navigation of domain-specific evidence. Several limitations should be acknowledged. No review achieved High AMSTAR-2 confidence, and only two were rated Moderate, meaning the umbrella is largely synthesizing evidence from methodologically limited reviews. Primary-study overlap concentrated in the cardiovascular cluster may inflate the apparent evidence volume for this domain. The restriction to English-language reviews may have excluded relevant evidence from other languages. The inability to perform quantitative synthesis at the umbrella level means conclusions rest on narrative synthesis of direction and magnitude.

A methodological observation warrants explicit mention. Several reviews – notably Das *et al.* and Roj *et al.* combined competent, well-documented search strategies and rigorous data extraction with AMSTAR-2 ratings of Critically Low, driven principally by two structural omissions: absent protocol pre-registration and missing per-study excluded lists. Because AMSTAR-2 weights these items as critical, a single failure moves a review from Moderate to Low and two move it to Critically Low. The result is a measurable threshold sensitivity in which two structural omissions override otherwise competent review conduct. We retain the AMSTAR-2 ratings as primary because it is the standard appraisal instrument, but readers should be aware that not all Critically Low ratings reflect substantive methodological failure.

A further methodological caveat concerns the heterogeneity of primary-study risk-of-bias instruments across the included reviews [Table 1]. Ten of the sixteen reviews used a Cochrane instrument – five applied the original Cochrane RoB tool or the Cochrane Handbook framework, three applied the revised Cochrane RoB 2, and two combined RoB 2 with a complementary tool for non-randomised studies. The remaining five reviews used non-Cochrane instruments: the PEDro scale alone in three,^[43,47,49] PEDro combined with QATQS in one,^[38] MQRs combined with the Newcastle-Ottawa Scale in one,^[46] and a SCRIBE-based framework adapted for within-subject and pre-post designs in one.^[36] These instruments differ in their domain structure, in whether they yield categorical judgments or numerical scores, and in how

stringently they treat blinding - which is structurally near-impossible in pranayama trials and which the older PEDro and Cochrane RoB 1 tools penalize more heavily than RoB 2. Because the GRADE certainty ratings in this umbrella review rest on the RoB judgments made within each source review, this instrument-level heterogeneity introduces an additional layer of imprecision beyond the AMSTAR-2 confidence rating of each review itself.

4.6. Implications for Practice

Current evidence does not support pranayama as a standalone treatment for any condition. However, the convergent cardiovascular signal across five independent reviews, the absence of reported harm across contributing primary studies, a defensible autonomic mechanism, and low cost together support pranayama as a reasonable adjunctive intervention for blood pressure management alongside established lifestyle modification – particularly where pharmacological therapy is contraindicated, poorly tolerated, or insufficient.^[39,40,41,42,43] The strength of this recommendation should be calibrated against the very low GRADE certainty: Directional consistency does not substitute for high-certainty effect estimation, and the recommendation is for adjunctive use rather than first-line therapy. The evidence is strongest for slow techniques practiced regularly over 8–12 weeks,^[40,43] with technique-specific effects potentially differing: slow pranayama for cardiovascular outcomes, Bhramari for tinnitus,^[44] Kapalabhati for attention and pulmonary function.^[49] Optimal dose, frequency, and duration remain undefined.

4.7. Implications for Research

No included review addressed pranayama's effects on metabolic disorders, oncology, immune biomarkers, or gene expression – domains where mechanistic plausibility is strong but evidence synthesis absent. Pediatric evidence is limited to two reviews^[37,48] covering different populations, and only one review addressed pranayama in pregnancy despite the mechanistic rationale documented in.^[41] Future systematic reviews should pre-register protocols (absent in 12/16 reviews), search at least three databases with grey literature (met by only 5/16), apply GRADE (used in only 1/16^[35]), and report adverse events. Primary studies require adequately powered RCTs with pranayama isolated from yoga postures and meditation, active comparators, standardised technique descriptions, follow-up beyond end of treatment, and pre-specified adverse event monitoring.

5. CONCLUSION

This umbrella review of sixteen systematic reviews finds pranayama associated with favorable effects across cardiovascular, respiratory, mental health and neurophysiological domains – most consistently in blood pressure reduction, and most mechanistically through autonomic modulation through vagal pathways. GRADE certainty is very low across nearly all outcomes, principally because pranayama cannot be isolated from broader yoga interventions in most reviews. Pranayama is therefore not currently recommendable as a standalone treatment. Its directional consistency, absence of reported harm and mechanistic plausibility nonetheless support its use as an adjunctive intervention and warrant investment in pranayama-isolated trials with standardised technique descriptions, active comparators and mandatory adverse event monitoring.

6. ACKNOWLEDGMENTS

None.

7. AUTHORS' CONTRIBUTIONS

All authors have read and approved the final version of the manuscript.

8. ETHICAL STATEMENT

Ethical approval was not required for this study, as it was a review article with data obtained through a literature search.

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10. CONFLICTS OF INTERESTS

The authors declare no conflicts of interest in relation to the publication of this paper.

11. DATA AVAILABILITY STATEMENT

The data analysed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible through databases.

12. DISCLAIMER/VIEW AND OPINIONS

The opinions expressed in this article are solely those of the authors and do not reflect the views of the International Research Journal of Ayurveda and Yoga or its editorial board.

13. AI-USE DECLARATION

The authors declare that no generative AI tools were used to create scientific content, interpret data, or draft any sections of this manuscript. AI-based tools were used solely for minor language and grammar refinements to improve clarity and readability. All scientific content, analysis, and conclusions remain the sole responsibility of the author.

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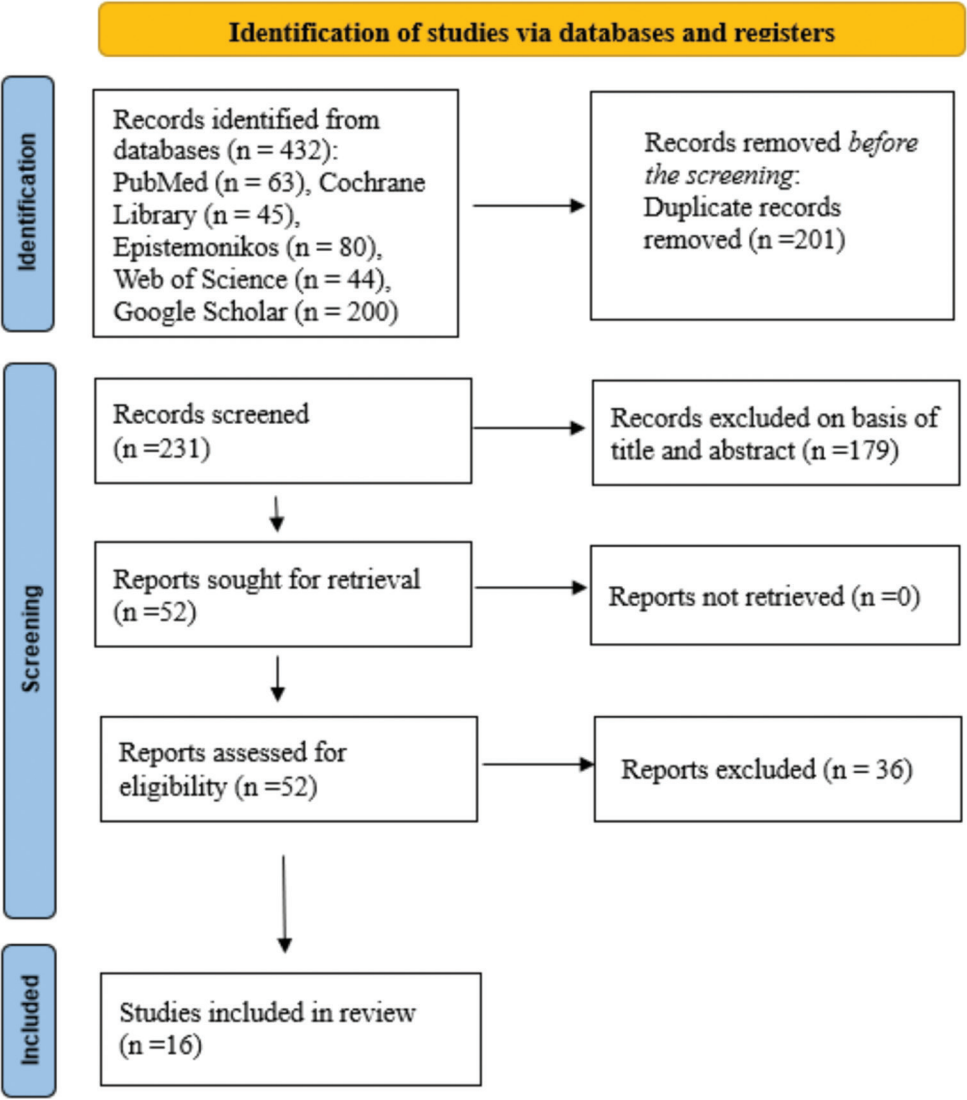


Figure 1: PRISMA 2020 flow diagram of study selection

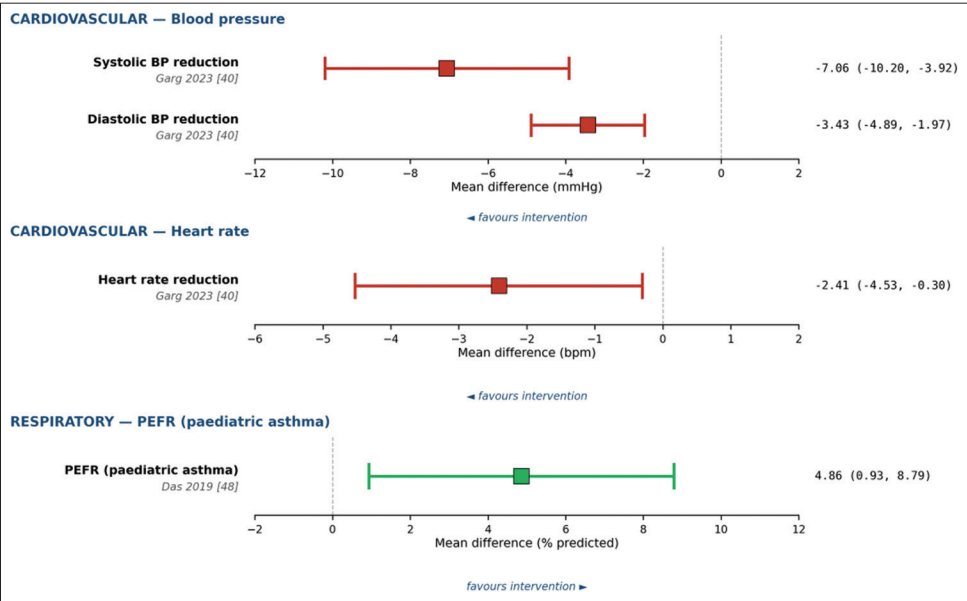


Figure 2: Summary forest plot grouped by health domains

Table 1: Characteristics of the 16 systematic reviews included in the umbrella review, including the risk-of-bias instrument used in each source review

First author (Year)	Focus/Aim	Population	Pranayama technique (s)	DBs (n)	Search To	k	MA	RoB tool	AMSTAR-2
Mütze <i>et al.</i> ^[35]	Standalone pranayama for mental disorders	Adults with diagnosed mental disorders	SKY (5/6 RCTs); slow pranayama (1/6)	4	2024	6	Yes	Cochrane RoB 2	Moderate
Zaccaro <i>et al.</i> ^[36]	Psychophysiology of slow breathing techniques	Healthy adults and clinical populations	Slow breathing techniques incl. pranayama	3	2017	15	No	SCRIBE+adapted pre-post quality scale	Moderate
Oka <i>et al.</i> ^[37]	Pranayama for adolescent stress and anxiety	Adolescents aged 10–19 years	Various pranayama techniques	4	2024	18	Yes*	Cochrane RoB 2+JBI (quasi-experimental)	Low
Bandyopadhyay <i>et al.</i> ^[38]	Pranayama and pulmonary function	Healthy adults and clinical populations	Multiple pranayama techniques	5	2024	11	Yes*	PEDro (RCTs) +QATQS (non-RCTs)	Low
Nam <i>et al.</i> ^[39]	ANB and blood pressure	Adults with/without hypertension	Alternate nostril breathing (ANB/Nadi Shodhana)	9	2023	13	Yes	Cochrane RoB	Low
Garg <i>et al.</i> ^[40]	Pranayama effects on BP and heart rate (MA)	Adults	Multiple pranayama techniques	5	2023	15	Yes	Cochrane RoB	Low
Rung <i>et al.</i> ^[41]	ANB: stress, anxiety, pregnancy/IPV	Various incl. pregnant women	Alternate nostril breathing	NR	NR	12	No	Cochrane RoB 2	Low
Chaddha <i>et al.</i> ^[42]	Device/non-device slow breathing and BP	Adults with hypertension	Slow breathing (device and non-device)	4	2018	17	Yes	Cochrane RoB 1	Critically low
Brandani <i>et al.</i> ^[43]	Hypotensive effect of yoga breathing	Adults with/without hypertension	Pranayama (various techniques)	4	2016	12	No	PEDro scale	Critically low
Shetty <i>et al.</i> ^[44]	Bhramari pranayama for tinnitus	Adults with tinnitus	Bhramari	5	2022	2	No	Cochrane RoB 2+7-domain non-RCT tool	Critically low
Chidambaram <i>et al.</i> ^[45]	Pranayama and cardiovascular/multi-system	Adults	Multiple pranayama techniques	4	2024	7	No	Cochrane RoB 2	Critically low
Kuppusamy <i>et al.</i> ^[46]	Bhramari pranayama health effects	Various	Bhramari	NR	NR	6	No	MQRS+ Newcastle-Ottawa Scale	Critically low
Jayawardena <i>et al.</i> ^[47]	Effects of pranayama on health (multi-system)	Various	Multiple pranayama techniques	3	2019	18	No	PEDro scale	Critically low
Das <i>et al.</i> ^[48]	Breathing exercises/ yoga in pediatric asthma	Children with asthma	Breathing exercises and yoga/pranayama	4	2018	10	No	Cochrane RoB 1	Critically low
Roj <i>et al.</i> ^[49]	Kapalbhati: cognitive and neurophysiological	Healthy adults and children	Kapalbhati	5	2024	4	No	PEDro scale	Critically low
Bhanot <i>et al.</i> ^[50]	Pranayama for asthma (respiratory parameters)	Adults with asthma	Various pranayama techniques	5	2024	11	Yes	Cochrane Handbook RoB	Critically low

*Pre-post within-group meta-analysis (not between-group comparison). ANB: Alternate nostril breathing; BP: Blood pressure; COPD: Chronic obstructive pulmonary disease; DBs: Databases searched; IPV: Intimate partner violence; JBI: Joanna Briggs Institute critical appraisal tool; k: Number of included primary studies; MA: Meta-analysis performed; MQRS: Methodological Quality Rating Scale; NR: Not reported; PEDro: Physiotherapy Evidence Database scale; RoB: Risk of bias, SCRIBE: Single-Case Reporting Guideline In Behavioral Interventions, SKY: Sudarshan Kriya Yoga, AMSTAR-2 confidence ratings: High, Moderate, Low, Critically low

Table 2: AMSTAR-2 item-level ratings for reviews included in the umbrella review of pranayama

Review	PICO	Protocol*	Design	Search*	Dup. selection	Dup. extraction	Excluded list*	Study detail	RoB tool*	Funding (I°)	MA methods*	RoB on MA	RoB interpret*	Heterogeneity	Pub. bias*	COI declared	Overall
Mütze <i>et al.</i> ^[35]	Y	Y	Y	Y	Y	Y	PY	Y	Y	N	Y	Y	Y	Y	PY	Y	Moderate
Zaccaro <i>et al.</i> ^[36]	Y	Y	Y	PY	Y	Y	N	Y	Y	N	NA	NA	Y	Y	NA	Y	Moderate
Oka <i>et al.</i> ^[37]	Y	PY	Y	Y	Y	Y	N	Y	Y	N	PY	NA	Y	PY	N	Y	Low
Bandyopadhyay <i>et al.</i> ^[38]	Y	N	Y	Y	Y	Y	N	Y	Y	N	PY	PY	Y	Y	N	Y	Low
Nam <i>et al.</i> ^[39]	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Low
Garg <i>et al.</i> ^[40]	Y	Y	Y	PY	Y	Y	N	Y	Y	N	Y	Y	Y	PY	Y	Y	Low
Rung <i>et al.</i> ^[41]	Y	N	Y	Y	PY	PY	PY	Y	Y	PY	NA	NA	Y	Y	NA	Y	Low
Chaddha <i>et al.</i> ^[42]	Y	N	Y	PY	Y	Y	N	Y	Y	N	Y	Y	Y	PY	PY	Y	Critically low
Brandani <i>et al.</i> ^[43]	Y	N	Y	PY	Y	Y	N	Y	Y	N	NA	NA	N	Y	NA	Y	Critically low
Shetty <i>et al.</i> ^[44]	Y	N	Y	PY	Y	PY	N	Y	Y	N	NA	NA	PY	Y	NA	Y	Critically low
Chidambaram <i>et al.</i> ^[45]	Y	N	PY	PY	Y	Y	N	Y	Y	N	NA	NA	PY	Y	NA	Y	Critically low
Kuppusamy <i>et al.</i> ^[46]	Y	N	PY	N	Y	PY	N	Y	Y	N	NA	NA	PY	N	NA	Y	Critically low
Jayawardena <i>et al.</i> ^[47]	Y	N	Y	N	Y	PY	N	PY	Y	N	NA	NA	N	N	NA	Y	Critically low
Das <i>et al.</i> ^[48]	Y	N	Y	PY	Y	Y	N	Y	Y	N	NA	NA	PY	Y	NA	Y	Critically low
Roj <i>et al.</i> ^[49]	Y	PY	Y	Y	Y	N	N	PY	Y	N	NA	NA	PY	Y	NA	Y	Critically low
Bhanot <i>et al.</i> ^[50]	Y	PY	PY	PY	Y	PY	N	Y	Y	N	Y	N	Y	PY	N	Y	Critically low
Yes	16	4	13	6	15	10	0	14	16	0	5	4	9	10	2	16	
Partial Yes	0	3	3	8	1	5	2	2	0	1	2	1	5	4	2	0	
No	0	9	0	2	0	1	14	0	0	15	0	1	2	2	3	0	
N/A	0	0	0	0	0	0	0	0	0	0	9	10	0	0	9	0	

*Critical domain (Shea *et al.*, 2017). Items 2, 4, 7, 9, 11, 13, and 15 are critical domains. Y: Yes, PY: Partial Yes, N: No, NA: Not applicable (review did not perform meta-analysis). Overall confidence ratings follow the Shea *et al.* (2017) algorithm: >1 critical flaw=Critically Low, 1 critical flaw=Low, >1 non-critical weakness (no critical flaws)=Moderate, ≤1 non-critical weakness=High. Ratings were assessed independently by two reviewers, with disagreements resolved by discussion

Table 3: Summary of findings: Effects of pranayama across health domains

Outcome	Reviews	Direction	Effect estimate	GRADE	Key limitation
Cardiovascular					
SBP reduction	Nam <i>et al.</i> , ^[39] Garg <i>et al.</i> , ^{[40]*} Rung <i>et al.</i> , ^[41] Chaddha <i>et al.</i> , ^[42] and Brandani ^[43]	↓ Favorable	MD−7.06 mmHg (95% CI−10.20 to−3.92)	Very low	Pooled estimate mixes pranayama and non-pranayama techniques; I ² =90%
DBP reduction	Nam <i>et al.</i> , ^[39] Garg <i>et al.</i> , ^{[40]*} Rung <i>et al.</i> , ^[41] Chaddha <i>et al.</i> , ^[42] and Brandani ^[43]	↓ Favorable	MD−3.43 mmHg (95% CI−4.89 to−1.97)	Very low	As above; I ² =78%; all 15 studies unclear/high RoB
Heart rate reduction	Garg <i>et al.</i> , ^{[40]*} Rung <i>et al.</i> , ^[41] Chaddha <i>et al.</i> , ^[42] and Brandani ^[43]	↓ Favorable	MD−2.41 bpm (95% CI−4.53 to−0.30)	Very low	Clinical significance of 2.4 bpm reduction debatable
HRV improvement (ANB)	Zaccaro <i>et al.</i> , ^[36] and Rung <i>et al.</i> , ^[41]	↑ Favorable	HF power ↑ ($P<0.001$); LF/HF ↓ ($P<0.001$)	Very low	General populations only (mostly young Asian Indian males); small samples ($n=11-99$)
Pro-inflammatory cytokines	Rung <i>et al.</i> , ^[41]	↓ Favorable	IL-1β ↓ ($P=0.005$); IL-8 ↓ ($P=0.01$)	Very low	Single study (Twal 2016, $n=20$); single 20-min session
Respiratory					
PEFR in pediatric asthma	Das <i>et al.</i> , ^[48]	↑ Favorable	MD 4.86% (95% CI 0.93 to 8.79; I ² =0%)	Very low	Pooled estimate includes non-pranayama studies; children 6–14 y only
Pulmonary function (healthy adults)	Bandyopadhyay <i>et al.</i> , ^[38] Roj <i>et al.</i> and Bhanot <i>et al.</i> , ^[50]	↑ Favorable	FVC, FEV1, PEFR all $P<0.001$ (Kapalbhati ^[49])	Very low	Healthy volunteers only; Kapalbhati was part of fast pranayama package, not isolated
Mental health					
Depression/anxiety (adults)	Mütze <i>et al.</i> , ^{[35]†}	↓ Favorable	Direction favorable; GRADE Low–Very Low (applied by review authors)	Low–very low	Pranayama not isolable from yoga; only review to apply GRADE internally
Stress/anxiety (adolescents)	Oka <i>et al.</i> , ^[37]	↓ Favorable	Reduced perceived stress and anxiety across studies	Very low	Pranayama a subset of broader breathing exercise class; 10–19 year olds
Neurophysiological and cognitive					
EEG alpha ↑/theta ↓ (slow breathing)	Zaccaro <i>et al.</i> , ^[36]	↑ Favorable	Consistent across 3 studies (Fumoto, Yu, Park)	Very low	3/15 studies pranayama-named; healthy subjects; surrogate outcome
Cortical/subcortical activation (fMRI)	Zaccaro <i>et al.</i> , ^[36]	↑ Favorable	Increased BOLD in PFC, pons, thalamus, hypothalamus, PAG, LC	Very low	Single fMRI study (Critchley 2015, $n=20$); 5.5 b/min paced breathing, not labeled pranayama
Attention (Kapalbhati, children)	Roj <i>et al.</i> , ^[49]	↑ Favorable	Cancellation task: total attempts ↑ ($P<0.05$), net scores ↑ ($P<0.05$); state anxiety ↓ ($P<0.05$)	Very low	Single RCT ($n=61$); single 18-min session; healthy children 11–12y
EEG alpha+gamma (Kapalbhati, adults)	Roj <i>et al.</i> , ^[49]	↑ Favorable	Alpha and gamma ↑ ($P<0.01$) across frontal, temporal, occipital	Very low	Single RCT ($n=36$); 15-day practice; healthy adults only
Technique-specific (Bhramari)					
Tinnitus handicap	Shetty and Acharya, ^[44] Kuppusamy <i>et al.</i> , ^[46]	↓ Favorable	$d=0.86$ (Pandey 2010); $d=0.92$ (Ismail 2022 RCT)	Very low	Entire global evidence base is $k=2$; large effects but nascent field
Multi-system					
Multiple outcomes (Cardiovascular, respiratory, metabolic, neurological)	Jayawardena <i>et al.</i> , ^[47]	↑ Mixed	Favorable trends across systems; no pooled estimates	Very low	Pranayama not isolable from yoga; no protocol; unclear RoB assessment

*Meta-analytic pooled estimate available from this review. †Pranayama is a minor subgroup within this review; pooled estimates reflect all yoga-inclusive breathing interventions, not pranayama specifically. GRADE ratings applied by umbrella review authors unless otherwise noted. ↓: Decrease/reduction, ↑: Increase/improvement. ANB: Alternate nostril breathing, CI: Confidence interval, HF: High frequency, HRV: Heart rate variability, LC: Locus coeruleus, LF: Low frequency, MD: Mean difference, PAG: Periaqueductal gray, PFC: Prefrontal cortex, RoB: Risk of bias, SBP/DBP: Systolic/diastolic blood pressure, fMRI: Functional magnetic resonance, imaging, RCTs: Randomised controlled trials, IL-1β: Interleukin-1 beta, FVC: Forced vital capacity, FEV1: Forced expiratory volume in one second, PEFR: Peak expiratory flow rate

SUPPLEMENT 1: SEARCH STRATEGY

The search combined two concept blocks: (1) Pranayama and named yogic breathing techniques, and (2) Systematic review or meta-analysis filters. Blocks were combined with AND. No restriction was applied on date, language, or publication status at the search stage. The complete search strategy across all five databases is presented in the table below as a single collated table with sections.

Consolidated search strategy across five databases (databases overview, PubMed concept blocks and combined string, and adapted strategies for Cochrane Library, Web of Science, Epistemonikos, and Google Scholar).-

#	Element	Search term/parameter	#	Element	Search term/parameter
Section 1 — Databases searched (inception to January 2026)			3.4	Search line	“meta-analysis”[tiab] OR “meta-analysis”[tiab]
1.1	MEDLINE	PubMed (https://pubmed.ncbi.nlm.nih.gov) — 63 records	3.5	Search line	“systematic literature review”[tiab]
1.2	Cochrane Library	CDSR+CENTRAL (https://www.cochranelibrary.com) — 45 records	3.6	Search line	“umbrella review”[tiab]
1.3	Web of Science	Core Collection (https://www.webofscience.com) — 44 records	3.7	Search line	“overview of reviews”[tiab]
1.4	Epistemonikos	https://www.epistemonikos.org — 80 records	3.8	Search line	Block 2 combined: #3.1 OR #3.2 OR #3.3 OR #3.4 OR #3.5 OR #3.6 OR #3.7
1.5	Google Scholar	First 200 ranked results (https://scholar.google.com) — 200 records	Section 4 — PubMed final combined search (Block 1 AND Block 2)		
—	TOTAL	432 records identified across five databases	4.1	Combined PubMed string (Block 1 AND Block 2)	((“Yoga”[Mesh] OR “Breathing Exercises”[Mesh] OR pranayama[tiab] OR “yogic breathing”[tiab] OR “yoga breathing”[tiab] OR “alternate nostril”[tiab] OR “alternate-nostril”[tiab] OR “alternate-nostril”[tiab] OR “nadi shodhana”[tiab] OR “nadi shuddhi”[tiab] OR “anulom vilom”[tiab] OR “anuloma viloma”[tiab] OR bhrumari[tiab] OR “humming bee breath”[tiab] OR “bellows breath”[tiab] OR kaplabhati[tiab] OR “skull shining breath”[tiab] OR ujjayi[tiab] OR “ocean breath”[tiab] OR shitali[tiab] OR sheetali[tiab] OR sitkari[tiab] OR “surya bhedana”[tiab] OR “surya bhedi”[tiab] OR “chandra bhedana”[tiab] OR “chandra bhedi”[tiab] OR “sudarshan kriya”[tiab] OR “sudarshana kriya”[tiab] OR “SKY breathing”[tiab] OR “slow breathing”[tiab] OR “deep breathing”[tiab] OR “voluntary slow breathing”[tiab] OR “controlled breathing”[tiab]) AND (“systematic review”[Publication Type] OR “meta-analysis”[Publication Type] OR “systematic review”[tiab] OR “meta-analysis”[tiab] OR “meta-analysis”[tiab] OR “systematic literature review”[tiab] OR “umbrella review”[tiab] OR “overview of reviews”[tiab]))
Section 2 — PubMed (MEDLINE) Concept Block 1: Pranayama and yogic breathing techniques			Section 5 — Cochrane Library (CDSR+CENTRAL) search strategy		
2.1	Search line	“Yoga”[Mesh]	5.1	Search line	MeSH descriptor: [Yoga] explode all trees
2.2	Search line	“Breathing Exercises”[Mesh]	5.2	Search line	MeSH descriptor: [Breathing Exercises] explode all trees
2.3	Search line	pranayama[tiab]	5.3	Search line	(pranayama OR “yogic breathing” OR “yoga breathing”):ti, ab, kw
2.4	Search line	“yogic breathing”[tiab]	5.4	Search line	(“alternate nostril” OR “nadi shodhana” OR “anulom vilom”):ti, ab, kw
2.5	Search line	“yoga breathing”[tiab]	5.5	Search line	(bhrumari OR bhastrika OR kaplabhati OR ujjayi):ti, ab, kw
2.6	Search line	“alternate nostril”[tiab] OR “alternate-nostril”[tiab]	5.6	Search line	(shitali OR sheetali OR sitkari):ti, ab, kw
2.7	Search line	“nadi shodhana”[tiab] OR “nadi shuddhi”[tiab]	5.7	Search line	(“surya bhedana” OR “chandra bhedana”):ti, ab, kw
2.8	Search line	“anulom vilom”[tiab] OR “anuloma viloma”[tiab]			
2.9	Search line	bhrumari[tiab] OR “humming bee breath”[tiab]			
2.10	Search line	bhastrika[tiab] OR “bellows breath”[tiab]			
2.11	Search line	kaplabhati[tiab] OR “skull shining breath”[tiab]			
2.12	Search line	ujjayi[tiab] OR “ocean breath”[tiab]			
2.13	Search line	shitali[tiab] OR sheetali[tiab] OR sitkari[tiab]			
2.14	Search line	“surya bhedana”[tiab] OR “surya bhedi”[tiab]			
2.15	Search line	“chandra bhedana”[tiab] OR “chandra bhedi”[tiab]			
2.16	Search line	“sudarshan kriya”[tiab] OR “sudarshana kriya”[tiab]			
2.17	Search line	“SKY breathing”[tiab]			
2.18	Search line	“slow breathing”[tiab] OR “deep breathing”[tiab]			
2.19	Search line	“voluntary slow breathing”[tiab] OR “controlled breathing”[tiab]			
2.20	Search line	Block 1 combined: #2.1 OR #2.2 OR . OR #2.19 (combine all with OR)			
Section 3 — PubMed (MEDLINE) Concept Block 2: Systematic review and meta-analysis filters					
3.1	Search line	“systematic review”[Publication Type]			
3.2	Search line	“meta-analysis”[Publication Type]			
3.3	Search line	“systematic review”[tiab]			

#	Element	Search term/parameter
5.8	Search line	("sudarshan kriya" OR "SKY breathing"):ti, ab, kw
5.9	Search line	("slow breathing" OR "deep breathing" OR "controlled breathing"):ti, ab, kw
5.10	Search line	#5.1 OR #5.2 OR #5.3 OR #5.4 OR #5.5 OR #5.6 OR #5.7 OR #5.8 OR #5.9
5.11	Filter	Filter: Cochrane Reviews and Trials
Section 6 — Web of Science Core Collection search strategy		
6.1	Search line	TS=(pranayama OR "yogic breathing" OR "yoga breathing" OR "alternate nostril" OR "nadi shodhana" OR "anulom vilom" OR bhramari OR bhasrika OR kapalabhati OR ujjayi OR shitali OR sheetali OR sitkari OR "surya bhedana" OR "chandra bhedana" OR "sudarshan kriya" OR "SKY breathing" OR "slow breathing" OR "deep breathing" OR "controlled breathing")
6.2	Search line	TS=("systematic review" OR "meta-analysis" OR "meta-analysis" OR "umbrella review" OR "overview of reviews")
6.3	Search line	#6.1 AND #6.2
6.4	Refined by	Document types=(Review OR Article); Timespan: All years
Section 7 — Epistemonikos search strategy		
7.1	Title field	title:(pranayama OR "yogic breathing" OR "yoga breathing" OR "alternate nostril breathing" OR "nadi shodhana" OR bhramari OR bhasrika OR kapalabhati OR ujjayi OR "sudarshan kriya" OR "slow breathing" OR "deep breathing" OR "controlled breathing")
7.2	Abstract field	abstract:(pranayama OR "yogic breathing" OR "yoga breathing" OR "alternate nostril breathing" OR "nadi shodhana" OR bhramari OR bhasrika OR kapalabhati OR ujjayi OR "sudarshan kriya" OR "slow breathing" OR "deep breathing" OR "controlled breathing")
7.3	Combined	#7.1 OR #7.2
7.4	Primary filter	Publication type=Systematic Review
7.5	Secondary filter	Publication type=Broad Synthesis (run as a separate search)
Section 8 — Google Scholar search strategy (first 200 ranked results screened per search)		
8.1	Primary search	allintitle: pranayama OR "yogic breathing" systematic review
8.2	Secondary search	allintitle: pranayama OR "yogic breathing" meta-analysis