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Yoga and Pranayama for Stress, Hypertension and Mental Health: A Narrative Review

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ABSTRACT

Hypertension and common mental disorders are leading and largely undertreated health problems. An estimated 1.4 billion adults worldwide have hypertension and fewer than one in five have it controlled; in India, 35.5% of adults have hypertension, 10.6% have a current mental disorder, and 70%–92% of people with mental disorders receive no proper treatment. Yoga, including its breathing practices (pranayama), is widely used in India and elsewhere as a low-cost approach to these problems. This narrative review summarises the practices, proposed mechanisms, evidence and safety. Meta-analyses of trials in people with elevated blood pressure find reductions of about 4–8 mmHg in systolic and 4–5 mmHg in diastolic pressure, but the certainty of evidence is very low in the most recent review, and programmes that include breathing techniques and meditation appear to work better than those that do not. For mental health, yoga has small effects on anxiety (SMD −0.43 versus no treatment; inconclusive in formally diagnosed anxiety disorders) and a small-to-moderate effect on depressive symptoms in people with mental disorders (SMD −0.41), and breath-work reduces stress (g = −0.35). The largest Indian trial, in 3,959 people after a heart attack, found better self-rated health but no significant difference in major cardiovascular events. Reported adverse events are mainly musculoskeletal and linked to forceful or advanced practices. Yoga is best positioned as an adjunct to, not a replacement for, medical treatment. Larger pragmatic trials with hard outcomes, and trials that isolate pranayama, are needed.

Key words: Yoga; pranayama; hypertension; stress; anxiety; depression; breath-work; integrative medicine; India.

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1. Introduction

Hypertension is the commonest modifiable risk factor for cardiovascular disease. The World Health Organization (WHO) estimates that 1.4 billion people aged 30–79 years had hypertension in 2024, yet fewer than one in five (about 320 million) had it adequately controlled; controlling it in half of those affected could prevent 76 million deaths by 2050 [1]. In India, the ICMR-INDIAB survey found hypertension in 35.5% of adults, about 315 million people [2]. Mental health shows a similar pattern of high burden and low coverage: the National Mental Health Survey of India, 2015–16, found that 10.6% of adults had a current mental disorder (13.7% over a lifetime) and that 70%–92% of those affected did not receive proper treatment, depending on the disorder [3] (Figure 1).

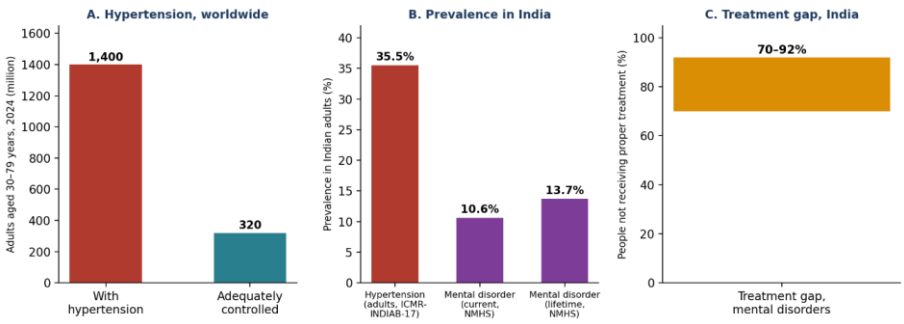


Figure 1. *Burden and treatment gaps.* (A). *Adults with hypertension worldwide and those adequately controlled* [1]. (B). *Prevalence of hypertension and mental disorders in Indian adults* [2,3]. (C). *Treatment gap for mental disorders in India* [3]. *Graphs prepared from published values.*

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Stress, hypertension and mental disorders are interlinked, and non-drug approaches that are cheap, acceptable and scalable are attractive. Yoga, a body of practices that originated in India, is one such approach. This review asks what yoga and pranayama do, how they might act, what the evidence shows for blood pressure, stress, anxiety and depression, and how safely and in what role they can be used. It is a narrative review: evidence was selected by the author from major meta-analyses, trials and official reports, without a systematic search.

2. What Are Yoga and Pranayama?

Modern yoga programmes usually combine three elements (Table 1): physical postures (asana), regulated breathing (pranayama) and meditation or relaxation. This matters for interpreting trials, because most studies test combinations of these elements rather than any one alone, and the content of programmes varies, with some including breathing techniques and meditation and others not [4]. Pranayama refers to voluntary regulation of breathing, for example slow breathing with a long exhalation, alternate-nostril breathing and humming breath, while forceful techniques such as rapid exhalations are also part of the tradition.

Table 1. Components of yoga programmes. The descriptions are the author's summary of traditional practice.

Component	Description	Evidence base	Ref.
Asana (postures)	Graded physical postures and stretching, held with attention	Physical-activity-type effects; reductions in resting heart rate, glucose and lipids with yoga that includes asanas	[5]
Pranayama (breath regulation)	Slow, paced breathing; alternate-nostril breathing; humming breath; forceful techniques	Slow breathing studied for psycho-physiological effects; breath-work reduces stress	[6,7]
Meditation and relaxation	Focused attention on breath or body; deep relaxation	Larger blood pressure reductions when added to yoga with breathing	[4]

3. Proposed Mechanisms

Several mechanisms have been proposed (Figure 2). Slow, paced breathing influences the autonomic nervous system and heart rate variability, and a systematic review of the psycho-physiological correlates of slow breathing has described effects on both physiological and psychological measures [6]. In a meta-analysis of randomised trials against active controls, interventions that included yoga asanas were associated with lower evening and waking cortisol, lower ambulatory systolic blood pressure, lower resting heart rate, higher high-frequency heart rate variability, and lower fasting glucose, total cholesterol and LDL cholesterol [5]. These findings support a combined effect on stress physiology and on cardiometabolic risk, but they cannot show which component is responsible.

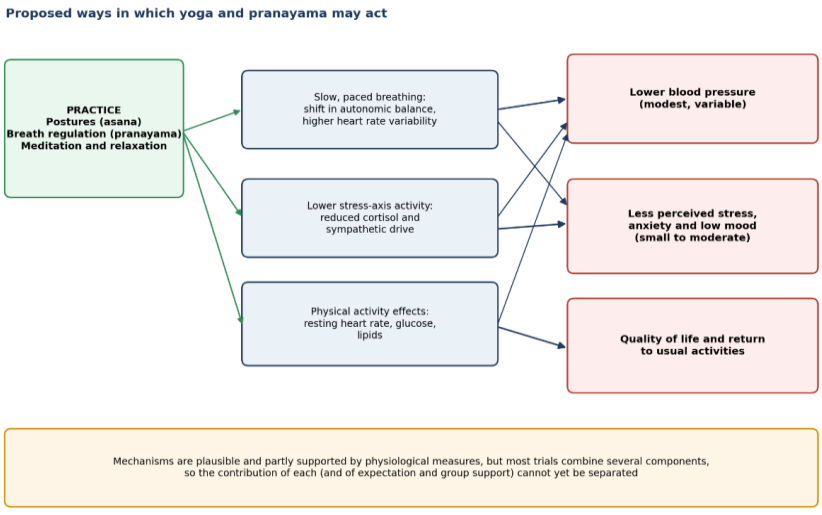


Figure 2. *Proposed ways in which yoga and pranayama may influence blood pressure and mental health, based on refs* [4–6].

4. Hypertension

Several meta-analyses have examined yoga for blood pressure (Table 2, Figure 3A). An earlier meta-analysis of controlled studies in prehypertension and hypertension found a modest but significant reduction in systolic blood pressure of 4.17 mmHg (95% CI −6.35 to −1.99) [8]. A larger meta-analysis of 49 controlled trials with 3,517 participants found average reductions of 5.0 mmHg systolic and 3.9 mmHg diastolic compared with controls [4]. The most recent review, of 30 randomised trials with 2,283 participants, found larger reductions against waitlist controls (systolic −7.95 mmHg, 95% CI −10.24 to −5.66; diastolic −4.93 mmHg; heart rate −4.43 beats per minute), but rated the quality of the evidence as very low because of high heterogeneity and methodological limitations [9].

The role of pranayama is suggested by moderator analysis. In people with hypertension practising three sessions per week, yoga interventions that included breathing techniques and meditation or mental relaxation reduced blood pressure by 11/6 mmHg compared with 6/3 mmHg for those that did not, after controlling for publication bias and study quality [4]. This does not prove that breathing is the active ingredient, since programmes with more components may also be more intensive, but it is consistent with a contribution from breath regulation and relaxation.

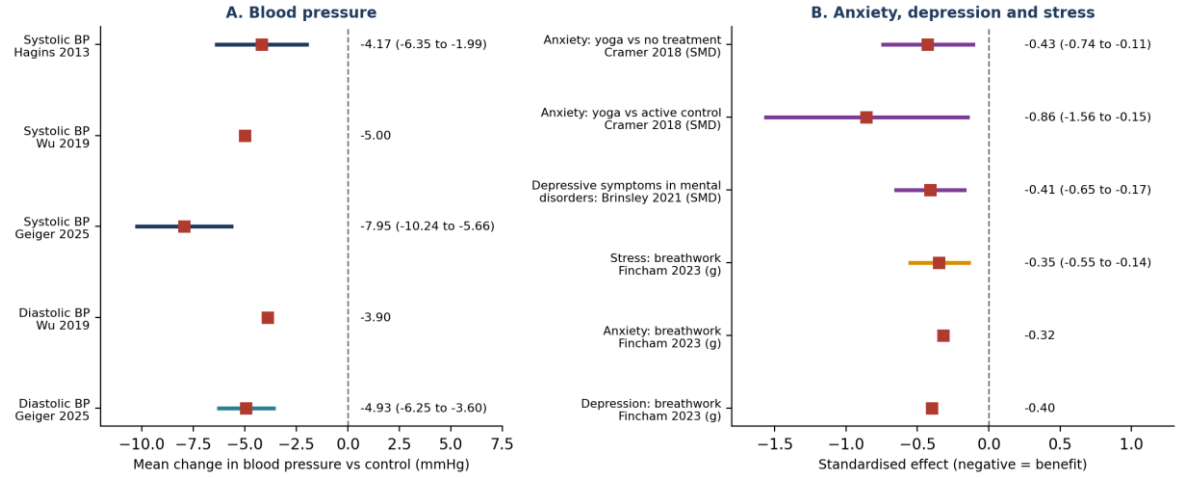


Figure 3. *Effect estimates from meta-analyses*. (A). *Mean change in blood pressure against controls, with 95% confidence intervals where reported; Wu et al. report confidence intervals in standardised units only* [4,8,9]. (B). *Standardised effects on anxiety, depressive symptoms and stress* [7,10,11]. *Negative values favour yoga or breath-work. SMD: standardised mean difference; g: Hedges'g. Graphs prepared from published values.*

The largest Indian trial tested a yoga-based cardiac rehabilitation programme (Yoga-CaRe) in 3,959 patients after acute myocardial infarction at 24 centres. Major adverse cardiovascular events occurred in 6.7% with Yoga-CaRe and 7.4% with enhanced standard care (hazard ratio 0.90, 95% CI 0.71–1.15, P = 0.41). Self-rated health was higher with Yoga-CaRe (77 vs 75.7; adjusted difference 1.5, 95% CI 0.5–2.5, P = 0.002) and participants returned more often to pre-infarct activities, but the trial lacked power to show a difference in cardiovascular events [12] (Figure 4).

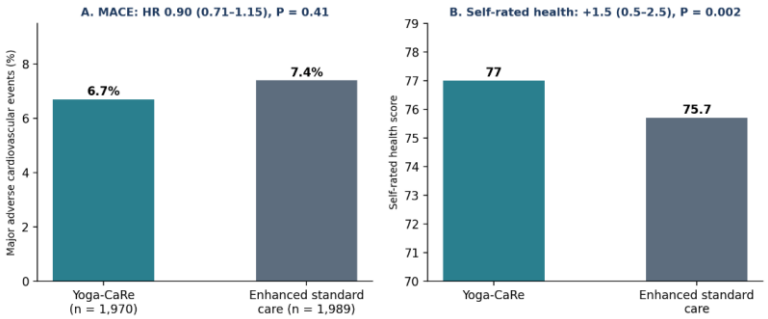


Figure 4. *Results of the Yoga-CaRe randomised trial after acute myocardial infarction in India*. (A). *Major adverse cardiovascular events (MACE)*. (B). *Self-rated health* [12].

Table 2. Evidence on yoga and blood pressure.

Study	Design	Key findings	Ref.
Hagins et al., 2013	Meta-analysis of controlled studies, prehypertension and hypertension	Systolic BP −4.17 mmHg (95% CI −6.35 to −1.99); modest effect	[8]
Wu et al., 2019	Meta-analysis of 49 controlled trials, 3,517 participants	Systolic −5.0 and diastolic −3.9 mmHg; 11/6 mmHg with breathing and meditation vs 6/3 without (hypertensive samples, 3 sessions/week)	[4]
Geiger et al., 2025	Meta-analysis of 30 RCTs, 2,283 participants	Vs waitlist: systolic −7.95, diastolic −4.93 mmHg; very low-quality evidence	[9]
Yoga-CaRe, 2020	RCT, 3,959 patients after myocardial infarction, India	MACE HR 0.90 (0.71–1.15); self-rated health improved; return to activities better	[12]

5. Stress, Anxiety and Depression

For anxiety, a meta-analysis of eight randomised trials with 319 participants found small short-term effects of yoga compared with no treatment (SMD −0.43, 95% CI −0.74 to −0.11) and large effects compared with active comparators (SMD −0.86, 95% CI −1.56 to −0.15), with small effects on depression (SMD −0.35). However, no effects were found in patients with anxiety disorders diagnosed by DSM criteria, only in people diagnosed by other methods or with elevated anxiety without a formal diagnosis, so the evidence for formally diagnosed anxiety disorders was inconclusive [10].

For depression, a meta-analysis of 13 randomised trials with 632 participants, all with a diagnosed mental disorder, found that physically active yoga reduced depressive symptoms more than waitlist, treatment as usual or attention control (SMD −0.41, 95% CI −0.65 to −0.17), with larger reductions when yoga was practised more often each week [11]. Because those yoga interventions included at least 50% physical activity, the finding does not apply to breathing practices alone.

For stress, a meta-analysis of 12 randomised trials with 785 adults found that breathwork was associated with lower self-reported stress than non-breathwork controls (Hedges' g = −0.35, 95% CI −0.55 to −0.14), with similar effects on anxiety (g = −0.32, 20 trials) and depressive symptoms (g = −0.40, 18 trials); most studies were at moderate risk of bias [7]. Together, these results suggest small-to-moderate benefits for stress and mood, but effect sizes are modest, trials are small and comparators vary (Table 3).

Table 3. Evidence on yoga and breath-work for stress, anxiety and depression.

Outcome	Design	Key findings	Ref.
Anxiety	8 RCTs, 319 participants	SMD −0.43 vs no treatment; −0.86 vs active control; inconclusive in DSM-diagnosed anxiety disorders	[10]
Depressive symptoms in mental disorders	13 RCTs, 632 participants; physically active yoga	SMD −0.41 (−0.65 to −0.17); larger effect with more frequent sessions	[11]
Stress, anxiety, depression (breathwork)	12 RCTs for stress (785 adults); 20 and 18 for anxiety and depression	g = −0.35, −0.32 and −0.40; moderate risk of bias	[7]
Stress physiology	Meta-analysis of RCTs vs active control	Lower cortisol, ambulatory SBP, resting heart rate; higher HF-HRV	[5]

6. Safety and Practical Considerations

Yoga is generally regarded as low risk, but adverse events occur. A systematic review of published case reports and case series (76 cases) found that pranayama, hatha yoga and Bikram yoga were the most common practices linked to adverse events, and that headstand, shoulder stand, lotus position and forceful breathing were the most frequently cited postures and techniques. Musculoskeletal injuries accounted for 35.5% of events, nervous system events 18.4% and eye problems 11.8%. The authors recommend practising under a qualified instructor, adapting postures for medical conditions, avoiding inversions in glaucoma and avoiding forceful practices when bone is compromised [13]. Case reports cannot give the frequency of events, so these data show what can go wrong rather than how often. In the Yoga-CaRe trial, the yoga programme was reported to be safe in patients after myocardial infarction [12].

An important practical point is that yoga should not displace effective treatment. The WHO report stresses that hypertension can be controlled with low-cost medicines, and that detection and treatment in primary care are the priority [1]. The authors of the most recent hypertension meta-analysis likewise advised that low-certainty evidence limits translation into guidelines [9]. Figure 5 summarises the components of a programme and the main cautions.

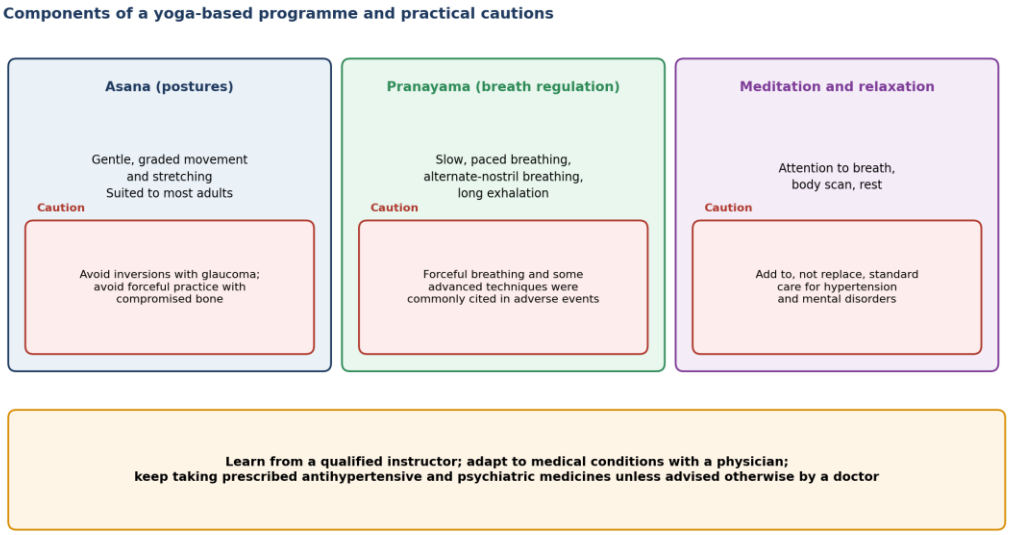


Figure 5. *Components of a yoga-based programme and practical cautions, based on refs* [1,4,13].

7. Interpreting the Evidence

Four limitations apply. First, blinding of participants is impossible, so expectation and attention effects are likely, particularly for self-reported outcomes [7]. Second, heterogeneity is high: programmes differ in style, duration, frequency and comparators, and the latest hypertension review rated the evidence as very low quality for this reason [9]. Third, few trials isolate pranayama, so its specific contribution is inferred from moderator analyses and from breathwork trials that use varied techniques [4,7]. Fourth, evidence on hard outcomes is scarce: the one large trial of cardiovascular events did not show a significant difference [12]. The results are better regarded as showing plausible, modest benefit with low cost than as proving effectiveness equal to drugs or psychotherapy.

8. Positioning Yoga in Care

Taken together, the evidence supports offering structured yoga that includes breathing practice and relaxation as an adjunct to standard care for people with raised blood pressure and for those with stress or mild-to-moderate mood symptoms, in particular where cost, acceptability or access limit other options. It does not support replacing antihypertensive drugs or evidence-based psychological or drug treatment, especially in people with diagnosed anxiety disorders, where benefit was not shown [1,10]. Figure 6 sets out a pragmatic way to position yoga: detect, treat, add yoga, protect with qualified instruction and adaptation, and evaluate.

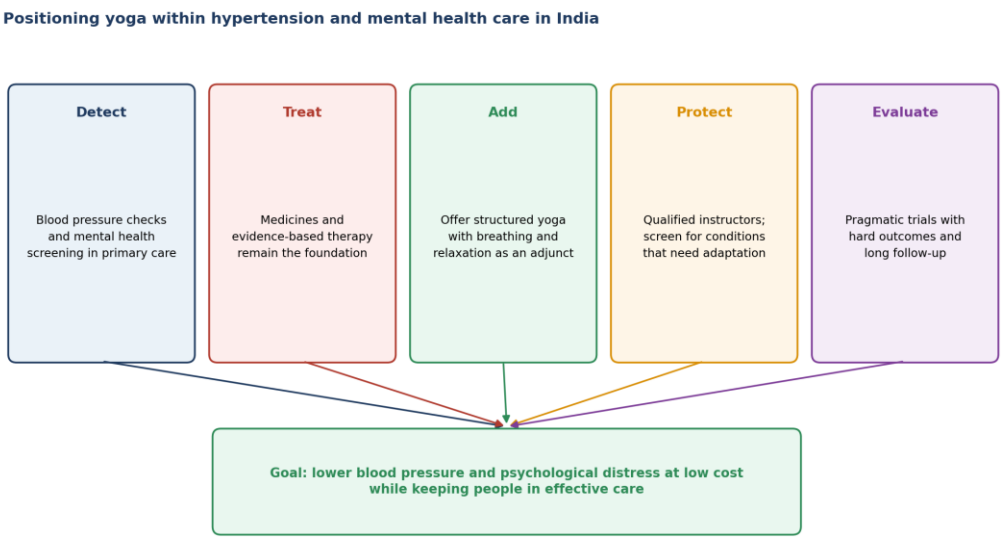


Figure 6. *A pragmatic framework for positioning yoga within hypertension and mental health care in India. The framework is the author's synthesis of refs* [1,4,10,12,13].

9. Research Gaps

Priorities include large pragmatic trials with hard outcomes such as stroke and hospitalisation and follow-up of at least several years; trials that compare pranayama alone, asana alone and the combination; standardised, reproducible protocols so that results can be pooled; trials in Indian primary care that report blood pressure control alongside medication use; and better safety surveillance, since existing data come from case reports [4,13]. Mental health trials should use formally diagnosed populations and active comparators and should report long-term outcomes [10,11].

10. Conclusions

Yoga that combines postures with breathing practice and relaxation is associated with modest reductions in blood pressure and with small-to-moderate improvements in stress and low mood. The evidence is limited by small trials, high heterogeneity and the impossibility of blinding, and the largest Indian trial showed better self-rated health but no significant effect on cardiovascular events. Reported harms are mostly musculoskeletal and linked to forceful or advanced practices. Yoga and pranayama are reasonable, low-cost adjuncts when taught by qualified instructors and used alongside, not instead of, standard treatment, and well-designed trials are needed to define who benefits most.

Declaration, Conflict of interest and funding

The content presented herein is developed using AI tools, and is meant to help Researchers who are working in the fields of Yogic Science.

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Conflict of interest: The author declares no conflict of interest.
Ethics approval: Not applicable; this article is a literature-based narrative review and contains no new human or animal data.
Data availability: No new datasets were generated or analyzed.

Author Note

This manuscript is a narrative review and is not a treatment recommendation for an individual patient. The treatment, generally, should be taken only for a clinically justified indication and with appropriate medical monitoring by expert Yogi's.

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