

REVIEW ARTICLE

Evidence-Based Clinical Effectiveness of Kundalini Yoga: Systematic Review of RCTs Across Multiple Health Conditions

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ABSTRACT

Background • Kundalini Yoga (KY) integrates breathwork, meditation, dynamic movement, and chanting, and has gained recognition as a therapeutic intervention. Despite promising results from individual randomized controlled trials (RCTs), to our knowledge, no systematic review has exclusively synthesized RCT evidence on KY across health domains.

Objective • To critically assess the clinical effectiveness and safety of KY interventions across diverse cognitive, psychological, emotional, sleep-related, and physical health outcomes.

Methods • PRISMA-guided systematic review of RCTs evaluating KY was conducted from January 2015 to December 2024. Databases included MEDLINE (PubMed), Scopus, CENTRAL (Cochrane Library), Embase, PsycINFO, and CINAHL. Risk of bias was independently assessed using the Joanna Briggs Institute Critical Appraisal Checklist.

Setting • Studies were conducted worldwide, across multiple sites.

Participants • Approximately 1370 participants ranging from healthy adults to those diagnosed with conditions such as Mild Cognitive Impairment (MCI), Generalized Anxiety Disorder (GAD), Obsessive-Compulsive Disorder (OCD), Post-Traumatic Stress Disorder (PTSD), insomnia, chronic pain, and post-treatment Lyme disease syndrome. No serious adverse events were reported.

Intervention • KY protocols (pranayama, asana/kriya, meditation, chanting) delivered in person, online, or hybrid formats; duration 6 weeks-12 months (most 8-12 weeks) with practice from once weekly to daily.

Outcome Measures • Pre-specified validated measures assessed cognitive function, psychological symptoms (e.g., anxiety, depression), sleep quality, emotional regulation, and physical health outcomes (e.g., hippocampal metrics, absenteeism, blood pressure).

Results • This systematic review included 15 studies, among which 13 demonstrated a low risk of bias. The findings suggest that KY significantly improves memory, executive functioning, and hippocampal structure, reduces symptoms of anxiety, PTSD, OCD, and depression, enhances sleep quality and emotional regulation, and modestly improves fatigue, blood pressure, and functional outcomes.

Conclusion • KY appears safe and shows benefits for a wide range of cognitive, psychological, and physical health conditions. However, larger, standardized RCTs with active comparators, biomarkers, and longer follow-up are needed. (*Altern Ther Health Med*. [E-pub ahead of print.]

Keywords • Kundalini Yoga, randomized controlled trials, cognitive function, mental health, sleep, PTSD, hypertension, complementary therapy, mind-body intervention

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INTRODUCTION

Kundalini Yoga (KY), also known as the “Yoga of Awareness” or “Kundalini Kriya Yoga,” is a multifaceted mind-body practice that synthesizes physical postures (asanas), breath regulation (pranayama), chanting (mantras), meditation, and guided relaxation.¹ Rooted in ancient yogic traditions and popularized in the West during the 1960s by Yogi BhaJan, KY is now practiced globally as a spiritual and therapeutic discipline.²⁻⁴ Unlike other forms of yoga that primarily emphasize flexibility or fitness, Kundalini Yoga integrates calming and energizing techniques through sequenced “kriyas” that unite movement, breath, sound, and

focused attention to harmonize the autonomic and endocrine systems, regulate emotional states, and awaken the dormant kundalini energy believed to lie at the base of the spine.²⁻⁶

Kundalini Yoga is uniquely characterized by its structured use of kriyas, pranayama techniques such as Breath of Fire and alternate nostril breathing, and meditative or chanting practices such as kirtan.^{3,4,7} Classes often emphasize one of three modes: kriya-centric sessions targeting physiological or psychological outcomes, meditation-centric sessions promoting mental clarity, or bhakti-centric chanting to uplift emotional well-being, yet all maintain KY's core goal of promoting holistic health through energetic balance and neuroendocrine harmony.^{3,4,8,9}

As interest in integrative and complementary therapies grows, KY has gained recognition for its potential in addressing a wide range of cognitive, psychological, and physical health conditions.^{8,10} Systematic reviews and meta-analyses have shown that yoga practices, including KY, can reduce symptoms of anxiety, depression, and insomnia, while improving cardiovascular and musculoskeletal outcomes.¹⁰⁻¹³ However, existing literature often groups different yoga styles, such as Hatha, Iyengar, Vinyasa, and KY under a single umbrella, obscuring the specific mechanisms and outcomes associated with KY's distinct features, such as its emphasis on breathwork, sound resonance, and spiritual insight.¹³⁻¹⁴

Emerging evidence highlights KY's ability to enhance neuroplasticity, modulate stress response systems, and improve cognitive and emotional regulation.¹⁵ Neuroimaging studies suggest KY may lead to increased hippocampal volume, preserved gray matter, and enhanced functional connectivity in older adults at risk of neurodegenerative disorders like Alzheimer's disease.¹³⁻¹⁵ Smaller clinical trials also report promising effects of KY in alleviating symptoms of Generalized Anxiety Disorder (GAD), obsessive-compulsive disorder (OCD), and posttraumatic stress disorder (PTSD), along with benefits in sleep quality, self-esteem, blood pressure regulation, fatigue, and immune function.^{3,16}

KY techniques such as Kirtan Kriya, which involve repetitive chanting, specific hand positions, and visualization, have demonstrated efficacy in enhancing cognitive function and reducing emotional distress.^{12,13} Moreover, KY's adaptable framework allows it to be tailored to specific populations and health challenges, reinforcing its value as a low-risk, holistic intervention with broad therapeutic applications.^{9,11}

Despite this promising evidence, the research on KY remains fragmented, with most published trials being small, underpowered, and limited in scope. No prior systematic review could be identified that exclusively focused on evaluating the effects of KY across health domains using only randomized controlled trials (RCTs), representing the gold standard of clinical evidence. As such, KY's efficacy, generalizability, and safety remain underexamined in a comprehensive and rigorous format.

To address this critical gap in the literature, the present study conducted a systematic review of RCTs published between 2015 and 2024 to evaluate the effects of KY across

four core health domains: (1) cognitive and neurological outcomes, (2) psychological and emotional health, (3) sleep and stress regulation, and (4) physical health and functional outcomes. This review exclusively includes RCTs to assess the methodologically rigorous evidence available. By synthesizing findings across diverse populations and outcomes, this review aims to provide public health practitioners, clinicians, and researchers with an evidence-informed understanding of KY's therapeutic potential, limitations, and future directions.

METHODS

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.¹⁷ The review protocol was registered with the Open Science Framework (OSF) (<https://doi.org/10.17605/OSF.IO/MBFYJ>). The research question was developed based on the Participants, Interventions, Comparators, and Outcomes (PICO) framework, focusing on the effects of KY interventions on cognitive, psychological, and physical health outcomes.¹⁸

Inclusion Criteria

Studies were selected according to the PICOS framework:

Participants (P): Human participants of any age, sex, or clinical background.

Intervention (I): KY interventions are delivered either in person or online.

Comparator (C): Any comparison groups, including sleep hygiene interventions, cognitive behavioral therapy (CBT), waitlist controls, or other active interventions.

Outcomes (O): Primary outcomes included cognitive performance, neuroimaging findings, mental health conditions (e.g., anxiety, PTSD, OCD), sleep quality, emotional self-regulation, and physical health outcomes such as blood pressure and chronic pain. Secondary outcomes included any reported evaluation of the intervention.

Study Design (S): Only RCTs were included.

Other Criteria: Studies must be published in English, peer-reviewed journal articles, quantitative analysis, from selected databases, and conducted in any global setting.

Exclusion Criteria

Studies were excluded if they (1) were not RCTs (e.g., observational studies, qualitative studies, or case reports), (2) did not explicitly describe the intervention as KY, (3) were not published in English, (4) focused only on feasibility or study design without reporting health-related outcomes, or (5) from gray literature or not from selected databases.

Search Strategy

A comprehensive literature search was conducted across the following electronic databases (Table 1): MEDLINE (PubMed), Web of Science, Scopus, and the Cochrane Library. The search included studies published from January 2015 to December 2024. Boolean operators and keyword combinations such as "Kundalini Yoga," "cognitive function,"

“memory impairment,” “Mild Cognitive Impairment (MCI),” “Alzheimer’s disease,” “mental health,” “anxiety,” “depression,” “PTSD,” “OCD,” “insomnia,” “sleep disturbance,” “blood pressure,” “chronic pain,” and “randomized controlled trial” or “RCT” were used. Additional eligible articles were identified by manually reviewing the reference lists of the included studies and relevant systematic reviews.

Selection of Studies

All retrieved citations were imported into a citation management system, and duplicates were removed. Two independent reviewers conducted the initial screening of titles and abstracts. Full-text articles of potentially eligible studies were retrieved and evaluated against the inclusion criteria. Discrepancies were resolved through discussion or, if necessary, with the input of a third reviewer.

Article Screening and Data Collection

The screening protocol followed a three-step process: (1) removal of duplicates, (2) title and abstract screening, and (3) full-text review. Where ambiguity existed, articles were retained for full-text evaluation. A standardized data collection form was used to extract key information from the included studies. The following data were captured and summarized in an Excel spreadsheet: (i) Study title, author(s), year, and country, (ii) Participant characteristics (age, clinical condition, sample size), (iii) Study design and intervention duration, (iv) Description of KY intervention and control conditions, (v) Primary and secondary outcome measures, and (vi) Key findings and conclusions.

Synthesis of Findings

Due to considerable heterogeneity in study populations, intervention durations, outcomes, and types of control groups, a narrative synthesis was performed. Studies were thematically grouped by health outcome domains, cognitive function, sleep and stress regulation, mental health disorders, and physical health outcomes. The key results and methodological limitations of each study were reviewed and summarized to inform overall conclusions.

Quality Assessment

Assessment of bias for each study was conducted independently by two reviewers (SR and AB) using the Joanna Briggs Institute (JBI) critical appraisal tools for RCTs.¹⁹ The risk of bias for each included study was categorized as follows: very low- met all criteria, low- met more than half of the criteria, moderate- met half of the criteria, and high- failed to meet the majority of criteria. The summarized quality appraisal results are presented in Table 5.

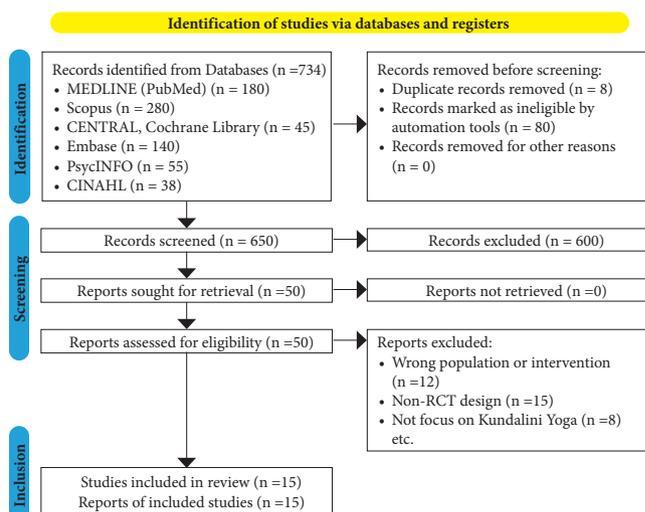
Study Selection and PRISMA Flow

The study selection process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines.¹⁷ A total of 738 records were identified through database searches. After 88 duplicates had been removed, 650

Table 1. Search Strategy Medline (PubMed)

Search
Kundalini Yoga [All Fields] AND (“cognitive function”[All Fields] OR “memory impairment”[All Fields] OR “mild cognitive impairment”[MeSH Terms] OR “MCI”[All Fields]) OR (“mental health”[MeSH Terms] OR “anxiety”[All Fields] OR “depression”[All Fields] OR “PTSD”[All Fields] OR “OCD”[All Fields]) OR (“insomnia”[All Fields] OR “sleep disturbance”[All Fields]) OR (“blood pressure”[MeSH Terms] OR “chronic pain”[All Fields]) OR (“randomized controlled trial”[Publication Type] OR “RCT”[All Fields])) AND ((humans[Filter]) AND (english[Filter]) AND (2015:2024[pdat])) Filters: Randomized Controlled Trial
Translations
<ul style="list-style-type: none"> • Kundalini Yoga: “Kundalini Yoga”[All Fields] • Cognitive Outcomes: “cognitive function”[All Fields] OR “memory impairment”[All Fields] OR “mild cognitive impairment”[MeSH Terms] OR “MCI”[All Fields] • Mental Health Conditions: “mental health”[MeSH Terms] OR “anxiety”[All Fields] OR “depression”[All Fields] OR “PTSD”[All Fields] OR “OCD”[All Fields] • Sleep Disturbances: “insomnia”[All Fields] OR “sleep disturbance”[All Fields] • Physical Health Outcomes: “blood pressure”[MeSH Terms] OR “chronic pain”[All Fields] • Study Design: “randomized controlled trial”[Publication Type] OR “RCT”[All Fields] • Filters: humans[MH], english[LA], 2015/01/01–2024/12/31[Date - Publication]

Figure 1. PRISMA Diagram of Included Studies



articles remained for title and abstract screening. Following initial screening, 50 full-text articles were assessed for eligibility based on the predefined inclusion and exclusion criteria. Of these, 35 articles were excluded for reasons such as not being RCTs (n = 15), not using KY as the primary intervention (n = 12), or lacking relevant outcome data (n = 8).

A total of 15 RCTs were included in the final qualitative synthesis. The studies included were grouped by outcome domains: Cognitive and neurological outcomes (n = 5); Sleep and stress regulation (n = 2); Anxiety, PTSD, and mental health disorders (n = 6); and, Physical health and pain management (n = 2).

Figure 1 presents the full PRISMA flow diagram, detailing the number of records identified, screened, excluded, and included at each stage of the review.

RESULTS

The reviewers confirmed the accuracy of the data extraction process and developed a PRISMA flow diagram (see Figure 1) and a PRISMA checklist, which are provided in the appendix.

Study Characteristics

This systematic review included 15 RCTs examining the effects of KY interventions across clinical and non-clinical

populations. All studies employed RCT designs, with various intervention modalities including in-person, online, or hybrid formats. These studies evaluated the efficacy of KY in improving outcomes such as sleep quality, cognitive functioning, stress reduction, PTSD symptoms, chronic pain, anxiety, and emotional regulation. Publication years ranged from 2015 to 2024, with studies conducted in countries like the USA, Canada, Sweden, Spain, Portugal, and Brazil. This highlights the global interest in KY as a complementary health intervention (Table 2).

Sample Characteristics: Age and Gender

The participant populations across the included studies varied in age, gender, and clinical background. Most studies involved adult participants ranging from 18 to 65 years, with a few studies including older adults or clinical subgroups such as veterans with PTSD, individuals with MCI, and patients experiencing insomnia or chronic pain. Across studies, the total sample was 1,370 participants. The sample sizes ranged from 28 to 210 participants. Several studies reported a predominance of female participants, particularly in studies related to anxiety, emotional self-regulation, or chronic pain, which aligns with the higher prevalence of such conditions among women. Overall, the gender distribution was either balanced or skewed towards females, and the

studies broadly reflected heterogeneous clinical and demographic populations (Tables 2-4).

Intervention Characteristics

The interventions were standardized to KY protocols, often incorporating breath regulation (pranayama), physical posture (asanas), meditation, and chanting. The duration of interventions ranged from 6 weeks to 12 months (most 8–12 weeks), with session/home-practice frequency ranging from once weekly to daily. Some studies delivered interventions through trained instructors in group settings, while others utilized online formats, enhancing accessibility. Control conditions included waitlist controls, sleep hygiene education, CBT, health education, or no treatment controls. Several studies also compared KY with other active interventions, assessing relative efficacy on mental and physical health outcomes (Tables 2-4).

Synthesis of Intervention Outcomes

Across the 15 RCTs, consistent improvements were reported in mental health outcomes such as anxiety, PTSD, depressive symptoms, and sleep quality. Cognitive benefits were observed in studies targeting memory and executive function, particularly among older adults with mild cognitive impairment. Physical health improvements included

Table 2. Summary of Studies with a Focus on Interventions (N=15)

Study	Country	Population & Sample	Theory/Model/Framework Used	Design	Intervention Description	Intervention Duration	Salient Findings
Jindani et al. (2015)	Canada	Adults with PTSD (n=80)	Trauma recovery & resilience	RCT, 8 sessions	KY vs waitlist control	8 sessions	Reduced PTSD symptoms; improved resilience (d = 0.25)
Hofmann et al. (2015)	USA	Adults with GAD (n=230)	Mindfulness vs CBT	3-arm RCT, 12 weeks	KY vs CBT vs stress education	12 weeks	KY non-inferior to CBT; both > stress education
Eyre et al. (2016)	USA	Older adults with MCI (n=81)	Neuroplasticity model	RCT, 12 weeks	KY vs memory training	12 weeks	KY non-inferior to CBT; both > stress education.
Wolff et al. (2016)	Sweden	Hypertensive adults (n=191)	Autonomic regulation	RCT, 12 weeks	Short home-based MediYoga (KY-derived) + usual care vs usual care	12 weeks	Reduced depression (HADS-D, $P < .05$); BP not significant
Brämberg et al. (2017)	Sweden	Workers with chronic back pain (n=159)	Workplace Wellness Framework	RCT, 12 months	KY vs strength training vs advice	12 months	Decreased absenteeism in adherent KY users (RR = 0.47, $P = .001$)
Shannahoff-Khalsa et al. (2019)	Brazil	Adults with OCD (n=48)	Y-BOCS symptom modulation	RCT, 4.5 months	KY vs Relaxation Response meditation	4.5 months	Decreased OCD symptoms (Y-BOCS; $P < .05$)
Simon et al. (2021)	USA	GAD adults (n=226)	CBT comparison	3-arm RCT, 12 weeks	KY vs CBT vs stress education	12 weeks	KY > stress education; CBT > KY ($P < .05$)
Khalsa et al. (2021)	USA	Insomnia patients (n=40)	Behavioral sleep medicine	RCT, 8 weeks	KY vs sleep hygiene	8 weeks	Increased sleep efficiency; reduced insomnia ($P < .001$)
Romero-Martinez et al. (2021)	Spain	Healthy adults in Spain (n=46)	Transpersonal psychology	RCT, brief daily meditation	Kirtan Kriya vs Internal Conflict Resolution	Daily brief meditation (6 weeks)	Improved self-esteem; emotional self-efficacy ($P < .05$)
Ibrahim et al. (2022)	Canada	Healthy older adults (n=11)	Neurobiological aging	Pilot RCT, 12 weeks	KY vs psychoeducation	12 weeks	Right-hippocampal volume increased specifically after KY ($P = .034$).
Krause-Sorio et al. (2022)	USA	Women with SCD & CVRFs (n=22)	Neurodegeneration prevention	RCT, 12 weeks	KY + KK vs MET	12 weeks	Reduced gray matter atrophy ($P < .05$)
Murray et al. (2022)	USA	PTLDS adults (n=29)	Mind-body integrative model	RCT, 8 weeks	KY vs waitlist	8 weeks	Decreased cognitive concerns and fatigue ($P < .01$)
Kilpatrick et al. (2023)	USA	Older women with subjective memory decline (n=22)	Neurofunctional connectivity	RCT, 12 weeks	KY vs MET	12 weeks	Greater increases in anterior-hippocampal DMN connectivity after KY ($P < .001$); stress reduction related to KY-linked connections.
Brandão et al. (2024)	Portugal	University students (n=106)	Holistic wellness	RCT, 6 weeks	Online KY vs autogenic training vs no treatment	6 weeks	Increased self-compassion; spiritual well-being ($P < .05$)
Grzenda et al. (2024)	USA	Older women with SCD & CVRFs (n=79)	Psychoneuroimmunology	RCT, 24 weeks	KY vs MET (12 weeks) + 12-week follow-up. KY vs MET; 6-week active phase with 6- and 12-month follow-ups	24 weeks total	Improved subjective cognition; decreased inflammatory markers ($P < .05$)

Abbreviations: KY, Kundalini Yoga; RCT, Randomized Controlled Trial; CBT, Cognitive Behavioral Therapy; CVRFs, Cardiovascular Risk Factors; GAD, Generalized Anxiety Disorder; HADS-D, Hospital Anxiety and Depression Scale-Depression subscale; KK, Kirtan Kriya; MET, Memory Enhancement Training; MCI, Mild Cognitive Impairment; OCD, Obsessive-Compulsive Disorder; PTLDS, Post-Treatment Lyme Disease Syndrome; PTSD, Post-traumatic stress disorder; RR, Relative Risk; SCD, Subjective Cognitive Decline; SE, Stress Education; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; DMN, Default Mode Network; BP, Blood Pressure.

Table 3. Summary of Studies with a Focus on Methodology (N=15)

Study	Design Type	Blinding	Sample Size	Outcome Measures
Jindani et al. (2015)	RCT	Not reported	Moderate (n=80)	PTSD scales, well-being
Hofmann et al. (2015)	3-arm RCT	Partial (assessor)	Large (n=230)	GAD, mindfulness, CGI
Eyre et al. (2016)	RCT	Partial (assessor-blinded)	Moderate (n=81)	Validated cognitive + MRI
Wolff et al. (2016)	RCT	None stated	Large (n=191)	BP, HADS, QOL
BrAomberg et al. (2017)	RCT	Assessor-blinded	Moderate (n=159)	Absenteeism, disability scales
Shannahoff-Khalsa et al. (2019)	RCT	Assessor-blinded Phase 1	Small (n=48)	Y-BOCS, secondary psychiatric
Simon et al. (2020)	3-arm RCT	Participant and assessor	Large (n=226)	Validated GAD scales
Khalsa et al. (2021)	RCT	Assessor-blinded	Small (n=40)	ISI, PSQI
Romero-Martinez et al. (2021)	RCT	Not reported	Small (n=46)	Self-report emotional/cognitive
Ibrahim et al. (2022)	RCT	Not reported	Very small (n=11)	MRI, cognitive
Krause-Sorio et al. (2022)	RCT	Assessor-blinded	Small (n=22)	MRI, resilience scales
Murray et al. (2022)	RCT	None stated	Small (n=29)	Validated fatigue/cognition
Kilpatrick et al. (2023)	RCT	Assessor-blinded	Small (n=22)	fMRI, cognitive
Brandeo et al. (2024)	RCT	Not reported	Moderate (n=106)	Validated psychological scales
Grzenda et al. (2024)	RCT	Assessor-blinded	Moderate (n=79)	Cognitive, immunological

Abbreviations: RCT, Randomized Controlled Trial; PTSD, Post-traumatic stress disorder; GAD, Generalized Anxiety Disorder; MCI, Mild Cognitive Impairment; CVRFs, Cardiovascular Risk Factors; HADS, Hospital Anxiety and Depression Scale; BP, Blood Pressure; QOL, Quality of Life; ISI, Insomnia Severity Index; PSQI, Pittsburgh Sleep Quality Index; MRI, Magnetic Resonance Imaging; fMRI, Functional Magnetic Resonance Imaging; CGI, Clinical Global Impressions; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale.

Table 4. Intervention Summaries

Authors & Year	Intervention summary
Simon et al. (2020)	Randomized 3-arm, 12-week group treatments matched on time and contact: KY, CBT, and SE. Each arm delivered twelve 120-minute sessions to cohorts of 4–6 participants, with 20 minutes of daily homework. KY combined postures, breath regulation, relaxation, meditation, and yoga theory/ethics; masked independent raters assessed outcomes.
Khalsa & Goldstein (2021)	8-week program for chronic primary sleep-onset insomnia comparing KY to an active sleep-hygiene program. Both conditions had an initial 60-minute instruction plus weekly check-ins; participants kept daily sleep diaries and completed questionnaires through treatment and at 6-month follow-up. KY was taught as a self-care framework with minimal instructor burden.
Brandão et al. (2024)	Online randomized controlled trial in university students: six weekly sessions over 6 weeks of KY vs autogenic relaxation (active control). Participants completed standardized questionnaires at baseline, end-of-intervention, and 1-month follow-up; yoga improved self-compassion and spiritual well-being vs control.
Murray et al. (2022)	8-week, manualized small-group KY feasibility program for post-treatment Lyme disease symptoms (PTLDS). Sessions were 90 minutes weekly, led by IKYTA-certified instructors; participants were encouraged to practice at home and received weekly email check-ins. Adherence and attendance were monitored (e.g., median 7 of 8 sessions attended).
Ibrahim et al. (2022)	Pilot randomized 1:1 KY (12 weeks) vs psychoeducation (10 weeks) in older adults with MCI. Once-weekly 2-hour sessions at a mental health institute in Kentucky included a customized mix of postures, pranayama, and meditation, with 30 minutes of daily home practice. Psychoeducation covered memory and healthy-aging content, accompanied by similar homework. Pre/post-MRI assessed hippocampal volume alongside cognitive testing.
Eyre et al. (2016)	RCT comparing KY (group classes plus KK homework) with Memory Enhancement Training (MET) in mild cognitive impairment. The study examined cognition and mood over 3 and 6 months; KK involves chanting “Saa-Taa-Naa-Maa,” finger mudras, and visualization, and can be practiced for 11 or 32 minutes/day.
Romero-Martinez et al. (2021)	Two-arm randomized comparison in a nonclinical adult sample: KK (mantra-based) vs Inner Conflict Resolution (non-mantra), both beginner-friendly KY meditations. Participants committed to daily 11-minute practice for 40 days, recruited online via a KY center; email support was provided; self-report measures were collected pre-/post.
Shannahoff-Khalsa et al. (2019)	Randomized clinical work comparing an OCD-specific KY meditation protocol vs the Relaxation Response. KY emphasized an “OCD-specific” unilateral forced nostril breathing (left-nostril UFNFB) within an 11-part protocol (8 primary & 3 optional techniques); authors discuss neurophysiological rationale (right-hemisphere effects) and symptom-management components. Outcomes tracked (e.g., Y-BOCS, DY-BOCS, POMS, BAI, BDI).
Simon et al. (2020)	RCT with three 12-week arms: KY, CBT, and SE. Each had twelve 120-minute sessions plus daily homework (20 minutes). KY combined postures, breathing, relaxation, meditation, and yogic ethics, delivered in small groups with masked outcome raters.
Khalsa & Goldstein (2021)	8-week program comparing KY to sleep-hygiene training in chronic insomnia. Both groups had a 60-minute introductory session, followed by weekly follow-ups, diaries, and questionnaires. KY is framed as a low-cost self-care tool, taught with minimal instructor burden.
Brandão et al. (2024)	Online RCT with university students. Six weekly KY sessions (via Zoom) vs autogenic relaxation. Baseline, post, and 1-month follow-up assessments. KY improved self-compassion and spiritual well-being.
Murray et al. (2022)	8-week feasibility trial of small-group KY (weekly 90-minute sessions) for post-treatment Lyme disease. Certified instructors, home practice encouraged with weekly email check-ins. Most participants completed ≥7 of 8 sessions.
Ibrahim et al. (2022)	Pilot RCT in older adults with MCI. 12-week KY (weekly 2h sessions + 30 min/day home practice) vs 10-week psychoeducation. MRI is used to assess hippocampal changes. Both had homework; KY emphasized pranayama, postures, and meditation.
Eyre et al. (2016)	RCT comparing KY + KK homework to MET in MCI. KK involved chanting + mudras (11–32 min/day). Outcomes: Cognition and mood at 3 & 6 months.
Romero-Martinez et al. (2021)	RCT: KK vs Inner Conflict Resolution (two KY meditations). Both groups practiced for 11 minutes per day for 40 days, recruited through KY centers, with pre- and post-online measures.
Shannahoff-Khalsa et al. (2019)	RCT for OCD comparing an 11-part KY meditation protocol (incl. left-nostril breathing, mantras, postures) to relaxation response. Used Y-BOCS and other psychiatric scales over 16 months.
Kilpatrick et al., (2023)	12-week KY & KK vs Memory Training, in women with memory decline & cardiovascular risks. Pre/post fMRI hippocampal connectivity measured. KY targeted stress-related networks, MET sensory-memory.
Grzenda et al., (2024)	RCT in older women at AD risk (n=79): 12-week KY vs Memory Training, weekly 60-minute classes & 12-minute daily KK homework. Blood samples for RNA sequencing and cytokines. KY improved subjective cognition and altered immune aging markers.
Krause-Sorio et al. (2022)	RCT in women with SCD & cardiovascular risks: 12-week KY+KK vs MET. Pre/post MRI showed KY prevented gray matter atrophy compared to MET, especially in prefrontal and hippocampal regions.
Jindani et al. (2015)	Pilot RCT with 80 PTSD patients: 8-session KY trauma program vs waitlist control. Weekly classes, breathing, postures, meditation. KY improved sleep, affect, stress, and resilience, with small to moderate effect sizes.
Hofmann et al. (2015)	Protocol for multi-site RCT in 230 adults with GAD: KY vs CBT vs Stress Education. 12 weekly group sessions (4-6 participants). Aimed to test the KY non-inferiority to CBT and superiority over control, with follow-ups at 6 months.
Wolff et al. (2016)	Large Swedish RCT (n=191 hypertensive patients): 12-week home-based KY program, 15 min twice daily vs usual care. Primary outcome: blood pressure; secondary: QoL, anxiety, depression. Both groups improved BP, yoga had small QoL/depression benefits.
Brämberg et al. (2017)	RCT (n=159 workers with chronic back/neck pain): KY vs strength training vs advice-only. Follow up at 6 weeks, 6 & 12 months. KY did not reduce absenteeism more than advice, but adherent participants (≥2 times per week) showed significant reductions in sick leave.

Abbreviations: KY, Kundalini Yoga; CBT, Cognitive Behavioral Therapy; SE, Stress Education; PTLDS, post-treatment Lyme disease symptoms; IKYTA, International Kundalini Yoga Teacher’s Association; MCI, Mild Cognitive Impairment; RCT, Randomized Controlled Trial; MRI, Magnetic Resonance Imaging; MET, Memory Enhancement Training; OCD, Obsessive-Compulsive Disorder; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; KK, Kirtan Kriya; fMRI, Functional Magnetic Resonance Imaging; PTSD, Post-Traumatic Stress Disorder; DY-BOCS, Dimensional Yale-Brown Obsessive Compulsive Scale; POMS, Profile of Mood Scales; BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; SCD, Subjective Cognitive Decline; AD, Alzheimer’s Disease.

Table 5. Study Quality Assessment

S. No	Author, Year	True Randomization	Allocation Concealed	Groups Similar at Baseline	Participants Blinded	Providers Blinded	Assessors Blinded	Groups Treated Identically	Follow-up Complete & Described	Analyzed as Randomized	Outcomes Measured Same Way	Outcomes Measured Reliably	Appropriate Statistical Analysis	Trial Design Accounted For	Overall Risk of Bias
1	Jindani et al. (2015)	✓	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓	✓	Low
2	Eyre et al. (2016)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
3	Khalsa et al. (2016)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Low
4	Wolff et al. (2016)	✓	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓	✓	Low
5	Brämberg et al. (2017)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
6	Shannahoff-Khalsa et al. (2019)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
7	Simon et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Low
8	Brandão et al. (2021)	✓	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓	✓	Low
9	Khalsa et al. (2021)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
10	Romero-Martinez et al. (2021)	✓	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓	✓	Low
11	Ibrahim et al. (2022)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
12	Krause-Sorio et al. (2022)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
13	Murray et al. (2022)	✓	✓	✓	X	X	✓	✓	✓	✓	✓	✓	✓	✓	Low
14	Kilpatrick et al. (2023)	✓	X	✓	X	X	✓	✓	Partial	✓	✓	✓	✓	✓	Moderate
15	Grzenda et al. (2024)	✓	X	✓	X	X	✓	✓	Partial	✓	✓	✓	✓	✓	Moderate

reductions in chronic pain and blood pressure. Emotional self-regulation and stress management have also significantly improved, particularly in trauma-affected populations. Studies employing neuroimaging and physiological assessments corroborate behavioral improvements with changes in brain function or autonomic regulation. Overall, KY demonstrated effectiveness across multiple domains of well-being (Table 2), supporting its use as an integrative health intervention in diverse populations.

DISCUSSION

This systematic review of 15 RCTs published between 2015 and 2024 offers robust evidence that KY is a structured integrative practice that combines breath regulation, movement, chanting, and meditation, providing multidimensional benefits across cognitive, psychological, physical, and biological health domains. The studies span diverse clinical and non-clinical populations, including older adults at risk for neurodegeneration, individuals with GAD, OCD, PTLDS, insomnia, hypertension, chronic pain, and emotionally stressed university students. Collectively, these findings highlight KY as a low-risk, accessible, and adaptable intervention with potential for improving resilience, self-regulation, and overall well-being (Tables 2 and 3).

Cognitive and Neurological Outcomes

The most consistent and compelling findings emerge from studies on aging-related cognitive function and neurological integrity. Across five RCTs, improvements in memory, executive function, and subjective cognition were accompanied by neurobiological changes observed via MRI and biomarker analysis. Significant increases in hippocampal volume have been reported following KY interventions, and improved hippocampal

connectivity has also been demonstrated.^{10,20} Additionally, gray-matter preservation and enhancements in cognitive functioning and immune regulation have been associated with KY participation.²⁰⁻²² These results emphasize KY’s potential as a non-pharmacological tool for mitigating neurodegeneration and promoting brain health in aging populations.

Psychological Health: Anxiety, PTSD, Depression, and OCD

Seven trials have examined KY’s impact on psychological symptoms, particularly anxiety-related disorders. KY was found to be non-inferior to SE but inferior to CBT for reducing GAD symptoms in a large, well-powered trial.^{5,8,10,13,15,16} Reductions in PTSD symptoms and increased resilience were reported among trauma-exposed individuals.¹⁵ Two trials focusing on OCD found significant symptom reductions, with participants in the KY group showing greater improvements in Y-BOCS scores compared to those practicing Relaxation Response meditation.⁸ For chronic sleep-onset insomnia, KY reportedly improves sleep outcomes relative to an active sleep-hygiene comparator.⁵

Self-Esteem, Emotional Efficacy, and Mood

In non-clinical populations, KY has the capacity to cultivate psychological well-being. Daily KY meditation was found to improve self-esteem, mood, and emotional self-efficacy among healthy adults.²³ KY also improved university students’ mood regulation and emotional resilience during the COVID-19 pandemic.²⁴

Immune Function and Inflammation

A particularly novel contribution is KY’s potential role in modulating immune and inflammatory markers. In

women at risk for Alzheimer's disease, KY was associated with improvements in cognition, alongside distinct immunologic signatures (e.g., attenuation of aging-related immune patterns).²² These findings suggest biobehavioral mechanisms through which KY may influence health.

Fatigue, Pain, and Functional Performance

KY helps improve physical functioning and reduce symptom burden in somatic conditions. Patients with PTLDS reported reduced fatigue and improved cognitive clarity following an 8-week KY program.²⁵ Although KY did not significantly outperform strength training in reducing back pain, it was associated with reduced sickness absenteeism among adherent participants; secondary outcomes favored KY or strength training on some pain/disability measures.²⁶ In primary-care hypertension, an RCT found blood-pressure reductions in both KY and usual-care groups without between-group differences, though small mood and quality-of-life benefits favored KY.²⁷

Sleep Quality and Stress Regulation

Two high-quality trials assessed KY's effectiveness in regulating sleep and stress. KY significantly reduced insomnia severity compared to sleep-hygiene education (Insomnia Severity Index).^{5,28} Improved sleep quality and reduced academic stress were also observed among university students practicing KY.²⁴

Statistical Significance of Kundalini Yoga Outcomes

As summarized in Table 2, several RCTs demonstrated statistically significant benefits of KY, mostly with *P* values below the conventional significance threshold of .05. For example, Khalsa et al. (2021) reported significant improvements in sleep efficiency ($P < .05$)⁵, while Murray et al. (2022) observed reductions in fatigue and cognitive concerns with similar levels of statistical significance.²⁵ Kilpatrick et al. (2023) found increased hippocampal connectivity in older women ($P < .01$), and Krause-Soriot et al. (2022) demonstrated significantly reduced gray matter atrophy ($P < .05$).^{10,21} Grzenda et al. (2024) further linked KY to statistically significant decreases in inflammatory markers ($P < .05$) with improvements in subjective cognition.²² In contrast, Wolff et al. (2016) did not observe significant reductions in blood pressure ($P \geq .05$), despite reporting improvements in depressive symptoms.²⁷ The findings across these trials suggest that the psychological and cognitive benefits of KY are statistically reliable and significant, while some physiological outcomes remain less consistent and warrant further investigation involving larger, well-powered studies.

Strengths and Public Health Implications

A significant strength of this review lies in its exclusive inclusion of RCTs, the gold standard for evaluating intervention efficacy. Most studies were methodologically rigorous, involving the use of validated instruments and defined protocols and reporting high adherence and safety.

KY's successful delivery across both in-person and online formats further supports its real-world applicability and scalability.

Limitations

- (i) Small sample sizes and feasibility designs in many trials limited statistical power and generalizability.
- (ii) Short intervention and follow-up periods, often only 8–12 weeks with ≤ 6 months follow-up, made the long-term effects unclear.
- (iii) Populations were narrow, such as older women, university students, or single-site samples, which reduced external validity.
- (iv) Methodological issues included single blinding, unequal program durations, lack of proper active controls, and limited randomization in some studies.
- (v) Adherence and attrition challenges were common, with self-reported practice, demanding homework protocols, and higher dropout in yoga groups.
- (vi) Outcomes often relied on self-report measures like diaries and questionnaires, with limited objective tools such as actigraphy, biomarkers, or long-term neuroimaging.

Despite these limitations, the overall pattern of results spanning biological, psychological, and functional outcomes strongly supports KY's integration into preventive and therapeutic strategies. Given its low cost, minimal risk, accessibility, scalability, and adaptability, KY may serve as a valuable complement to conventional care, particularly for underserved or treatment-resistant populations.

Future Research Directions

Future RCTs should prioritize more extensive and more diverse samples, standardized intervention protocols, and longer-term follow-up assessments. Incorporating biological endpoints, such as inflammatory cytokines, cortisol levels, neuroimaging biomarkers, and autonomic function, will help unravel the underlying mechanisms. Additionally, pragmatic trials and implementation science approaches will help explore the integration of KY into community health settings, digital platforms, and multidisciplinary care models.

CONCLUSION

This systematic review of 15 randomized controlled trials demonstrates that Kundalini Yoga (KY) is a promising mind-body intervention with positive effects on mental health, cognitive function, sleep quality, and stress-related symptoms. Across diverse populations, KY was found to be associated with improvements in anxiety, depression, post-traumatic stress disorder, mild cognitive impairment, and overall emotional well-being. Benefits were observed in both in-person and online formats, suggesting that KY is adaptable and accessible across different delivery contexts. Although sample sizes and intervention protocols varied, most trials reported low to moderate risk of bias and employed validated

outcome measures. Collectively, the evidence supports KY as a complementary approach to mental and cognitive health, particularly for individuals seeking holistic and non-pharmacological strategies.

Future research should aim to standardize protocols, explore underlying mechanisms, and conduct large-scale, long-term studies to strengthen the evidence base. In addition, findings from several trials highlight improvements not only in psychological outcomes but also in physiological indicators such as heart rate variability, immune function, and sleep patterns, underscoring KY's integrative impact on both mind and body. With its low-risk profile and growing body of supportive evidence, KY has the potential to serve as an accessible and scalable tool for promoting health and well-being, particularly in communities with limited access to conventional healthcare resources.

Definitions of Specialized Yoga Terms

Pranayama, Comes from Sanskrit *prana* (“breath, energy, or life force”) and *yama* (“pause, regulation, or expansion”). Often translated as “breathing practices,” but more broadly refers to the regulation of the breath, or control/expansion of the life force.²⁹ Sudarshan Kriya Yoga (SKY), A structured breathing practice involving rhythmic cycles of slow, medium, and fast breathing (rhythmic hyperventilation at different rates).³⁰ Kriya-centric, Kriya-centric term used in yoga and meditation literature to describe practices or interventions that are primarily organized around kriyas, structured sequences of postures, breathing patterns, mantras, and meditative techniques rather than free-form or posture-only yoga. In Kundalini Yoga research, a “kriya-centric” intervention refers to a practice that revolves around specific kriya protocols designed to achieve targeted physical, mental, or energetic goals.⁸⁸

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DATA AVAILABILITY

Data can be shared on request.

AUTHOR DISCLOSURE STATEMENT

The authors have nothing to declare, and there is no competing interest.

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AUTHORSHIP CONTRIBUTION STATEMENT

Sharmistha Roy and Ashis Kumar Biswas contributed equally to conceptualization, protocol development, literature search, article screening, data extraction, synthesis of findings, and drafting of the manuscript. Dr. Manoj Sharma provided overall guidance, supervision, and validation of the review methodology, interpretation of findings, and critical revisions of the manuscript. All authors reviewed and approved the final version of the manuscript.

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