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REVIEW ARTICLE

Remotely Delivered Yoga for Chronic Musculoskeletal and Widespread Pain: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Background: Chronic musculoskeletal pain is a leading cause of global disability, and guidelines recommend exercise-based approaches including yoga. In-person delivery embeds barriers of travel, cost, and scheduling, and remote delivery is advocated to overcome them, but no systematic review has examined it in this population.

Methods: Five databases were searched to June 2026 for randomized controlled trials of yoga delivered predominantly online to adults with chronic musculoskeletal or widespread pain. Co-primary outcomes were pain intensity and physical function. Risk of bias (RoB) was assessed using RoB 2 and certainty using Grading of Recommendations, Assessment, Development and Evaluation. Findings were synthesized narratively by International Classification of Diseases-11 pain category; meta-analysis was not appropriate.

Results: Six trials (589 participants, five conditions) were included: Five delivered supervised synchronous classes, and one an unsupervised pre-recorded program. Function improved relative to control in four trials. Effects on pain were inconsistent and clinically important in only one, in which live-streamed classes reduced pain and disability in chronic low back pain at 12 weeks, sustained to 24 weeks. Unsupervised asynchronous yoga did not reduce knee pain. Three trials were at some concerns and three at high RoB. No serious adverse events occurred, although minor musculoskeletal events were more frequent with yoga where systematically collected. Certainty was moderate to very low. All trials invoked access barriers, yet none recruited an access-limited population or measured travel burden.

Conclusion: Remotely delivered yoga appears safe and may improve physical function, but the evidence is sparse and of low certainty, delivery mode remains confounded, and the equity rationale on which it is advocated is untested.

1. INTRODUCTION

Chronic musculoskeletal pain is among the largest contributors to global disability. Low back pain alone affected an estimated 619 million people worldwide in 2020 and is projected to rise to 843 million by 2050, remaining the single leading cause of years lived with disability across most countries and age groups.[1,2] Musculoskeletal conditions more broadly – encompassing osteoarthritis, neck pain, and the inflammatory arthropathies – affect well over one and a half billion people and impose sustained costs on individuals, health systems, and economies.[3] These conditions are characteristically persistent, recurrent, and only partially responsive to pharmacological management, and the populations they most affect are aging, a demographic shift that will widen the gap between need and service capacity over the coming decades.[1]

The way chronic pain is conceptualized has also shifted. The eleventh revision of the International Classification of Diseases, 11th Revision (ICD-11) introduced, for the first time, a systematic taxonomy of chronic pain that distinguishes chronic primary pain – where pain is the disease itself, as in fibromyalgia and non-specific low back pain – from chronic secondary pain arising from an identifiable underlying disorder, such as osteoarthritis or axial spondyloarthritis.[4,5] This distinction

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matters clinically because it separates conditions in which nociplastic mechanisms and altered central pain processing predominate from those driven principally by structural or inflammatory pathology.[6] It also matters for evaluating interventions, because a treatment that engages the autonomic and affective dimensions of pain might be expected to perform differently across these mechanistic categories – a possibility rarely examined directly.

Clinical guidelines across jurisdictions consistently recommend exercise and active, non-pharmacological approaches as first-line care for chronic musculoskeletal pain, while acknowledging that the evidence does not favor any single exercise modality over another.[7,8] Yoga occupies a distinctive position within this landscape. As a mind–body practice combining physical postures, breath regulation, and meditative attention, it engages several plausible mechanisms relevant to persistent pain: Down-regulation of sympathetic arousal and the hypothalamic–pituitary–adrenal stress axis, enhancement of parasympathetic (vagal) tone and heart-rate variability, reduction of allostatic load, and cultivation of interoceptive awareness that may recalibrate maladaptive pain processing.[9-11] A Cochrane review of yoga for chronic non-specific low back pain concluded that yoga probably produces small-to-moderate improvements in pain and function compared with no exercise, though the certainty of evidence was limited and benefits at longer follow-up were uncertain.[12] Comparable signals have been reported for osteoarthritis and inflammatory arthritis, positioning yoga as a credible component of multimodal pain care.[13]

Yet the conventional delivery of yoga – supervised, in-person, group-based classes – embeds precisely the barriers that limit access to structured exercise for the people who might benefit most. Travel, cost, class scheduling, geographic distance, limited local provision of appropriately trained instructors, and the mobility limitations imposed by the pain itself all constrain participation, particularly for older, rural, and functionally impaired populations.[14] Remotely delivered yoga – provided through synchronous videoconferencing, live-streamed classes, asynchronous pre-recorded programs, or dedicated applications—has been advanced as a solution to these barriers, promising to extend an evidence-based intervention to those for whom in-person attendance is impractical.

The COVID-19 pandemic accelerated this shift dramatically, prompting a rapid and largely unplanned migration of exercise and rehabilitation services to remote formats, and normalizing digital delivery for both providers and patients.[15] This expansion has, however, exposed a paradox central to the equity argument for remote care. The populations for whom remote delivery is most often advocated – older adults, those in rural or under-served areas, people of lower socioeconomic status – are frequently the same groups least able to access it, owing to a persistent digital divide encompassing limited broadband, device availability, and e-health literacy.[16-18] Whether remotely delivered yoga genuinely reaches and benefits access-limited populations, or whether it has principally been evaluated in digitally advantaged groups, is therefore an empirical question of considerable importance rather than a settled assumption.

The evidence base has grown substantially, but existing syntheses do not resolve these questions. Earlier reviews of online or remotely delivered yoga were general in scope, focused on feasibility and acceptability, and conducted searches that concluded before the post-pandemic surge in primary trials.[19] More recent synthesis has been confined to oncology populations.[20] No review has specifically examined remotely delivered yoga for chronic musculoskeletal and chronic widespread pain, despite this being one of the most active areas of recent trial activity and one in which the mode of delivery—synchronous versus asynchronous, supervised versus unsupervised—may plausibly moderate effectiveness.

This systematic review therefore aims to evaluate the effectiveness, safety, and acceptability of remotely delivered yoga for adults with chronic musculoskeletal and chronic widespread pain. Beyond estimating effects on pain and function, it examines whether outcomes vary by underlying pain mechanism and by mode of remote delivery, and assesses the extent to which trials have recruited the access-limited populations that the rationale for remote delivery is intended to serve.

2. METHODS

2.1. Protocol and Registration

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines,[21] with synthesis reported following synthesis without meta-analysis (SwiM),[22] and was conducted according to the Cochrane Handbook.[23] The protocol was prospectively registered on the Open Science Framework (10.17605/OSF.IO/TPD2V) before formal screening began.

2.2. Eligibility Criteria

Studies were eligible for inclusion if they met the following criteria using the Population, Intervention, Comparator, Outcome, Study design framework.[24]

2.3. Population

Adults aged 18 years or older with musculoskeletal or chronic widespread pain of at least 3 months' duration, established by clinical diagnosis or validated criteria. Eligible conditions spanned the ICD-11 categories of chronic primary musculoskeletal pain (non-specific low back and neck pain), chronic widespread pain (fibromyalgia), and chronic secondary musculoskeletal pain (osteoarthritis, spondyloarthritis, rheumatoid arthritis). Chronic widespread pain was included rather than excluded on mechanistic grounds: ICD-11 classifies fibromyalgia and non-specific low back pain within the same parent category, so excluding one while retaining the other would be inconsistent. Pain mechanism was instead treated as a subgroup variable. We excluded pain predominantly of visceral, neuropathic, orofacial, headache, pelvic or cancer-related origin, and post-surgical cohorts. Mixed populations required at least 75% eligible participants, or disaggregated data.

2.4. Intervention

Yoga delivered predominantly or wholly by remote means. Trials had to describe the intervention as yoga or a named yoga tradition and include physical postures (*asana*) as a core component, with breath regulation, meditation and relaxation permitted as adjuncts; interventions in which mindfulness or meditation was the primary active component were excluded. At least 75% of prescribed instructed sessions had to be delivered via an internet-connected platform: Synchronous videoconferencing, asynchronous pre-recorded video, or application-delivered programs. Interventions delivered by DVD, manual, audio or telephone alone were excluded, as were in-person interventions with remote practice only as a home-exercise adjunct.

2.5. Comparator

Any comparator, including inactive controls, active non-yoga comparators, in-person yoga and alternative remote formats; comparator type was used to structure the synthesis.

2.6. Outcomes

Co-primary outcomes were pain intensity and physical function, measured on any validated scale. Secondary outcomes were adherence, attrition, adverse events, quality of life, psychological outcomes and sleep.

2.7. Study Design

Randomized controlled trials, including randomized pilot and feasibility trials, were included.

2.7.1. Information sources and search strategy

PubMed, Scopus, Web of Science, Physiotherapy Evidence Database and Cochrane Library were searched from inception to June 2026. The strategy combined controlled vocabulary and free-text terms across two blocks, yoga and remote delivery, with a third block for musculoskeletal and chronic pain conditions where sensitivity permitted. The remote-delivery block was deliberately broad, reflecting inconsistent terminology in this literature. No trial design filter, date limit or language restriction was applied. Grey literature (e.g., theses, conference abstracts) was excluded to prioritize peer-reviewed evidence.

2.7.2. Study selection and data extraction

Two reviewers independently screened the titles, abstracts, and full texts using Rayyan software, with disagreements resolved by consensus or by a third reviewer.[25] Data were extracted using a piloted standardized form by one reviewer and verified by a second. Extracted domains were study characteristics; participant characteristics including ICD-11 category and baseline scores; recruitment route and access-related characteristics, including urban–rural distribution, socioeconomic indicators, digital access prerequisites, and whether travel burden was measured; intervention characteristics including delivery mode, supervision, platform, yoga style, dose and instructor qualification; comparator characteristics; and outcome data with adherence, attrition and adverse events.

2.7.3. Risk of bias (RoB) and certainty of evidence

RoB was assessed using the Cochrane RoB 2 tool at the outcome level for both co-primary outcomes (pain intensity and physical function), independently by two reviewers with disagreements resolved by consensus or a third reviewer.[26] Because participant blinding to a yoga intervention is not feasible and primary outcomes were participant-reported, all trials were expected to carry some concerns for performance and detection bias; these domains were interpreted in that context. Certainty of evidence for the co-primary outcomes was rated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach.[27]

2.7.4. Data synthesis

Meta-analysis was not undertaken: The small number of eligible trials, distributed across heterogeneous conditions and comparators, meant that pooling would have produced spuriously precise summary estimates. Findings were synthesized narratively following SwiM, structured by ICD-11 pain category and comparator type, and described in terms of direction of effect, magnitude relative to established minimal clinically important differences, consistency across trials, and certainty of evidence. Vote counting by direction of effect was not used. Three groupings were examined descriptively and treated as hypothesis-generating: ICD-11 pain category; delivery mode (synchronous versus asynchronous, supervised versus unsupervised); and comparator type. Finally, the access rationale stated in each trial's background was compared against its recruitment route and sample composition, to assess whether trials advocating remote delivery had recruited populations facing the barriers invoked.

3. RESULTS

3.1. Study Selection

The search initially identified 744 records from the five databases. After removing 424 duplicates, 320 records underwent title and abstract screening. Of these, 292 were deemed irrelevant based on predefined eligibility criteria. Full-text review of the remaining 28 articles led to the exclusion of 22 studies that did not meet the inclusion criteria. Consequently, six clinical trials were included in this systematic review.[28-33] The PRISMA flow diagram is presented in Figure 1.

3.2. Characteristics of Included Studies

The six trials randomized 589 participants and were published between 2022 and 2026. Two were conducted in Turkey, two in the United States, one in Australia and one in India. Study, participant, and intervention characteristics are summarized in Table 1. Populations spanned four ICD-11 categories: Knee osteoarthritis,[28] ankylosing spondylitis,[29,30] non-specific chronic low back pain,[31] fibromyalgia,[32] and mixed chronic musculoskeletal pain in veterans.[33]

The interventions were divided along the axis most relevant to this review. Five delivered supervised, synchronous, instructor-led classes by videoconference;[29-33] one delivered an unsupervised, asynchronous program through pre-recorded video.[28] Programs ran from 4 to 12 weeks. Comparators were inactive in five trials, online education,[28] wait-list,[29,31] standard care,[30] and no intervention.[32] No trial used an active non-yoga comparator, and only two followed participants beyond the end of the intervention, both to 24 weeks.[28,31]

3.3. RoB

RoB assessments are presented in Figures 2 and 3. Three trials were judged overall to have some concerns,[28-30] and three at high RoB.[31-33] Two trials had problems with missing outcome data: Outcome completion was markedly lower in the yoga arm than the control arm in one trial (67.6% vs. 87.0% at 12 weeks),[31] and attrition reached 50% in the in-person arm of the other, against 17% in the tele-yoga arm.[33] The third trial at high risk reported no registration or protocol, so prespecification of outcomes could not be verified.[32] Across the remaining domains, three trials analyzed participants as randomized while three excluded participants after randomization and analyzed completers only, one of which additionally required 70% session attendance for inclusion in the analysis without reporting how many participants this removed.[30] All six trials were rated with some concerns for measurement of the outcome, since primary outcomes were participant-reported and blinding of participants to a yoga intervention is not feasible.

3.4. Effects on pain intensity

Findings are summarized in Table 2 and were not pooled. Two trials reported a validated standalone measure of pain intensity against an inactive control. In chronic low back pain, virtual live-streamed classes

reduced pain more than wait-list at 12 weeks (mean difference −1.5, 95% confidence interval [CI] −2.2–−0.7) with the benefit sustained and larger at 24 weeks (−2.3, 95% CI −3.1–−1.6).[31] In knee osteoarthritis, unsupervised pre-recorded yoga did not reduce walking pain relative to online education at 12 weeks (−0.6, 95% CI −1.2–0.1), although more yoga participants reached the minimal clinically important difference (60% vs. 41%; relative risk 1.44, 95% CI 1.09–1.91), and no benefit remained at 24 weeks.[28]

In fibromyalgia, the between-group difference in pain favored tele-yoga (P = 0.047), but this reflected deterioration in the untreated control group rather than improvement with yoga: Median pain was unchanged in the yoga arm and rose in controls.[32] The two ankylosing spondylitis trials reported no standalone pain measure; pain was captured within composite disease-activity indices, both of which improved more with tele-yoga than control.[29,30] In the only head-to-head comparison, tele-yoga produced a statistically significant within-group reduction in pain severity while in-person yoga did not. Still, the between-group difference was not significant in a trial not powered for efficacy.[33]

3.5. Effects on Physical Function

Function improved more with remotely delivered yoga than with control in four trials. Effects were largest in chronic low back pain, where disability fell relative to wait-list at 12 weeks (−2.8, 95% CI −4.3–−1.3) and further by 24 weeks (−4.6, 95% CI −6.1–−3.1).[31] Both ankylosing spondylitis trials reported improved functional index scores.[29,30] In knee osteoarthritis, function improved relative to online education at 12 weeks (−4.0, 95% CI −6.8–−1.3), but the difference did not reach the minimal clinically important difference of six units and was not sustained at 24 weeks,[28] Disease impact did not differ significantly between groups in fibromyalgia,[32] and pain interference did not differ between delivery modes in the veteran trial.[33]

3.6. Adherence, Attrition and Safety

Adherence was high in the supervised synchronous programs, reaching a mean of 22 of 24 classes in one trial,[29] and 72% of prescribed classes in the tele-yoga arm of another,[33] but was low in the largest synchronous trial, where only 37% attended at least half of classes despite regular home practice.[31] In the unsupervised asynchronous program, participants completed a mean of 2.5 of three prescribed weekly sessions, and adherence declined once the program became optional.[28] One trial did not quantify adherence.[32]

No serious intervention-related adverse events were reported in any trial. Non-serious events were reported in one trial and were more frequent with yoga than control (13% vs. 1%), consisting mainly of transient musculoskeletal pain;[28] transient exacerbation of back pain was reported by three participants in another.[31] Three trials reported no adverse events,[29,30,32] and one reported none serious.[33]

3.7. Certainty of Evidence

Certainty of evidence is summarized in Table 3. No comparison reached high certainty. Certainty was moderate for pain and function in knee osteoarthritis and for function in ankylosing spondylitis, low for pain and function in chronic low back pain and for pain in ankylosing spondylitis, and very low for all outcomes in fibromyalgia and for the comparison of remote against in-person delivery. Downgrading was driven by imprecision in every stratum, since each was informed by one or two small trials, and by RoB in the three trials described above. Pain in ankylosing spondylitis was additionally downgraded for indirectness because no trial in that population measured pain directly.

3.8. Appraisal of the Access Rationale

All six trials justified remote delivery on grounds of access, citing travel, cost, scheduling, distance or mobility [Table 4]. No trial measured travel burden, distance or geographic access as an outcome. Recruited samples were generally not access-limited. One trial recruited from a self-insured health-system employee plan, and 74% of participants held a college degree.[31] Another recruited from the community online and reported that participants were English-speaking with high computer self-efficacy, acknowledging this as a limit to generalizability.[28] A third invoked barriers of transportation and rural distance from Veterans Affairs facilities, then restricted recruitment to veterans living within 20 miles of an urban medical center.[33] Internet access was a formal inclusion criterion in four trials,[28,29,32,33] and two reported excluding potential participants at screening for lacking it.[28,29] Only one trial provided participants with devices and connectivity support.[33]

4. DISCUSSION

Six randomized trials of remotely delivered yoga in chronic musculoskeletal and widespread pain have been published, all since 2022, together randomizing 589 participants across five conditions. Remotely delivered yoga improved physical function relative to inactive controls in four trials, but effects on pain were inconsistent and reached clinical importance in only one. No comparison achieved high certainty, and the most favorable estimates came from the trials at greatest RoB. Adverse events were consistently minor, and no serious intervention-related harm was reported. Every trial justified remote delivery by reference to access barriers, and none recruited a population characterized by them.

4.1. Comparison with in-Person Yoga

The virtual estimates in chronic low back pain exceed those pooled from in-person trials. The Cochrane review of yoga for chronic non-specific low back pain reported improvements in back-related function and pain against non-exercise controls that its authors judged clinically unimportant, with a mean difference of −1.69 points on the Roland–Morris questionnaire against a minimal clinically important difference of five points, and −4.53 on a 0–100 pain scale against a threshold of 15.[12] The single virtual trial in this review reported a disability difference of −2.8 points at 12 weeks widening to −4.6 at 24 weeks, and a pain difference equivalent to roughly 15 points on the same scale.[31] Taken at face value, this would suggest virtual delivery outperforms the in-person literature, which is implausible. More likely explanations are the wait-list comparator, which the trial's own authors identified as generating larger contrasts than the education controls common in earlier trials, and the differential loss of a third of the intervention arm before the primary timepoint.

The pattern reverses in osteoarthritis, where pooled in-person data favor yoga on pain and function, albeit at very low certainty,[34] yet the unsupervised asynchronous program here produced no reduction in pain and only a transient, sub-threshold gain in function.[28] Because this was the largest and most rigorously conducted trial in the set, its null result carries disproportionate weight, and the contrast with the supervised trials points to supervision rather than remoteness as the operative variable. This cannot be tested here: The only unsupervised trial is also the only asynchronous one, the only one with an active

education comparator, and the only one in a degenerative condition. Delivery mode, supervision, comparator and pathology are entirely confounded across these six trials.

4.2. Comparison with the Wider Telerehabilitation Evidence

A recent network meta-analysis of 37 trials of telerehabilitation for chronic musculoskeletal pain found that self-managed rehabilitation applications and videoconferencing platforms were the most effective delivery modes, with self-managed applications producing the largest reduction in pain.[35] Two observations follow. First, that review modeled delivery mode as the unit of comparison and did not treat yoga as a distinct intervention node, so the specific question of whether yoga behaves like other remotely delivered exercise remains unanswered. Second, its finding that self-managed applications performed well for pain sits uneasily beside the null pain result from the only self-directed yoga program in this review.[28] Yoga may depend more heavily on real-time observation and correction than the prescribed exercise programs that dominate telerehabilitation trials, but the two bodies of evidence are not directly comparable and this remains conjecture.

4.3. Comparison with Existing Reviews of Remote Yoga

Earlier syntheses of online yoga were general in scope and concerned with feasibility and acceptability rather than effectiveness, drawing on eight unique studies and using qualitative synthesis,[36] or mapping the field through scoping methods with searches concluding in 2021.[19] More recent work has been confined to oncology.[20] The present review is the first restricted to chronic musculoskeletal and widespread pain, and the first in this literature to apply RoB 2 and GRADE. Notably, a narrative review of tele-yoga for chronic pain published in 2018 identified methodological limitations and set out recommendations for future research;[37] the deficiencies it described – small samples, absent long-term follow-up, and a lack of adequately powered comparative trials – persist unchanged 8 years later.

4.4. Safety

No serious intervention-related harm occurred in any trial, which is reassuring given that one program was wholly unsupervised; but minor musculoskeletal events were markedly more common with yoga than control in the one trial that collected them systematically,[28] echoing the fourfold excess over no exercise seen in the in-person literature.[12] That three trials reported no adverse events at all more likely reflects absent surveillance than absent harm, so remotely delivered yoga can be called safe for serious harm but not yet for minor harm.

4.5. The Access Paradox

The most consistent finding of this review is a mismatch between rationale and recruitment. Trials invoked travel, cost, distance, mobility limitation and rural isolation, then recruited a health-system employee population of whom three-quarters held degrees,[31] a community sample the investigators themselves described as digitally confident,[28] and veterans living within 20 miles of an urban medical center despite a rationale built on rural distance from care.[33] Internet access was a formal eligibility requirement in four trials, two of which excluded applicants for lacking it.[28,29] and only one trial supplied devices and connectivity.[33] No trial measured travel burden or geographic access as an outcome.

This matters because the case for remote delivery is an equity case, and the equity case is untested. The trials establish that people who already have broadband, a device, digital literacy, and the physical capacity to follow an unsupervised class can benefit from yoga at home. They do not establish that remote delivery reaches anyone who could not otherwise attend. Commissioners considering virtual yoga as an access intervention should recognize that this is a hypothesis, not a finding.

4.6. Strengths and Limitations

Strengths include prespecified stratification by ICD-11 pain mechanism, formal risk-of-bias and certainty assessment, an absence of language restriction in a literature concentrated outside English-speaking settings, and structured appraisal of the access rationale.

The principal limitation is the small and heterogeneous evidence base, which precluded meta-analysis and left most strata informed by a single trial. Searches only covered five databases, so eligible trials may have been missed. Requiring physical postures as a core component excluded interventions in which mindfulness predominated, a defensible boundary that nonetheless removes trials others might include. Two trials measured pain only within composite disease-activity indices, and one reported no registration, limiting what could be verified.

4.7. Implications

For practice, remotely delivered yoga can reasonably be offered to motivated patients with chronic musculoskeletal pain who have the means to access it, on the basis of acceptability and safety rather than demonstrated superiority. It should not yet be commissioned as a solution to inequitable access. For research, three priorities follow. Trials should recruit the populations the rationale describes and measure travel burden, distance and digital access as outcomes rather than assuming them. Adequately powered head-to-head comparisons of synchronous against asynchronous and supervised against unsupervised delivery are needed to separate variables that are currently confounded. Moreover, trials in inflammatory arthritis should measure pain directly rather than within composite indices, so that this population can contribute to future synthesis.

5. CONCLUSION

Remotely delivered yoga for chronic musculoskeletal and widespread pain is supported by six small randomized trials, none of which provides high-certainty evidence. It appears acceptable to those who take it up and free of serious harm, and it improves physical function more consistently than pain, but the largest effects come from the trials at greatest RoB and no population is informed by more than two studies. Whether outcomes depend on synchronous or asynchronous delivery, or on the presence of a supervising instructor, cannot be determined from trials in which these features are entirely confounded.

The central weakness of this literature is not its size but its direction. Remote delivery is advocated as a means of reaching people for whom travel, cost, distance, or disability make in-person yoga impractical, yet no trial has recruited such a population or measured whether those barriers were overcome. Until trials are designed around the people the rationale describes, remotely delivered yoga should be offered as a convenient option for those already able to access it rather than commissioned as a remedy for inequitable access.

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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. CONFLICT OF INTERESTS

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

11. DATA AVAILABILITY STATEMENT

The data analyzed 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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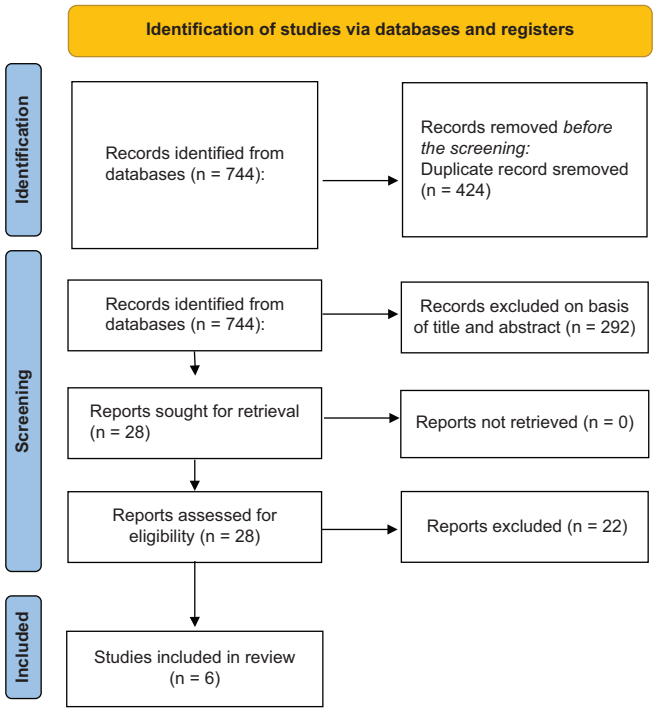

Figure 1: PRISMA 2020 flow diagram of study selection. PRISMA: Preferred reporting items for systematic reviews and meta-analyses

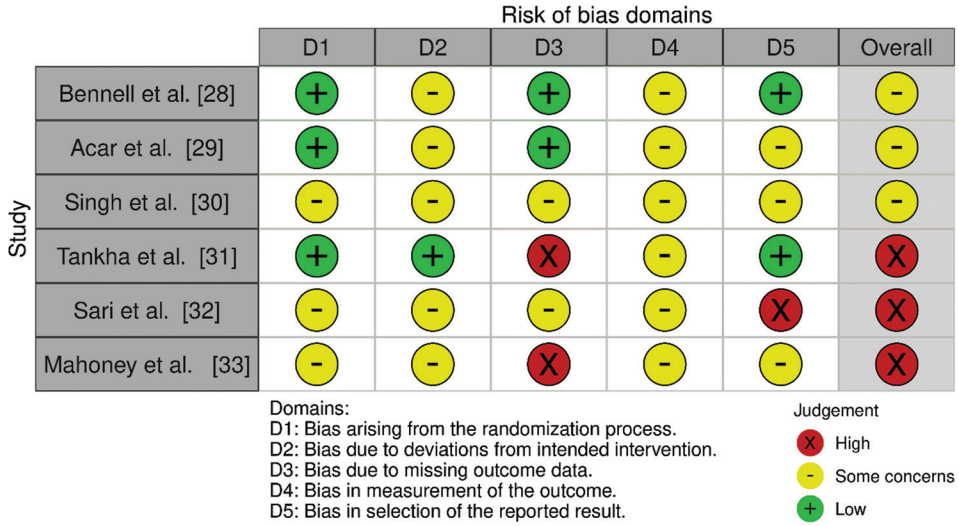

Figure 2: Risk of bias assessment using the RoB 2 tool across included studies

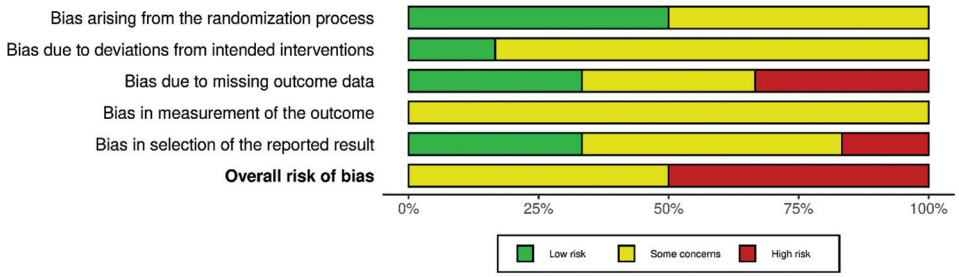

Figure 3: Summary plot of risk of bias assessments

Table 1: Characteristics of included studies

Study, country	Population (criteria)	ICD-11 category	Randomized *n* (yoga/control)	Age, mean (standard deviation); % female	Yoga intervention	Dose	Comparator	Outcome measures; timepoints
Bennell *et al*. (2022)[28] Australia	Knee osteoarthritis; NICE clinical criteria, age ≥45, knee pain ≥3 mo, walking pain ≥4/10	Chronic secondary MSK pain (degenerative)	212 (107/105)	62.3 (7.7); 69.8%	Hatha; asynchronous pre-recorded video; unsupervised; purpose-built website	1 new video/wk, each performed 3×/wk; 30 min; 12 wk; wholly home-based	Online OA education (same website, no yoga)	Pain: NRS walking 0–10 (MCID 1.8). Function: WOMAC 0–68 (MCID 6). 12 wk (primary), 24 wk
Acar *et al*. (2023)[29] Turkey	Ankylosing spondylitis; Modified New York criteria, age 20–60, internet access	Chronic secondary MSK pain (inflammatory)	60 (30/30); 55 analyzed	44.7 (7.6); 43.6%	Vinyasa; synchronous; supervised, groups ≤5; Zoom	3×/wk; 60 min; 8 wk; no home practice requested	Wait-list (standard medical care continued)	Function (primary): BASFI 0–10. No standalone pain measure; BASDAI 0–10. 8 wk
Singh *et al*. (2023)[30] India	Ankylosing spondylitis; New York criteria, HLA-positive, age 30–50, ≥3-yr history	Chronic secondary MSK pain (inflammatory)	109 (57/52)	34.7 (9.6); 16.5%	Integrated tradition-based module (loosening, āsana, prāṇāyāma, meditation, kriyā); synchronous; supervised; platform not specified	2×/wk; 60 min; 12 wk; home practice via video and picture modules	Standard care only	Disease activity incl. pain: BASDAI 0–10. Function: BASFI 0–10. Also ASQoL, ESR, CRP. 3 mo
Tankha *et al*. (2024)[31] USA	Non-specific chronic low back pain ≥12 wk; NRS ≥4; daily interference ≥half of days; age 18–64; health-plan members	Chronic primary MSK pain	140 (71/69)	47.8 (11.7); 80.7%	Hatha; synchronous live-streamed; supervised (2 instructors, 1 for safety); Webex; class recordings provided	1 class/wk; 60 min; 12 wk; 30 min/day home practice encouraged	Wait-list ("yoga later")	Pain: NRS 0–10. Function: RMDQ 0–23. Also analgesic use, sleep. 6, 12 (primary), 24 wk
Sari *et al*. (2025)[32] Turkey	Fibromyalgia; 2016 ACR criteria; female; age 18–65; internet and equipment access	Chronic widespread pain	34 (17/17); 31 analyzed	39.7 (6.9); 100%	Hatha; synchronous; supervised with verbal correction; Zoom and WhatsApp	1×/wk; 60 min; 4 wk; home practice not prescribed	No intervention (routine activity maintained)	Pain: NRS 0–10. Impact: FIQ 0–100. Also tender points, CSI-SF, FABQ, PSQI, FSS. 4 wk
Mahoney *et al*. (2026)[33] USA	Veterans with mixed chronic MSK pain (fibromyalgia-like, back, joint); DVPRS ≥4– <9 for ≥6 mo	Mixed chronic MSK pain	34 (tele 18/ in-person 16)	61.5 (17.2); 11.8%	Hatha/ Krishnamacharya; synchronous; supervised (instructor plus assistant); Zoom; iPad and props supplied	1 class/wk; 75 min; 12 wk; 15–20 min home practice on 5 non-class days	In-person yoga (identical protocol)	Pain: PEG 0–10, BPI severity. Interference: BPI, PROMIS-6b. Also BDI-II. End of treatment (12 wk)

Wk: Week, mo: month, Yr: Year, ACR: American College of Rheumatology, ASQoL: Ankylosing Spondylitis Quality of Life, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, BASFI: Bath Ankylosing Spondylitis Functional Index, BDI-II: Beck Depression Inventory-II, BPI: Brief Pain Inventory, CRP: C-reactive protein, CSI-SF: Central Sensitization Inventory Short Form, DVPRS: Defense and Veterans Pain Rating Scale, ESR: erythrocyte sedimentation rate, ICD-11: International Classification of Diseases, 11th Revision, FABQ: Fear-Avoidance Beliefs Questionnaire, FIQ: Fibromyalgia Impact Questionnaire, FSS: Fatigue Severity Scale, HLA: human leukocyte antigen, MCID: minimal clinically important difference, MSK: musculoskeletal, NICE: National Institute for Health and Care Excellence, NRS: Numerical rating scale, OA: Osteoarthritis, PEG: Pain: Enjoyment and General activity scale, PROMIS: Patient-Reported Outcomes Measurement Information System, PSQI: Pittsburgh Sleep Quality Index, RMDQ: Roland–Morris Disability Questionnaire, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index. Age is reported as the pooled mean across arms where arm-specific values were given. ICD-11 categories were assigned by the review team

Table 2: Effects on pain and physical function, adherence, attrition and adverse events

Study	Pain: Between-group effect (95% CI)	Function: Between-group effect (95% CI)	MCID reached	Adherence	Attrition	Adverse events
Bennell *et al*. (2022)[28]	NRS walking: 12 wk−0.6 (−1.2–0.1), NS 24 wk−0.3 (−1.0–0.4), NS	WOMAC function: 12 wk−4.0 (−6.8–−1.3) 24 wk−2.1 (−5.1–0.9), NS	No for both. More yoga participants reached MCID: Pain 60% versus 41% (RR 1.44, 1.09–1.91); function 60% versus 44% (RR 1.34, 1.02–1.76)	Mean 2.5 (SD 0.7) of 3 prescribed sessions/wk; 69% ≥2/wk in final week; declined after program became optional	8% missing both primary outcomes at 12 wk; balanced across arms	No serious related events. Non-serious related events more frequent with yoga: 13/97 (13.4%) versus 1/97 (1.0%), mainly transient musculoskeletal pain
Acar *et al*. (2023)[29]	No standalone measure. BASDAI group×time F=7.66, *P*=0.008, ηp²=0.13; within-yoga−1.53 (−2.05–−1.00)	BASFI group×time F=12.17, *P*=0.001, ηp²=0.19; within-yoga−1.32 (−1.78–−0.86); control−0.18 (−0.65–0.29), NS	Not assessable; no MCID applied	Mean 22.07 (SD 1.98) of 24 classes (92%)	5/60 (8%); 2 intervention, 3 control	None related to yoga reported
Singh *et al*. (2023)[30]	No standalone measure. BASDAI−0.79 (−1.30–−0.29), *P*=0.002	BASFI−0.86 (−1.59–−0.14), *P*=0.019	Not assessable; no MCID applied	Not quantified; ≥70% attendance required for inclusion in analysis	13 lost to follow-up (4 intervention, 9 control) plus 6 excluded for COVID-19	None observed
Tankha *et al*. (2024)[31]	NRS: 12 wk−1.5 (−2.2–−0.7), *P*<0.001 24 wk−2.3 (−3.1–−1.6), *P*<0.001	RMDQ: 12 wk−2.8 (−4.3–−1.3), *P*<0.001 24 wk−4.6 (−6.1–−3.1), *P*<0.001	30% reduction reached by more yoga participants at 12 wk: Pain 38.0% versus 20.3%; function 42.3% versus 24.6%	36.6% attended ≥50% of classes; median 4 (IQR 3–6) classes; home practice median 4 d/wk, mean 28.1 min/day	Differential: 12-wk completion 67.6% yoga versus 87.0% control; 24 wk 60.6% versus 89.9%	Uncommon and not serious. Three yoga participants reported transient exacerbation of back pain; one control participant a pre-existing neck pain flare
Sari *et al*. (2025)[32]	NRS (medians): Yoga 4→4, control 5→8. Between-group change *P*=0.047, d=0.76. Tender points *P*=0.002, d=1.33	FIQ: Yoga 70.3→64.0, control 70.4→59.0. Between-group change *P*=0.230, NS	Not assessable; no MCID applied	Not quantified; two consecutive absences led to exclusion	3/34 (9%), all in the control arm (two declined, one symptom flare)	None reported
Mahoney *et al*. (2026)[33]	PEG group difference−0.30, NS (tele-yoga within-group−1.45, *P*=0.003, d=−0.82; in-person NS). BPI severity group difference−0.80, NS, d=−0.45	BPI interference group difference−0.43, NS (tele-yoga within-group−0.99, *P*=0.020). PROMIS-6b group difference−2.99, NS, d=−0.46	Not assessable; feasibility trial not powered for efficacy	Tele-yoga 8.62/12 classes (71.8%); in-person 9.25/12 (77.1%). Protocol adherence 75% versus 60%. fidelity 91%	Differential: In-person 8/16 (50%); tele-yoga 3/18 (17%)	No serious adverse events

Effects are between-group differences at the end of intervention unless a timepoint is stated; negative values favor yoga. Results were not pooled. Abbreviations as for Table 1. Wk: Week, NS: Not statistically significant, RR: Relative risk, d, Cohen's d; ηp², partial eta squared, SD: Standard deviation. Acar *et al*. 2023 and Singh *et al*. 2023 reported no standalone measure of pain intensity; pain is captured only within the composite BASDAI. Sari *et al*. 2025 reported non-parametric statistics and medians, so their estimates are not directly comparable with the mean differences reported by the other trials. Mahoney *et al*. 2026 compared remote with in-person yoga, and its clinical outcomes were secondary to feasibility endpoints

Table 3: GRADE summary of findings

Population and comparison	Outcome	Trials (participants)	Effect at end of intervention	Certainty	Reasons for downgrading
Chronic primary MSK pain (low back pain) versus wait-list[31]	Pain intensity	1 (140)	MD−1.5 (−2.2–−0.7); sustained to 24 wk	Low	Risk of bias (−1); imprecision (−1)
	Physical function	1 (140)	MD−2.8 (−4.3–−1.3); −4.6 at 24 wk	Low	Risk of bias (−1); imprecision (−1)
Chronic secondary MSK pain, degenerative (knee OA) versus online education[28]	Pain intensity	1 (212)	MD−0.6 (−1.2–0.1), NS	Moderate	Imprecision (−1)
	Physical function	1 (212)	MD−4.0 (−6.8–−1.3); below MCID	Moderate	Imprecision (−1)
Chronic secondary MSK pain, inflammatory (ankylosing spondylitis) versus inactive control[29,30]	Pain intensity	2 (164)	No standalone estimate; within composite disease-activity index, favoring yoga	Low	Indirectness (−1); imprecision (−1)
	Physical function	2 (164)	BASFI MD−0.86 (−1.59–−0.14)[30]; significant group×time[29]	Moderate	Imprecision (−1)
Chronic widespread pain (fibromyalgia) versus no intervention[32]	Pain intensity	1 (31)	Between-group differencefavoring yoga (P=0.047), driven by control deterioration	Very low	Risk of bias (−1); imprecision (−2)
	Disease impact	1 (31)	No significant between-group difference	Very low	Risk of bias (−1); imprecision (−2)
Mixed MSK pain: remote versus in-person yoga[33]	Pain intensity	1 (34)	Group difference NS; within-group reduction in tele-yoga only	Very low	Risk of bias (−1); imprecision (−2)
	Pain interference	1 (34)	Group difference NS	Very low	Risk of bias (−1); imprecision (−2)

BASFI: Bath ankylosing spondylitis functional index, GRADE: Grading of Recommendations, Assessment, Development and Evaluation, MCID: Minimal clinically important difference, MD: Mean difference, MSK: Musculoskeletal, NS: Not statistically significant, OA: Osteoarthritis. Negative effect estimates favor yoga. Certainty (GRADE): High – further research very unlikely to change confidence in the estimate; Moderate – further research likely to have an important impact; Low – further research very likely to have an important impact; Very low – any estimate is very uncertain. Certainty was assessed per outcome within each ICD-11 stratum and comparator type. Imprecision was rated down in every stratum because each was informed by one or two small trials not meeting the optimal information size; where a single trial contributed, inconsistency could not be assessed. Risk of bias was rated down where the contributing trial(s) were at overall high risk (Tankha *et al*. 2024, Sari *et al*. 2025, Mahoney *et al*. 2026). Pain in ankylosing spondylitis was rated down for indirectness because neither trial measured pain as a standalone outcome. Publication bias could not be formally assessed in any stratum. No comparison reached high certainty

Table 4: Stated access rationale compared with characteristics of the recruited sample

Study	Stated access rationale	Recruited sample	Internet a formal inclusion criterion?	Devices/ connectivity provided?	Travel or geographic access measured?
Bennell *et al*. (2022)[28]	Online delivery reaches a wide audience at little or no cost regardless of location and overcomes barriers to exercise participation	Community volunteers recruited online; English-speaking with high computer self-efficacy; the authors noted this as a limit to generalizability	Yes	No (participants used own devices)	No
Acar *et al*. (2023)[29]	Removes barriers of distance, working hours and travel time	Patients from a university rheumatology department; internet access required	Yes	Not reported	No
Singh *et al*. (2023)[30]	Provides a platform for home-based rehabilitation extending beyond the pandemic	Members of a patient society; educational status significantly imbalanced between arms	Not stated (online participation implied)	Video and picture modules provided	No
Tankha *et al*. (2024)[31]	Virtual delivery removes barriers of scheduling, travel and mobility, and affords privacy	Self-insured health-system employee plan members; 74% college-educated; 81% female; 82% White	No (device/internet implied)	Mat, manual and class recordings	No
Sari *et al*. (2025)[32]	Telerehabilitation overcomes time and travel barriers and is cost-effective	Outpatient clinic patients, urban; women only; internet and equipment required	Yes	Not reported	No (perceived exercise burden measured, not travel)
Mahoney *et al*. (2026)[33]	Overcomes barriers of space, time and transportation, particularly for rural veterans distant from Veterans Affairs facilities	Veterans recruited within a 20-mile radius of an urban medical center; 88% male; ~26% employed full-time	Yes (Wi-Fi and space required)	iPad, holder, mat, props and Bluetooth speaker supplied	No (qualitative comments on travel only)

MSK: Musculoskeletal, OA: Osteoarthritis. Rationale statements are paraphrased from each trial's introduction or background. "Recruited sample" summarises the enrolled population on the characteristics relevant to the stated access barrier. No trial measured travel burden, distance to care, or geographic access as a study outcome. This table underpins the review's appraisal of the access rationale: every trial justified remote delivery by reference to barriers of travel, cost, distance or mobility, yet the recruited samples were predominantly digitally connected, urban, and in several cases socioeconomically advantaged, and internet access was itself an eligibility requirement in four of the six trials