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How yoga interventions are operationalized and reported in the context of mental health and wellbeing RCTs: a systematic review and qualitative synthesis

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Abstract

Background Yoga is a popular intervention demonstrating promising impacts for mental health and wellbeing. Despite growing research interest, yoga remains poorly operationalized and inconsistently described in scientific literature, hindering dissemination, rigorous evaluation, and replication. This systematic review aims to address this critical knowledge gap by examining how yoga is operationalized in recent mental health and wellbeing research.

Methods We conducted a systematic review of literature from January 2013 to August 2024. Terms relating to yoga, mental health, wellbeing, and interventions were used to search MEDLINE, CINAHL, Embase, Emcare, PsycINFO, and Scopus. Randomized controlled trials that included yoga as the primary intervention and reported a validated measure of mental ill-health, mental wellbeing, or quality of life, were included. Inductive qualitative analyses of yoga definitions and descriptions were conducted.

Results Of 5206 studies identified, 129 were included with exclusion primarily due to study design. Qualitative analysis resulted in a total of 1291 meaning units (MU). Yoga definitions suggest that yoga is operationalized as a *practice*, *complementary and alternative medicine*, or *system* (e.g., encompassing philosophy and practices) with *mind-body* or *mind-body-spirit* aspects. Components of yoga included *physical* such as postures, *mental* such as meditation, and *breath*.

Conclusions This is the first systematic review to comprehensively analyze how yoga is operationalised and reported in recent experimental mental health and wellbeing research. Generally, yoga is operationalized as a mind-body or mind-body-spirit practice comprising mental, physical, and breathing components. We provide recommendations to improve the translation and implementation of yoga interventions.

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Keywords Mental health, Wellbeing, Yoga, Physical activity, Holistic, Intervention, Review

Introduction

Mental disorders are increasingly recognized as the leading cause of disease burden and poor quality of life globally [1, 2]. Commonly co-presenting with other mental health conditions and comorbid physical health conditions, individuals face significantly higher risk of cardiometabolic diseases contributing to premature mortality of up to 15–20 years compared to the general population [3]. Recognizing that mental health is more than the absence of disorder and suffering [4], wellbeing is operationalized as positive aspects of mental health including positive affect and life satisfaction (i.e., subjective wellbeing), meaning, purpose, and related concepts (i.e., psychological wellbeing) [5]. Yoga, an increasingly popular intervention [6, 7], has demonstrated promising impacts for wellbeing [8, 9], with evidence for improved mental health [10, 11] and overall quality of life [12]. Substantial research on yoga within the past decade [13, 14] indicates a plethora of positive health benefits, including improved cognition [15] and both chronic and acute conditions such as cardiovascular health and pain management [16, 17]. However, yoga, with its ancient origins and rising popularity in Western countries as a health and wellness activity, remains inconsistently defined and described as a behavioral intervention in the academic literature [18–20], limiting the dissemination, interpretation, replicability, and implementation of the benefits of yoga.

"Yoga" originates from Ancient India (3,500 B.C.) [21]. Modern yoga evolved from medieval Hindu Hatha yoga before being translated, colonized, and commercialized into "an internationally recognized practice that emphasizes physical & emotional wellbeing" in the 20th century [21, 22]. Consequently, there are numerous styles and variations of modern yoga, often emphasizing the physical practice and omitting more traditional spiritual components [20]. The word "yoga" stems from the Sanskrit word *yuj* often translated as "union" or "to unite the mind, body, and spirit" [21]. Broadly, ancient practices of yoga did not include flowing movement, but instead largely consisted of expansion of the 'vital energy' by means of sustained physical posture (*asana*); breath (*pranayama*); sounds (*nada*); and single-pointed focus, or placement of the mental faculty (*dharana*) [21, 23]. Much of modern yoga practice is based on the "Eight Limbs of Yoga" (also known as Ashtanga or Raja yoga) from the Yoga Sutras, ancient texts from the 4th – 5th century [21, 23]. The eight limbs of yoga are often described as: (1) moral values or restraints (*yama*), (2) ethical observances (*niyama*), (3) poses or postures (*asana*), (4) breath regulation (*pranayama*), (5) sense withdrawal (*pratyahara*), (6) single-pointed concentration (*dharana*), (7) single-pointed meditation (*dhyana*), and (8) union or integration with the Divine, sometimes termed enlightenment (*samadhi*) [21, 23]. Modern yoga for public health promotion often includes the three yoga practices of movement (*asana*), breathwork (*pranayama*), and meditation (*dhyana*) [19]. However, the ancient history and broad, heterogeneous range of activities in yoga continues to make defining and describing the word "yoga" a challenge for researchers [18–20].

Overall, the gaps in defining and describing yoga prevents accurate interpretation, translation, replication, and dissemination, hindering progression of yoga research and its integration into the mainstream field of behavioral health research [18–20]. By reviewing how yoga is defined and described, we can disseminate current practices to provide information from which researchers may base decisions in evidence to promote clarity, improve consistency, and reduce ambiguity. Therefore, this systematic review aims to (1) describe how definitions and descriptions of modern yoga practice are operationalized according to peer-reviewed literature within the context of mental health and wellbeing interventions, and (2) describe how yoga definitions, types, and components are utilized across population groups and geographical locations.

Methods

Protocol and registration

The protocol for this systematic review was prospectively registered on PROSPERO (registration number: CRD42023455373) and results are reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [24].

Search strategy and selection of studies

The following electronic databases were searched from January 2013 to August 2024: MEDLINE (Ovid), CINAHL (EBSCOhost), Embase (Ovid), Emcare (Ovid), PsycINFO (Ovid) and Scopus. Search terms relating to yoga, mental health, wellbeing and intervention were used (see Supplementary File 14 for full search strategy). Additional searches via Google Scholar and scanning reference lists of included papers and review articles were also undertaken to identify any additional studies.

Inclusion and exclusion criteria

The population, intervention, comparison, outcomes and study type (PICOS) framework was used to develop the inclusion criteria as follows: *population*: any population; *intervention*: interventions where yoga was the primary component (>50% of total intervention time). Eligible interventions were any that included a structured, formal, and premeditated activity involving the integration of at least two yoga components (e.g., postures and movement, breathing, and/or mindfulness/mental practices) to improve physical and/or mental health and wellbeing [10]. Interventions were eligible irrespective of type of yoga, setting, delivery method (e.g., in person or online), or dose (frequency, intensity and duration); *comparator*: all comparators are eligible for inclusion; *outcome*: validated measures of mental ill-health (e.g., depression, anxiety, etc.), mental wellbeing (e.g., flourishing, stress, etc.), or quality of life listed as a primary outcome. Due to the broad and differing definitions of wellbeing [25], we are considering wellbeing measures listed as per van Agteren's 2021 review [5]. Studies that focused on momentary affective states were considered outside the scope of this review and were excluded. *Study type*: randomized controlled trials (RCTs). We focused specifically on RCTs as these represent the gold standard for intervention research and are the primary evidence base informing clinical practice guidelines. RCTs require detailed intervention descriptions for replication purposes, providing comprehensive data on how yoga is operationalized in experimental contexts. While other study designs could provide insights into yoga conceptualization, our research question specifically aimed to understand intervention operationalization within rigorous experimental frameworks that directly influence clinical implementation.

Data management and extraction

Search results were imported into Covidence (Veritas Health Innovation, Melbourne, Australia) where duplicates were removed. Title/abstract and full-text screening were completed independently and in duplicate by six authors (MCF, KSB, DED, MZG, DEO, KMM), with disagreements resolved by team discussion with a senior author (MCF, MR, or JB). Data were extracted in duplicate by five authors independently (KSB, DED, MZG, DEO, KMM), with discrepancies resolved by collaboratively reviewing the original text, coders describing the justification for their coding, and final discussion until consensus was reached, with a third reviewer available for mediation (MCF, MR, or JB). As this review does not focus on the effectiveness of these interventions, risk of bias was considered outside the scope of this review and not assessed. A systematic tool was used to extract the following data from each study: definition of yoga, description of yoga intervention, study population (i.e., apparently healthy, elevated mental health symptoms, diagnosed mental health condition, other chronic health condition), continent of first author, country of first author, study aim / research question, primary outcome (i.e., anxiety, depression, stress/destress, wellbeing, quality of life), comparator condition (i.e., active comparison group, attention control, no intervention / waitlist control, treatment-as-usual / standard care), sample characteristics (i.e., sample size, mean age, % female, drop out), funding, use of reporting guidelines, study stage according to the National Institute of Health (NIH) Stage Model for Behavioral Intervention Development [26], and yoga intervention delivery format (i.e., in-person, digital, self-guided, live, group, individual [1:1], not reported), difficulty level (i.e., low, medium, high, variable), duration (i.e., 0–6 weeks, 7–12 weeks, 13 weeks–6 months, 6.1–12 months, ≥ 12 months, not reported), % of the intervention that home practice comprised (i.e., No, ≤ 25%, 26–50%, 51–75%, ≥ 76%, Yes but unable to determine %), intensity (i.e., light, moderate, vigorous, graded), session duration (i.e., ≤ 30 mins, 31–60 mins, 61–90 mins, 91–120 mins, not reported), session frequency (i.e., daily, 4–6x/week, 2–3x/week, 1x/week, not reported), setting (i.e., community, clinical, virtual, digital), and instructor details (e.g., "certified", "registered", or "trained" yoga instructor).

Data analysis

Reviewers (KSB, DED, MZG, DEO, KMM) identified and entered data for yoga definitions and descriptions by looking for terms such as 'yoga is', 'yoga has become', 'yoga means', 'yoga focuses on', 'yoga combines', 'mindfulness-based elements', 'mind-body practices', 'mindful practice', and 'holistic intervention'. For descriptions for yoga interventions, reviewers looked for terms such as intervention 'integrates', 'comprises', 'includes', and 'consisted of'. We qualitatively coded and analyzed the data on definitions and descriptions of yoga and yoga interventions using an inductive, thematic analysis approach [27]. Two authors, who are Yoga Alliance (YA) registered yoga teachers (MCF and MJP), each independently coded the data (See **Supplementary File 1** for qualitatively coded data). To develop an ongoing codebook, the two coding authors met after coding 30 (23%) of the included studies. Subsequently, four dominant categorizations of codes inductively arose from the data: definitions of yoga (i.e., what yoga is called, e.g., yoga is a practice), aspects of yoga (i.e., that on which yoga functions, e.g., yoga relates to the mind and body), components of yoga (i.e., what the definition of yoga comprises, e.g., yoga includes physical poses and self-study), and core elements of yoga interventions (i.e., what the yoga intervention comprises, e.g., the yoga intervention entailed movement and

breathwork). In determining categories in our inductive approach, the researchers sought to stay as close to the data as possible to limit bias. For example, meaning units that included language such as "holistic health" and "health, happiness, and general wellbeing" to be under the category *holistic health*. Comparatively, meaning units with language such as "mental, physical, and spiritual" or "mind, body, and spirit" under *mind-body-spirit* (i.e., distinct from *holistic health*). In addition to coding data, the two coding authors identified keywords used to define and describe yoga for word cloud generation. To reconcile discrepancies for codes and keywords, the two coding authors met to discuss discrepancies with review of original text for context and assistance with disagreements as needed from a third party researcher and YA registered yoga teacher (SMH). For this review, two sources for translating Sanskrit were chosen based on use of primary sources [23] and scholarship [28].

Deviation from registered protocol

While we planned to compare yoga definitions across fields of research and journal of publication, we only conducted comparisons across study populations and geographical locations due to the substantial complexity and minimal insight this would have added to the locations. Additionally, although our protocol specified assessing the quality of yoga definitions, this assessment was not conducted due to feasibility and scope constraints.

Results

Study characteristics

Of 5206 studies, 129 were included (Fig. 1, Supplementary File 2). Study populations included people with chronic health conditions ($n=47$, 35.9%), apparently healthy populations ($n=45$, 34.4%), populations with symptoms of mental ill-health ($n=36$, 27.5%) as well as other populations (i.e., patients with COVID–19, premenstrual syndrome, and lower limb amputees; $n=3$; 2.3%). Geographical location of study first authors represented six continents: Asia ($n=73$, 55.7%), Europe ($n=30$, 22.9%), North America ($n=20$, 15.3%), Oceania ($n=4$, 3.1%), Africa ($n=2$, 1.5%), and South America ($n=2$, 1.5%). Countries of first authors varied across 24 countries with India ($n=49$, 37.4%) and the United States of America ($n=17$, 13.0%) as most prevalent (Supplementary File 3). Primary outcomes of included studies comprised of depression ($n=62$, 47.3%), anxiety ($n=60$, 45.8%), quality of life ($n=57$, 43.5%), stress ($n=35$, 26.7%), and wellbeing ($n=16$, 12.2%). Regarding where study descriptions met definitions of NIH intervention stages, most studies were

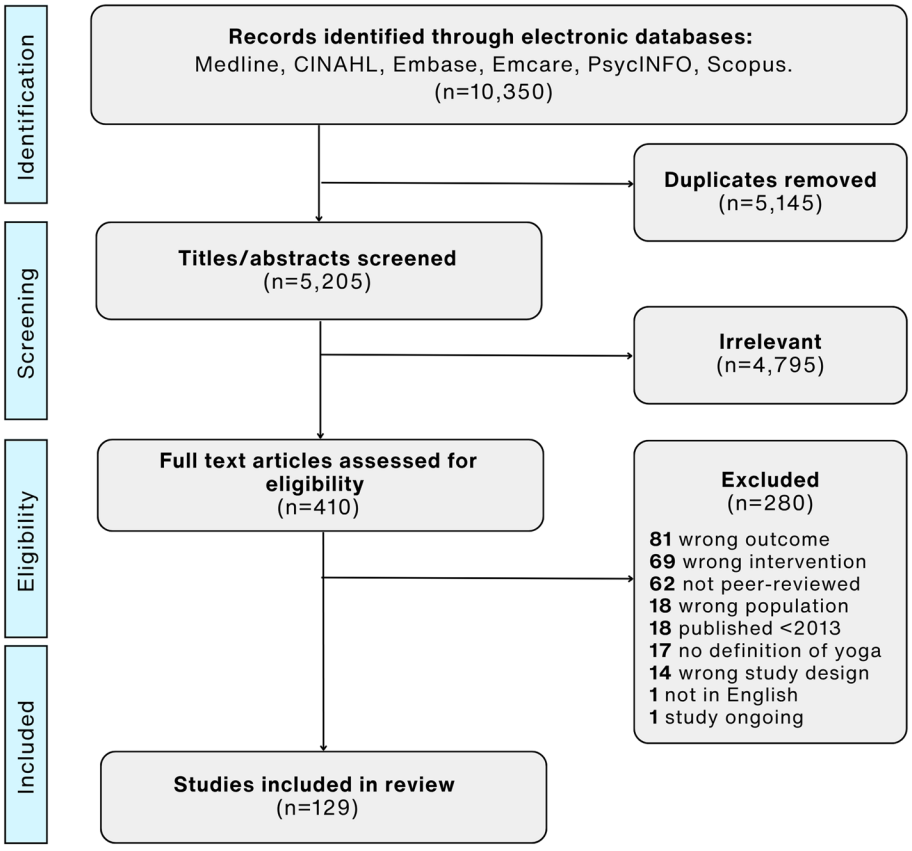

Fig. 1 Systematic review flow diagram of identification, screening, eligibility, and inclusion of studies

stage 2 ("pure efficacy", $n = 85$, 64.9%). Most yoga interventions of included studies were delivered face-to-face ($n = 100$, 76.3%) to groups ($n = 99$, 75.6%) in clinical settings ($n = 75$, 57.3%) with 31–60-minute sessions ($n = 68$, 51.9%) for 7–12 weeks ($n = 77$, 58.8%). Most studies did not include descriptions of intervention difficulty levels ($n = 99$, 75.6%) nor report intervention intensity ($n = 126$, 96.2%). Most studies included instructor details ($n = 104$, 81%) although details varied overall. Most studies did not include reporting guidelines ($n = 91$, 70.5%). Interestingly, some studies ($n = 22$, 16.8%) used a CONSORT flow diagram but did not cite CONSORT guidelines (See Supplementary File 3 for distribution of study characteristics).

Keywords used to describe yoga

Prevalent keywords used to describe yoga definition and aspects included "Mind", "Body", "Breath", and "Meditation" (Fig. 2). Prevalent keyword counts by study population were similar (Supplementary File 4) including "Mind" (34 apparently healthy, 42 chronic health condition, 33 mental health condition), "Body" (34 apparently healthy, 39 chronic health condition, 24 mental health condition), and "Physical" (21 apparently healthy, 25 chronic health condition, 24 mental health condition). Prevalent keyword counts by continents of first author varied overall (Supplementary File 5): Africa consistently used "Body" (4 count); Asia prevalently used "Body" (55 count), "Mind" (55 count), and "Breath" (35 count); Europe prevalently used "Mind" (29 count), "Body" (21 count), and "Physical" (19 count); North America prevalently used "Mind" (19 count), "Meditation" (16 count), and "Breath" and "Physical" (15 count each); Oceania consistently used "Mind" (4 count) and "Physical" (3 count); and South America used "Body", "Meditation, "Physical", and "Practice" (2 count each).

Qualitative findings

Qualitative analysis resulted in a total of 1291 meaning units (MU). Inter-rater reliability between the two coding authors was 99%.

Definitions and aspects of yoga

Definitions (159 MU, 96.9% of studies) and aspects (131 MU, 87.6%) of yoga were overall heterogenous across the included studies (Table 1). Yoga as a *practice* was most used as a definition (35 MU, 27.1% of studies) followed by yoga as a *complementary and alternative medicine* (19 MU, 14.1% of studies), a *system* (14 MU, 10.9% of studies), a *lifestyle* (13 MU, 10.1% of studies), a *therapy* (13 MU, 10.1% of studies), a *technique* (12 MU, 8.5% of studies), an *intervention* (11 MU, 8.5% of studies), a *discipline* (11 MU, 8.5% of studies), a form of *mindful movement* (9 MU, 7.0% of studies), *physical activity* (8 MU, 5.4% of studies), a *science* (7 MU, 5.4% of studies), *union* (3 MU, 2.3% of studies), an *art* (2 MU, 1.6% of studies), then a *philosophy* (2 MU, 1.6% of studies). Aspects of yoga included *mind-body* (81 MU, 60.5% of studies), *mind-body-spirit* (33 MU, 25.6% of studies), *holistic health* (7 MU, 5.4%) of

Fig. 2 Word clouds of key words used for definitions and aspects of yoga, components of yoga, and core elements of yoga interventions

Table 1 Definitions and aspects of yoga

Theme (MU, % of studies)	Category (MU, % of studies)	Meaning Unit
Definition of yoga (159 MU, 96.9%)	Practice (35 MU, 27.1%)	Yoga is a traditional Indian.. practice that has gained worldwide popularity [29]. Yoga, practiced in its traditional contemplative practice format, is a multicomponent behavioral practice.. [30]
	Complementary and alternative medicine (19 MU, 14.7%)	[Yoga] is identified as a form of complementary and alternative medicine.. [31] (Yoga is) considered an integrative and complementary health practice by the World Health Organization [32].
	System (14 MU, 10.9%)	During the twentieth century, yoga became increasingly recognised outside India, and over the past decades, it has continued to grow in popularity world-wide as a system for promoting health and wellbeing.. [33] Yoga is a wholistic multidimensional system (with multicomponent practices).. [34]
	Lifestyle 13 MU, 10.1%)	Yoga as an ancient traditional method of lifestyle modification finds roots in the early civilizations of the central Asian regions of different countries [35]. [Yoga is a] way of life originating from ancient India.. [36]
	Therapy 13 MU, 10.1%)	Yoga is used for wellness care in large parts of the world and has recently also been introduced as therapy in health care [37]. Yoga is widely recognized as a form of therapy for various health conditions and/or their comorbid symptoms [38].
	Technique (12 MU, 8.5%)	Yoga is an ancient complementary technique that has become popular in the world.. [39]
	Intervention (11 MU, 8.5%)	One intervention that is of increasing interest is Yoga.. [40]
	Discipline (11 MU, 8.5%)	Components of yoga have been explored for their viability and its practice as a comprehensive multi-component discipline [41].
	Mindful movement (9 MU, 7.0%)	Yoga, which is known as "mindfulness in motion,"..
	Physical activity (8 MU, 5.4%)	Yoga is a form of physical activity that aims to improve health and may be particularly suitable for older adults.. Yoga is an increasingly popular form of physical activity..
	Science (7 MU, 5.4%)	Yoga is a profound science for wellbeing and disease management.
	Union (3 MU, 2.3%)	Yoga means union through discipline..
	Art (2 MU, 1.6%)	Yoga is an ancient holistic art of living..
	Philosophy (2 MU, 1.6%)	Yoga is an ancient philosophical method..
Aspects of yoga (131 MU, 87.6%)	Mind-body (81 MU, 60.5%)	(Yoga) harmonizes the body the mind and the emotions. (Yoga is) used to improve physiological, psychological and cognitive functions. Yoga practices are mind-body interactions..
	Mind-body-spirit (33 MU, 25.6%)	(Yoga) to harmonize body, mind, and spirit and to transcend suffering by developing an abiding awareness of one's spiritual nature. (Yoga) to attain equilibrium and wellbeing of mental, physical, emotional and spiritual aspects, thereby improving QoL of the individual. This integrated approach of Yoga helps the person to attain health by viewing the individual as a unit of body, mind, and spirit.
	Holistic health (7 MU, 5.4%)	[Yoga is].. holistic health.. [31] (Yoga) contributes positively to the maintenance of health, happiness, and general wellbeing.
	Biopsychosocial-spiritual (6 MU, 4.7%)	(Yoga) helps to achieve bio-psychosocial and spiritual homeostasis. Though it is important to emphasize that yoga as we understand it nowadays is a melting pot of a long history of spiritual practice, far-eastern traditions and cultural appropriation by Western concepts of sports, body image and economical purpose.. the cessation of the fluctuation of the mind..
	Mind (4 MU, 3.1%)	(Yoga) to calm down the mind. (Yoga) treatment of psychological disorders..

MU Meaning unit

studies, *biopsychosocial-spiritual* (6 MU, 4.7%), and *mind* (4 MU, 3.1% of studies).

Prevalent definitions of yoga were similarly distributed across study population (Supplementary File 6) such as *practice* (33% apparently healthy, 37% chronic health condition, 28% mental health condition, 2% other), *complementary and alternative medicine* (28% apparently healthy, 38% chronic health condition, 31% mental health

condition, 3% other), and *system* (30% apparently healthy, 43% chronic health condition, 25% mental health condition, 2% other). Aspects of yoga had similar distributions across study populations (Supplementary File 7) for *mind-body-spirit* (48% apparently healthy, 33% chronic health condition, 18% mental health condition, 0% other) and *holistic health* (57% apparently healthy, 29% chronic health condition, 14% mental health condition, 0% other) although distribution was distinct for *mind-body* (26% apparently healthy, 43% chronic health condition, 28% mental health condition, 2% other) and *biopsychosocial-spiritual* (0% apparently healthy, 50% chronic health condition, 50% mental health condition, 0% other).

Prevalent definitions of yoga overall varied across geographical locations (Supplementary File 8) including *practice* (3% Africa, 43% Asia, 29% Europe, 23% North America, 0% Oceania, 3% South America), *complementary and alternative medicine* (0% Africa, 58% Asia, 21% Europe, 16% North America, 0% Oceania, 5% South America), *system* (0% Africa, 36% Asia, 14% Europe, 21% North America, 21% Oceania, 7% South America), and *lifestyle* (8% Africa, 77% Asia, 0% Europe, 8% North America, 3% Oceania, 0% South America). No one definition was used consistently by each or all of six continents. Aspect of yoga also varied in distribution across geographical locations (Supplementary File 9) including *mind-body* (1% Africa, 60% Asia, 17% Europe, 15% North America, 5% Oceania, 1% South America), *mind-body-spirit* (6% Africa, 58% Asia, 30% Europe, 6% North America, 0% Oceania, 0% South America), *holistic health* (0% Africa, 71% Asia, 14% Europe, 0% North America, 0% Oceania, 14% South America), and *biopsychosocial-spiritual* (0% Africa, 50% Asia, 17% Europe, 17% North America, 0% Oceania, 17% South America).

Components of yoga

Components of yoga (327 MU, 67.4% of studies) were less heterogenous (Table 2; Fig. 2). Most studies reported on *physical* (84 MU, 59.7% of studies), *mental* (121 MU, 57.4% of studies), and *breathing* (69 MU, 51.2% of studies) components of yoga. Other reported yoga components included *spiritual* (13 MU, 10.1% of studies), *philosophical* (18 MU, 9.3% of studies), *combined energetic and physical* (4 MU, 3.1% of studies), *cleansing* (2 MU, 1.6% of studies), *nutritional* (1 MU, 0.8% of studies), *combined breathing and mental* (1 MU, 0.8% of studies), *social* (1 MU, 0.8% of studies), and *environmental* (1 MU, 0.8% of studies) components. Some studies also reported on *lineages* of yoga (12 MU, 9.3%), most predominately *Hatha* (7 MU, 5.4% studies) and *various* other lineages (5 MU, 3.9%) including *Kundalini*, *Bikram*, *Dru*, *Hasyayoga*, and *Sudarshan Kriya* lineages.

Interestingly, some studies used the Sanskrit words for components of yoga (59 MU). Sanskrit use for components of yoga overall included *asana* (i.e., yogic physical posture, 19 MU, 14.7% of studies), *pranayama* (i.e., yogic breath regulations, 18 MU, 14.0% of studies), *dhyana* (i.e., yogic 'pointed' meditation, 8 MU, 6.2% of studies), *niyama* (i.e., yogic ethical restraints, 4 MU, 3.1% of studies), *yama* (i.e., yogic ethical restraints, 4 MU, 3.1% of studies), *samadhi* (i.e., union with the Divine, 2 MU, 1.6% of studies), *dharana* (i.e., yogic 'pointed' concentration, 1 MU, 0.8%), *moksha* (i.e., liberation, release, 1 MU, 0.8%), *mudra* (i.e., "seal" hand gesture or bodily position, 1 MU, 0.8%), *pratyahara* (i.e., yogic sensory withdrawal, 1 MU, 0.8%), and *sutra* (i.e., thread, 1 MU, 0.8%) [23, 28].

Prevalent components of yoga were similarly distributed across study population (Supplementary File 10) such as physical component (35% apparently healthy, 35% chronic health condition, 29% mental health condition, 2% other), mental component (35% apparently healthy, 32% chronic health condition, 31% mental health condition, 2% other), and breathing component (30% apparently healthy, 35% chronic health condition, 32% mental health condition, 3% other). Prevalent components of yoga overall similar across geographical locations (Supplementary File 11) including physical component (1% Africa, 48% Asia, 25% Europe, 20% North America, 4% Oceania, 2% South America), mental component (2% Africa, 47% Asia, 23% Europe, 21% North America, 3% Oceania, 4% South America), and *breathing component* (1% Africa, 52% Asia, 22% Europe, 19% North America, 3% Oceania, 17% South America).

Core elements of yoga interventions

All studies (n = 129, 100.0%) included information on core elements of yoga interventions (635 MU, Table 3; Fig. 2). Predominant core yoga intervention elements comprised of *physical* (186 MU, 92.2% of studies), *mental* (177 MU, 86.8% of studies), and *breathing* (138 MU, 86.8% of studies). Additional key yoga interventions included *educational* (13 MU, 9.3% of studies), *philosophical* (12 MU, 7.8% of studies), *social* (8 MU, 5.4% of studies), *combined breathing and mental* (8 MU, 6.2% of studies), *combined breathing and physical* (7 MU, 4.7% of studies), *spiritual* (5 MU, 3.9% of studies), *combined energetic and physical* (4 MU, 2.3% of studies), *combined breathing, mental, and physical* (2 MU, 1.6% of studies), *environmental* (2 MU, 1.6% of studies), *nutritional* (2 MU, 1.6% of studies), *kosha* (i.e., sheath, casing, 6 MU, 0.8% of studies) [23, 28], *cleansing* (1 MU, 0.8% of studies), and *combined mental and physical* (1 MU, 0.8% of studies) elements. Almost half of the studies also reported on *styles* of yoga (63 MU, 41.9%), most predominately *Hatha* (35 MU, 26.4% studies), followed by *Kundalini* (4 MU, 3.1% studies), *Ashtanga* (3 MU, 2.3% studies), *Restorative* (2 MU, 1.6% studies), *Raja* (2 MU, 1.6% studies), *Yin* (2 MU, 1.6% studies), and other lineages (11 MU, 8.5%)

Table 2 Components of yoga

Theme (MU, % of studies)	Category (MU, % of studies)	Meaning Unit
Physical component (84 MU, 59.7%)	Posture (52 MU, 40.3%)	(Yoga) typically includes the practices of yoga postures and sequences (asana).. [Yoga] combines physical postures..
	Unspecified physical practice (18 MU, 14.0%)	(Yoga consists of) physical practices..
	Flow (7 MU, 5.4%)	.. and sequences which are performed in a flowing, gentle style [40].
	Loosening practices (7 MU, 5.4%)	[Yoga] involves gentle stretching..
Mental component (121 MU, 57.4%)	Meditation (54 MU, 41.1%)	[The system of yoga integrates] meditation (dhyana). [Yoga encompasses] meditation.
	Relaxation (30 MU, 23.3%)	[(Yoga) involves techniques such as] relaxation..
	Mindfulness (12 MU, 9.3%)	[(Yoga) typically includes the practices of] mindfulness..
	Concentration (4 MU, 3.1%)	[.. the practice usually incorporates one or more of the mental or spiritual elements that are traditionally part of yoga, such as] concentration.. [33]
	Awareness (3 MU, 2.3%)	(Yoga consists of) the cultivation of a nonjudgmental (mindful) awareness of body sensations and thought. (457)
	Combined meditation and mindfulness (3 MU, 2.3%)	(Yoga incorporates) meditation/mindfulness [30].
	Unspecified mental practice (3 MU, 1.6%)	(Yoga involves) mind based practice trained in a specific pattern.
Breathing component (69 MU, 51.2%)	Breathing (67 MU, 51.2%)	The core of yoga is conscious, deep and slow breathing.. (Yoga includes) pranayama (breath exercise)..
	Chanting (2 MU, 1.6%)	The common components of yoga include] making certain sounds..
Spiritual component (13 MU, 10.1%)	Union (8 MU, 6.2%)	(Yoga includes) samadhi.. (Yoga) is assumed to "involve the union between mind, body, and spirit".
	Enlightenment (3 MU, 2.3%)	(Yoga aims) to achieve higher states of consciousness and spiritual enlightenment [70].
Philosophical component (18 MU, 9.3%)	Ethics (10 MU, 4.7%)	(Yoga includes) the ethical precepts of.. niyamas.. [Yoga.. merges] to enhance emotional regulation through the practice of yama.. The common components of yoga include moral principles..
	Philosophy (5 MU, 3.9%)	[Yoga originated] based on ancient Vedic philosophy [33].
	Eight limbs of yoga (2 MU, 1.6%)	Yoga.. is based on the yoga sutras (principles) of Patanjali having eight limbs..
Lineage (12 MU, 9.3%)	Hatha (7 MU, 5.4%)	Hatha, the physical form of yoga, is the most commonly practiced style of yoga in Western culture..
	Various lineages (5 MU, 3.1%)	Bikram yoga is.. (physical yoga) [72]. Medical yoga derives from the classic Kundalini yoga with its origins in northern India and Tibet.. [37]
Combined energetic and physical component (4 MU, 3.1%)	Gesture (2 MU, 1.6%)	(Yoga includes) mudra (hand gestures).. [40]
	Lock (2 MU, 1.6%)	[Yoga focuses on] energy locks..

MU Meaning unit

Table 3 Core elements of yoga interventions

Theme (MU, % of studies)	Category (MU, % of studies)	Meaning Unit
Physical element (186 MU, 92.2%)	Postures (97 MU, 75.2%)	[Classes included] posture practice.. (The Hatha yoga intervention consisted of) Pranayama (breathing exercises)..
	Loosening practices (39 MU, 30.2%)	Each class started with low-intensity loosening exercises. Each class started with low-intensity warm-up exercises.. The integrated yoga sessions have been designed to combine the techniques of loosening exercise (sookshma vyayama)..
	Flow (24 MU, 18.6%)	[Classes included] half sun salutations.. .. Sun Salutation, (Surya namaskara in Sanskrit..
	Props (9 MU, 7.0%)	Props such as bricks, belts, and ropes were introduced initially and used until the participants could perform the postures without them.
	Unspecified physical practices (8 MU, 5.4%)	The yoga session included physical activity.. [41]
Mental element (177 MU, 86.8%)	Relaxation (80 MU, 59.7%)	Savasana, a posture of gradually relaxing the body parts, was performed between asanas throughout the floor series and at the end of class.. The session ended with Yoga Nidra, a 10-min traditional yogic final relaxation to relieve emotional and mental tension and increase the patient's ability to rest comfortably. [Yoga intervention consists of] relaxation techniques..
	Meditation (64 MU, 48.8%)	[The protocols incorporated a range of practices including] meditation. [Meditation included techniques such as] repeating a mantra to bring about a state of self awareness and inner calm.. [The group that underwent yoga intervention was asked to practice] Meditation (Dhyana)..
	Combined meditation and relaxation (12 MU, 9.3%)	10 min of deep relaxation/meditation practice.. Subjects were allowed to stay in savasana for 10 min in deep relaxation exercise.
	Mindfulness (8 MU, 6.2%)	[The yoga intervention, according to principles of] mindful awareness..
	Concentration (5 MU, 3.9%)	This was followed by a concentration practice (dhāraṇā)..
	Centering (4 MU, 3.1%)	Classes included centering..
	Combined meditation and mindfulness (4 MU, 3.1%)	[The (yoga) protocol includes] mindfulness meditation..
Breathing element (138 MU, 86.8%)	Breathing (127 MU, 86.0%)	[The yoga practices consisted of] breathing exercises.. Based on published evidence, the manualized yoga practice focused on cyclical breathing and breathe control (pranayamas) as the key component of the yoga protocol. [(Integrated Approach of Yoga Therapy) is a combination of] kriya..
	Chanting (10 MU, 7.8%)	Subjects were asked to practice the Om chanting...Subjects were asked to sit straight and take a deep inhalation, and chant Om while exhaling.
Style (63 MU, 41.9%)	Hatha yoga (35 MU, 41.2%)	The yoga practiced as an intervention in the research included traditional Hatha Yoga exercises.
	Various styles (24 MU, 18.6%)	The yoga program was designed for the purpose of this study and based on Ashtanga Vinyasa. Kundalini yoga is a well-known, accessible yoga practice.. [30]
Educational element (13 MU, 9.3%)	Lectures (7 MU, 4.7%)	(The yoga intervention started with a) brief teaching about yoga (e.g., what the word yoga means)..
	Discussion (6 MU, 4.7%)	After each intervention, the participants had time to ask questions and give their testimonies..
Philosophical element (12 MU, 7.8%)	Philosophy (6 MU, 4.7%)	(Participants) also got lifestyle advice based on yoga philosophy.. [The classes involved a broad and integrated approach to yoga and included] yoga philosophy (jñāna)..
	Combined ethics and philosophy (2 MU, 1.6%)	[Each individualized yoga practice specified appropriate] other aspects of yoga practice such as cultivation of positive values, thoughts and attitudes, and lifestyle factors [34].
	Eight limbs of yoga (2 MU, 1.6%)	The yoga module used.. was developed specifically for the purpose culled out from original scriptures (Patanjali Yoga Sutras..

Table 3 (continued)

Theme (MU, % of studies)	Category (MU, % of studies)	Meaning Unit
Combined breathing and mental element (8 MU, 6.2%)	Combined breathing and meditation (4 MU, 3.1%)	10 min of meditation including breathing meditation..
	Combined breathing and relaxation (2 MU, 1.6%)	[The same] relaxation/breathing techniques were taught at each class..
Social element (8 MU, 5.4%)	Social connection (6 MU, 3.9%)	Each class also includes additional time immediately following the class for participants to stay on and socialize [33].
	Group discussion (2 MU, 1.6%)	[Group sessions involved] a discussion on lifestyle and psychosocial concerns [29].

MU Meaning unit

including *Bikram*, *Dru*, *Krishnamacharya*, *Kripalu*, *Tantra*, *Thai*, *Power*, *Viniyasa*, *Viniyoga*, *Yoga Nidra*, and *Yoga Vidya* lineages.

Over half of the studies included Sanskrit when describing at least one of the core elements of yoga interventions (225 MU), particularly *asana* (i.e., yogic physical posture, 73 MU, 56.6% of studies) and *pranayama* (i.e., yogic breath regulations, 65 MU, 50.4% of studies). Sanskrit words used also included variations of *suryanamaskara* (i.e., sun salutations – a specific sequence of yogic poses synchronized with breath, 15 MU, 11.6% of studies), variations of *savasana* (i.e., absolute relaxation, corpse pose, 15 MU, 11.6% of studies), *yoga nidra* (i.e., yogic-sleep, 12 MU, 8.5% of studies), *dhyana* (i.e., yogic 'pointed' meditation, 9 MU, 7.0% of studies), *kriya* (i.e., action, ritual, 6 MU, 4.7% of studies), *mantra* (i.e., sacred sound, 6 MU, 4.7% of studies), *vyayama* (i.e., physical exercise, 4 MU, 3.1% of studies) [29], *sutra* (i.e., thread, 2 MU, 1.6% of studies), variations of *anapana* (i.e., observation of breath, 2 MU, 1.5% of studies), *jathis* (i.e., transformation, birth, 2 MU, 1.5% of studies), *kosa* (i.e., kosha – sheath, casing, 6 MU, 0.8% of studies), *bandhas* (i.e., locks or bond, confining lifeforce, 1 MU, 0.8% of studies), *dharana* (i.e., holding or concentration, 1 MU, 0.8% of studies), *naadanusandhana* (i.e., absorption of internal sound, 1 MU, 0.8% of studies), *niyamas* (i.e., yogic ethical restraints, 1 MU, 0.8% of studies), *Pranava-japa* (i.e., recitation of OM, 1 MU, 0.8% of studies), and *yamas* (i.e., yogic ethical restraints, 1 MU, 0.8% of studies) [23, 28]. Additionally, one study included *smrtia sadha* (i.e., mindfulness, mindful observation, 1 MU, 0.8% of studies) [23, 28].

Prevalent core elements of yoga interventions were similarly distributed across study population (Supplementary File 12) such as *physical element* (33% apparently healthy, 37% chronic health condition, 28% mental health condition, 2% other), *mental element* (28% apparently healthy, 38% chronic health condition, 31% mental health condition, 3% other), and *breathing element* (30% apparently healthy, 43% chronic health condition, 25% mental health condition, 2% other). Prevalent core elements of yoga interventions were also similar in distribution across geographical locations (Supplementary File 13) including *physical element* (2% Africa, 56% Asia, 24% Europe, 15% North America, 2% Oceania, 1% South America), *mental element* (1% Africa, 53% Asia, 22% Europe, 18% North America, 3% Oceania, 2% South America), and *breathing element* (1% Africa, 62% Asia, 20% Europe, 12% North America, 2% Oceania, 3% South America).

Discussion

This systematic review provides the first comprehensive analysis of how yoga is defined, described, and operationalized within 129 mental health and wellbeing interventions across 24 countries, over the past 10 years. Our findings describe both commonalities and variations in how yoga is conceptualized in research: studies defined yoga as a practice (27.1%), a complementary and alternative medicine (14.7%), a system (10.9%), a lifestyle (10.1%) or a therapy (10.1%) and most studies described yoga as addressing mind-body (60.5%) or mind-body-spirit (25.6%). Some studies emphasize the integrational aspects of yoga, such as "one of the widely accepted and structured lifestyle practices which promote the integration of the mind, body, and soul" [30]. Other studies focused more on the introspection-based aspects of yoga, for example, "yoga is a millenary philosophical and practice system, with the purpose of self-perception and self-knowledge, which assists individuals in their physical, psychological, spiritual and social dimensions" [31]. The heterogeneity in definitions reflects yoga's complex nature as an ancient practice evolving within modern healthcare contexts.

Our findings both complement and extend previous efforts to standardize yoga terminology in research. While earlier works have emphasized the challenge of defining yoga [18–20], our systematic review analysis provides empirical evidence on how researchers are actually operationalizing yoga in mental health interventions.

Data from this present study indicates that authors have predominantly defined yoga as a mind-body practice with use of Sanskrit in over half of the studies (56.6%) and contextualization of the yoga style or lineage in almost half of the studies (41.9%). The predominance of mind-body conceptualizations (60.5%) may allude to the omission of traditional spiritual-philosophical frameworks in favor of more secular and possibly more culturally acceptable health-focused applications. This practice of omission raises important questions about cultural appropriation when adapting yoga practices for modern healthcare contexts [32].

Our findings reveal a notable disparity between how yoga is conceptually defined and operationally implemented in mental health and wellbeing research. While studies commonly acknowledge yoga's multifaceted nature, interventions predominantly focus on physical, mental, and breathing practices, possibly reflecting the influence of medical research agencies like the NIH, which primarily defines yoga through these components [34]. However, our analysis revealed an emerging trend toward broader conceptualization, particularly evident in the prominence of the mental component of relaxation (23.3%) and the inclusion of spiritual (10.1%) and philosophical (9.3%) components. This expanded operationalization aligns with traditional yoga frameworks that emphasize "off-the-mat" practices [18, 22], potentially offering valuable tools for navigating contemporary mental health challenges. Yet, the relative scarcity of ethical elements (4.7%) in interventions, despite their traditional importance in yoga philosophy [21, 23], highlights a persistent gap between historical frameworks and modern therapeutic applications. This selective implementation may both oversimplify potential benefits of yoga and undervalue its comprehensive approach to wellbeing. Moving forward, this gap between definition and implementation presents both a challenge and opportunity for developing holistic, culturally-informed mental health interventions.

Standardized reporting guidelines are essential for advancing the dissemination, reproducibility, and implementation of yoga interventions. Several established frameworks offer valuable starting points such as the Template for Intervention Description and Replication (TIDieR) which provides a 12-item checklist for intervention replication [35]. Additionally, the Holistic Movement Practices REsearch DEsign and Reporting (HMP-REaDER) guidelines incorporate important consideration to the philosophical, theoretical, and mechanistic aspects of the holistic component(s) affecting mental and physical health processes and outcomes [36]. For yoga-specific interventions, CLARIFY (CheckList stAndardising the Reporting of Interventions For Yoga) outlines 21 items across 10 domains, including intervention theory, rationale or goals essential to the yoga practice [37]. Notably, standardizing yoga intervention reporting faces field-specific challenges: the interdisciplinary nature of yoga research leads to varied terminology and reporting preferences, while academic publishing constraints often limit the space available for comprehensive intervention descriptions. Furthermore, while these reporting guidelines provide valuable frameworks, they notably lack guidance on defining yoga interventions. This gap is significant because clear definitions help identify key mechanistic components that drive health improvements [19] and behavior change [38]. Understanding these core elements is crucial for implementation science, as it enables researchers and practitioners to identify which aspects of yoga interventions must remain constant and which can be adapted for different contexts [39]. Use of implementation strategies would further strengthen both the scientific rigor of yoga research and enhance successful contextual adaptations of yoga interventions while preventing duplicate research efforts [40, 41]. This review underscores that without clear, standardized operationalizations and reporting of yoga in mental health and wellbeing research, evidence remains difficult to interpret and apply. By establishing consistent reporting and grounding interventions in both traditional roots and modern frameworks, researchers can improve the rigor, accessibility, and impact of yoga-based mental health and wellbeing interventions across diverse settings.

Future directions

Our findings point to several critical directions for future research. First, while we provide insight on how yoga is defined and described in mental health research, other rigorous methods such as using a Delphi consensus should be employed to establish consensus on a complete definition of yoga. Second, future research should examine how different conceptualizations of yoga—from physical, exercise-based approaches to more comprehensive mind-body-spirit approaches—influence intervention outcomes and implementation success. Third, collaborative approaches that centre Indigenous and traditional yoga knowledge holders should be prioritized. Such partnerships could examine how traditional yoga conceptualizations align with or differ from Western research operationalizations, fostering more culturally sensitive and comprehensive approaches to yoga intervention research. Lastly, investigation into the role of specific components (e.g., relaxation, ethical principles) in driving mental health outcomes could further elucidate the therapeutic mechanisms and inform more targeted intervention design. These directions, supported by standardized reporting frameworks and clear operational

definitions, will advance both the scientific study of yoga and its practical application in mental health care.

Strengths and limitations

This systematic review offers several key strengths in its examination of yoga definitions and descriptions in mental health research. First, it represents the first comprehensive synthesis of how yoga is conceptualized in peer-reviewed mental health and wellbeing interventions, employing a wide-ranging search strategy that captured both positive and negative dimensions of mental health. Second, our exclusive focus on randomized controlled trials, while limiting breadth, was methodologically justified and ensured a robust evidence base from which to derive our findings. RCTs represent the gold standard for intervention research and require detailed intervention protocols, providing comprehensive data on how yoga is operationalized in experimental contexts that directly inform clinical practice and policy decisions. Third, the qualitative analytical approach allowed for nuanced examination of how yoga is operationalized across diverse contexts and populations. However, several limitations warrant consideration. The inherent challenge of analyzing yoga definitions stems from the lack of consensus on terminology, making the extraction and categorization of definitions inevitably subject to author interpretation. Additionally, restricted access to supplementary intervention materials and figures in eligible studies may have resulted in incomplete data capture, although this only applied in a handful of cases. It is also worth acknowledging that analyzing yoga definitions within the available academic literature, which may not fully represent traditional yoga knowledge systems, is a limitation. Yoga RCTs may be constrained by Western biomedical paradigms, including trial methodology and funding priorities, as well as regulatory, cultural or epistemological barriers in RCT design, thus potentially impacting on the inclusion and emphasis on traditional components of yoga such as the yamas and niyamas. While our methodology focused on published research and we took measures to minimize bias in our analysis, the predominantly Western academic framework of the included studies may inadvertently reflect colonial perspectives on yoga conceptualization. Finally, while focusing exclusively on randomized controlled trials strengthened methodological rigor, it potentially excluded valuable insights from other study designs. Future syntheses may complement this analysis by including qualitative literature to explore how traditional and lived experiences of yoga inform intervention design and delivery.

Conclusion

This systematic review provides the first comprehensive analysis of how yoga is defined and operationalized in mental health research, revealing both commonalities and critical gaps in current approaches. Our findings demonstrate that while researchers predominantly conceptualize yoga as a mind-body (60.5%) practice (27.1%), there is substantial heterogeneity in how yoga is defined and implemented across interventions. This variability, coupled with the identified gap between traditional frameworks and modern applications, highlights the need for more standardized approaches to defining and reporting yoga interventions. To address these challenges, we propose combining established reporting guidelines with a comprehensive framework for defining yoga that acknowledges: (1) origin, etymological roots, and translation under which yoga and yoga components are being operationalized; (2) specific schools or lineages from which yoga intervention practice(s) originate(s); (3) any modern theoretical and mechanistic underpinnings informing the yoga intervention (e.g., cognitive behavior therapy/acceptance and commitment therapy principles); and (4) detailed, specific core elements of yoga that comprise the intervention (e.g., pranayama [ujjayi], asana [suryanamaskara], meditation [metta]). With growing public interest in yoga as a health behavior, establishing standardized definitions and reporting guidelines is crucial for translating research into practice. Such advances may support the utilization and access to evidence-based mind-body practices across diverse populations and healthcare contexts.

Abbreviations

MU	Meaning unit
YA	Yoga Alliance
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PICOS framework	Population, Intervention, Comparison, Outcomes and Study type framework
TIDieR	Template for Intervention Description and Replication
HMP-REaDER	Holistic Movement Practices REsearch DEsign and Reporting
CLARIFY	CheckList stAndardising the Reporting of Interventions For Yoga

Supplementary Information

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Supplementary File 1: Dataset with qualitative information and codes, including meaning units, keywords, subcategories, categories, subthemes, and themes.

Supplementary File 2: Characteristics of included studies.

Supplementary File 3: Distribution of characteristics of included studies.

Supplementary File 4: Distribution of top seven keywords used for yoga definitions and aspects by study population.

Supplementary File 5: Word cloud of keywords used for yoga definitions and aspects by continent (From top left to right: North America, Europe,

Asia, South America, Africa, and Oceania).

Supplementary File 6: Distribution of yoga definitions by study population (apparently healthy, chronic health condition, mental health condition, and other). Percentages calculated using meaning units (MU) of each definition by study population divided by total MU of each definition.

Supplementary File 7: Distribution of yoga aspects by study population (apparently healthy, chronic health condition, mental health condition, and other). Percentages calculated using meaning units (MU) of each aspect by study population divided by total MU of each aspect.

Supplementary File 8: Distribution of yoga definitions by continent (Africa, Asia, Europe, North America, Oceania, and South America). Percentages calculated using meaning units (MU) of each definition by continent divided by total MU of each definition.

Supplementary File 9: Distribution of yoga aspects by continent (Africa, Asia, Europe, North America, Oceania, and South America). Percentages calculated using meaning units (MU) of each aspect by continent divided by total MU of each aspect.

Supplementary File 10: Distribution of yoga components by study population (apparently healthy, chronic health condition, mental health condition, and other). Percentages calculated using meaning units (MU) of each component by study population divided by total MU of each component.

Supplementary File 11: Distribution of yoga components by continent (Africa, Asia, Europe, North America, Oceania, and South America). Percentages calculated using meaning units (MU) of each component by continent divided by total MU of each component.

Supplementary File 12: Distribution of yoga intervention elements by study population (apparently healthy, chronic health condition, mental health condition, and other). Percentages calculated using meaning units (MU) of each element by study population divided by total MU of each element.

Supplementary File 13: Distribution of yoga intervention elements by continent (Africa, Asia, Europe, North America, Oceania, and South America). Percentages calculated using meaning units (MU) of each element by continent divided by total MU of each element.

Supplementary File 14: Search Strategy.

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Authors' contributions
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Data availability
All data analyzed were extracted from previously published studies. Datasets may be accessed in Supplementary File 1 (qualitative information and codes, including meaning units, keywords, subcategories, categories, subthemes, and themes) and Supplementary File 2 (characteristics of included studies).

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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