ARTICLE

Yoga and mental health: what every psychiatrist needs to know

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SUMMARY

Yoga was developed primarily as a tool for self-mastery and spiritual progress. However, over the past few decades, the therapeutic applications of yoga in mental healthcare have been explored with promising results. This article aims to inform psychiatrists about the clinical usefulness of yoga for mental disorders. We discuss the rationale and latest evidence base for the use of yoga in psychiatric practice, including the neurobiological mechanisms and indications and contraindications for yoga therapy. We suggest practical yoga techniques that can be used as an add-on for managing common psychiatric conditions. Finally, we discuss the setting up and running of yoga clinical services in a tertiary psychiatric hospital in India and explore what can be learnt to facilitate yoga as a therapeutic approach in the Western world.

LEARNING OBJECTIVES

After reading this article you will be able to:

- understand the role and possible mechanisms of action of yoga therapy in clinical psychiatric practice based on current evidence
- recognise yoga practices beneficial for common psychiatric disorders, their indications, contraindications and underlying rationale
- appreciate what kind of referral patterns might be expected for yoga therapy in a tertiary care psychiatric hospital.

KEYWORDS

Yoga; mental health; psychiatry; evidence base; treatment.

The growing burden of mental illness worldwide has significant health, social, human rights and economic consequences, despite improvements in treatment and access to care (World Health Organization 2019). According to the World Health Organization (WHO), one in four people experience a mental disorder at some point in their lives. The global disability-adjusted life-years attributed to mental disorders has increased from 3.1% in 1990 to 4.9% in 2019 (GBD 2019 Mental Disorders Collaborators 2022). More than half of the world's countries lack sufficient skilled professionals to handle mental illnesses in the community, especially in low and lower middle income countries. More than 50% of countries have only one psychiatrist per 100 000 people and 40% of countries have less than one hospital bed reserved for mental disorders per 10 000 people (World Health Organization 2015). For the past decade, there has been an emphasis on prevention in the WHO's Mental Health Action Plan 2013–2020. In 2013, the WHO set objectives of providing comprehensive, integrated and responsive mental health and social care services in community-based settings and implementing strategies for promoting mental health and preventing mental illness (World Health Organization 2013).

Yoga originated as a holistic system in India more than 3000 years ago. It is an ancient way of living in harmony with oneself (body, emotion and intellect) and nature (Satyananda 2002). The fundamental components of yoga were summarised in a systematic eight-limbed approach (*ashtanga* yoga, which includes: ethical precepts – *yama* and *niyama*, physical postures – *asana*, breathing practices – *pranayama*, interoceptive awareness – *pratyahara*, focussed meditation – *dharana*, effortless meditative "flow" state – *dhyana* and the transcendental state – *samadhi*) by the Sage Patanjali in 400 BCE (Satyananda 2002). Patanjali's sutras (aphorisms) describe that main objective of yoga is to 'calm down the agitations of the mind' (sutra 1.2). All major schools of yoga that emphasise postures, breathing practices and cleansing techniques (as a preparation to the advanced meditative yoga of Sage Patanjali) are derived from hatha yoga. According to yoga philosophy, the word 'hatha' comes from 'Ha', which means the Sun, and 'Tha', meaning the Moon. Thus, all yogic practices aim to align an individual's biorhythms with those of nature, thereby improving overall health. Most schools of yoga incorporate elements of asanas (physical movements), including relaxation, pranayamas (breathing practices) and dhyana (meditation) to achieve this.

Although traditionally yoga was a discipline designed for spiritual growth, over the past two decades it has emerged as a promising complementary and alternative non-pharmacological option in the management and prevention of mental disorders

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(Varambally 2020). Yoga therapy is free from stigma and has gained popularity across cultures. Other advantages of yoga therapy include the easy accessibility of trained professionals, cost-effectiveness (as it does not require any expensive equipment or maintenance costs) and the option of conducting yoga sessions in groups. The synchronisation of body movements, breath and mind together during a group yoga practice may lead to better sense of connectivity among people while practising yoga (coupling of the consciouness). Yoga can also be a helpful community-based intervention for providing comprehensive, holistic mental healthcare and promoting mental well-being and preventing mental illness (Varambally 2020).

Studies have found a gap between the use of yoga by individuals with neuropsychiatric disorders and the prescription of yoga by trained mental health professionals (Sirven 2003). The primary reason for this gap is the lack of sufficient training and education of mental health professionals in yoga therapy.

This article aims to provide a scientific update on the role of yoga therapy for psychiatric disorders, along with the essential conceptual framework and clinical tips (based on our clinical experience of over a decade) for psychiatrists who seek to integrate yoga into their clinical practice.

Yoga in psychiatry: the evidence–base

Depression

A recent systematic review and meta-analysis (Brinsley 2021) assessed the effects of yoga interventions based on physical postures in alleviating depressive symptoms. It included 19 studies (13 randomised controlled trials, RCTs) and 1080 participants with mental disorders such as depression, post-traumatic stress disorder (PTSD), schizophrenia, anxiety, alcohol dependence and bipolar disorder. The review authors found that yoga led to a greater reduction in depressive symptoms than treatment as usual, attention control or being on a waiting list. They also observed a dose–response relationship between the number of yoga sessions per week and a reduction in depressive symptoms. There is some preliminary evidence that yoga-based interventions may be a promising non-pharmacological option for depressive symptoms during pregnancy, especially for mild depression, as noted in a meta-analysis that included six studies (405 pregnant mothers) (Ng 2019). Evidence is also emerging to support the usefulness of yoga as monotherapy for mild to moderate depression, as demonstrated by a few good-quality RCTs (Prathikanti 2017; Nyer 2018). One of these RCTs found that a 12-week Iyengar yoga and coherent breathing programme was a helpful solo intervention for resolving suicidal ideations in people with major depressive disorder. It also reported that the most common adverse event associated with yoga practice was musculoskeletal pain, which resolved over the study period (Nyer 2018).

Anxiety disorders

A systematic review and meta-analysis assessing the effect of yoga intervention on anxiety identified eight RCTs involving 319 participants with elevated anxiety levels or anxiety disorders (Cramer 2018a). It found short-term beneficial effects of yoga in reducing anxiety in individuals with elevated levels of anxiety compared with no treatment and active comparators but no significant impact for individuals with clinical diagnosis of anxiety disorders (as per DSM-5 criteria). Based on this evidence, only a weak recommendation can be made at present for the clinical use of yoga in people diagnosed with anxiety disorders.

Post-traumatic stress disorder

A systematic review and meta-analysis of RCTs of yoga (7 RCTs; $n = 284$) in people with PTSD revealed low-level evidence for its clinical utility in reducing PTSD symptoms (Cramer 2018b).

Obsessive–compulsive disorder

Owing to the limited number of studies of yoga interventions for obsessive–compulsive disorder, no systematic reviews or meta-analyses have been published in this area. Though emerging evidence for an add-on utility of yoga is encouraging (Shannahoff-Khalsa 2019; Shannahoff-Khalsa 1999), there is a need for more quality trials to make specific clinical recommendations.

Schizophrenia

A recent systematic review and meta-analysis of 15 RCTs involving 1081 people with schizophrenia found beneficial effects of meditation-based mind–body therapies (yoga, tai-chi, qi-gong and mindfulness) on negative symptoms compared with treatment as usual or non-specific control interventions (Sabe 2019). The review authors pointed out that there was moderate to high heterogeneity in these studies and that the effect size was small. Another meta-analysis found that mindful exercises such as yoga, tai-chi and qi-gong were more beneficial than non-mindful physical exercises in reducing psychiatric symptoms (Positive and Negative Syndrome Scale scores) and improving working memory in this population. However, the quality of evidence was low (Li 2018). Overall, yoga can be considered helpful as an adjunctive therapy in reducing negative symptoms and improving the

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quality of life in people with schizophrenia. Most of the trials demonstrated clinical improvement after 8–12 weeks of yoga practice.

Chronic pain syndromes

A systematic review and meta-analysis of yoga for people with chronic non-specific neck pain has reported positive effects on pain intensity, pain-related functional disability, quality of life and mood (Li 2019). Similarly, meta-analyses have supported the beneficial short-term and long-term effects of yoga in reducing functional disability and pain in people with chronic non-specific lower back pain (Holtzman 2013: eight RCTs; Cramer 2013: ten RCTs).

A recent meta-analysis assessed the effect of yoga in people with a diagnosis of chronic or episodic headache (tension-type headache and migraine). The pooled effect size of five RCTs revealed a significant overall effect favouring yoga on headache frequency, duration and pain intensity (Anheyer 2020). This overall effect is mainly attributable to patients with tension-type headaches. Similarly, a meta-analysis of four trials reported yoga to be highly effective in alleviating menstrual pain in women with primary dysmenorrhoea (Kim 2019). Hence, in summary, yoga can serve as a valuable complementary treatment in managing chronic pain conditions.

Mild cognitive impairment and early dementia

The effect of common forms of mind–body exercises (yoga, tai-chi and qi-gong) on cognitive functions of people with mild cognitive impairment (MCI) has been evaluated in a systematic review and meta-analysis of nine RCTs and three non-RCTs (Zou 2019). The review authors observed that there was a significant improvement in the following domains of cognition (in decreasing order of pooled effect size): (a) attention; (b) short-term memory; (c) executive function; (d) visuospatial function; and (e) global cognitive function. This indicates that mind–body interventions such as yoga, tai-chi and qi-gong can improve cognitive function in people with MCI. The evidence points to the potential role of such interventions in delaying the progression from MCI to Alzheimer's disease or other types of dementia.

Substance use disorders

A review of the evidence over the past 10 years for yoga in smoking cessation concluded that it is a promising intervention for improving smoking cessation rates (Dai 2014). Similarly, reviews of studies of yoga for various substance use disorders (four RCTs involving people with nicotine dependence, four RCTs in people with alcohol dependence and two RCTs in people with opioid use disorder) have concluded that yoga can be a useful adjuvant intervention in reducing addiction severity and improving quality of life (Sarkar 2017; Kuppili 2018). Thus, there is preliminary evidence for the utility of yoga as an adjunctive treatment in substance use disorders.

Psychiatric disorders in children and adolescents

A systematic review of 27 studies assessing the effects of yoga interventions on anxiety and depression in young people found that 70% of the studies reported overall improvements. Among the studies evaluating anxiety and depression, 58% showed improvement, whereas 70 and 40% of the studies assessing anxiety alone and depression alone reported improvements. The review authors concluded that regardless of intervention characteristics, yoga improves anxiety and depression in young people (James-Palmer 2020).

A systematic review that included four RCTs (two involving mantra meditation and two using yoga) could not draw any firm conclusion for the recommendation of yoga in attention-deficit hyperactivity disorder (ADHD) (Krisanaprakornkit 2010). Thus, the current evidence is not sufficient to make clinical recommendations for ADHD, but this is an important area for future research.

A review article in the area of yoga, mindfulness and autism spectrum disorders identified eight empirical studies that showed promising early results on social, emotional or behavioral metrics (Semple 2019). Though empirical evidence from the review was inconclusive, authors suggested need for further research.

This review of the evidence indicates that yoga can be useful for reducing anxiety and depression in children and adolescents but no conclusions can be drawn for its utility in ADHD or autism spectrum disorders at present.

Sleep disorders

A recent systematic review and meta-analysis examined the effects of mind–body therapies on sleep quality in healthy individuals and in people with insomnia (Wang 2019). It found 49 studies (4506 participants) with interventions such as meditation, tai-chi, qi-gong and yoga. The review authors concluded that these interventions produced a statistically significant improvement in sleep quality and reduction in insomnia severity, with more significant effects on healthy people than the clinical population. Thus, yoga can be recommended for enhancing the quality of sleep in healthy individuals and in people with insomnia.

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TABLE 1 **Yoga practices to be emphasised for various psychiatric disorders**

Diagnosis/indication	Yoga practices to be emphasised[a]
Moderate to severe depression (Naveen 2013; Varambally 2021)	Energising and activating practices such as Sun salutations (start with 4 rounds, increase by 2 every week up to 12 rounds per day), asanas involving back-bends and chest opening postures (maintain each pose for 30 s): half-wheel pose (*ardha-chakrasana*), half-camel pose (*ardha-ushtrasana*), serpent pose (*bhujangasana*); Fast breathing practices (*kriya*): bellows breath (*bhastrika*, 20 strokes per cycle, 3 cycles), skull shining breath *(kapalabhati*, 60 strokes per minute, 2 min); Specific slow regulated breathing (*pranayama*): right-nostril breathing (*surya anuloma viloma,* 27 cycles of breath), coherent breathing (equal ratio between inhalation and exhalation) and loud mantra chanting (such as 'aaa' or 'om', 3 min).
Anxiety disorders (More 2021)	Gentle relaxing practices of mild to moderate intensity (with gradual reduction of speed) which help in bringing parasympathetic dominance. Practices should focus on synchronisation of the body and breath, and mindfulness of the physical movements. Practices such as slow and deep breathing with prolonged exhalations, e.g. hands in and out breathing (10 rounds), tiger breathing (10 rounds), left-nostril breathing (*chandra anuloma viloma*, breathe in:hold:breathe out ratio of 1:4:2, i.e. breathe in for 4 counts, hold for 16 counts, breathe out for 8 counts; total 27 cycles), cooling pranayamas (*sitali* or *sadanta*, 9 cycles), gentle humming breath (*bhramari*, sound 'mmm', 3 min), *shavasana* with deep abdominal breathing (inhalation:exhalation ratio of 1:3, i.e. breathe in for 1 count, breathe out for 3 counts).
Post-traumatic stress disorder/stress management (Varambally 2021; Jasti 2020)	Main emphasis is on the coordination of body, breath and mind. Slow gentle practices that promote body and breath awareness (maintain each pose for 30 s), e.g. half-waist wheel pose (*ardhakati chakrasana*), triangle pose (*trikonasana*), butterfly practice, wind-releasing pose (*pavanmuktasana*). Practices for breath regulation: sectional breathing (*vibhagiya pranayama*) in different mudras (*chin*, *chinmaya* and *adi*) with longer duration of exhalation than inhalation (breathe in:hold:breathe out ratio of 1:4:2, i.e. breathe in for 4 counts, hold for 16 counts, breathe out for 8 counts; total 27 cycles). Laughter yoga may be helpful at the end of a session. At bedtime, gentle part-by-part tightening and relaxation of muscles, progressing from the toes to the head, with synchronisation of the breath and soothing visual imagery with soft humming chants (guided yogic relaxation/yoga nidra) may also help.
Schizophrenia and other psychotic disorders (Govindaraj 2016; Varambally 2012)	Practices that are easy to learn but are performed more intensely, with rapid change of postures synchronised with dynamic breathing after sufficient warm-up. Some useful techniques are jogging, twisting poses, dynamic Sun salutations (start with 4 rounds, gradually increase by 2 every week to reach 10 rounds), fast yoga breathing practice (*bhastrika*, 20 strokes/min for 2 cycles) followed by slow breathing practices (alternate-nostril breathing; 6 cycles) loud mantra chanting ('aaa', 'uuu', 'mmm', 5 min) with brief periods of interspersed relaxations (with eyes open) in *shavasana* (corpse pose).
Bipolar affective disorder (Varambally 2021)	A balance has to be achieved by avoiding too slow practices and preventing overdoing of fast practices. This can be achieved by keeping the person engaged with dynamic change of practice from one to another, interspersed with brief periods of relaxation in *shavasana*. Individuals with a current episode of depression should perform dynamic asanas with fast breathing practices interspersed with a brief period of relaxation where mantras emphasising the sound 'aaa' should be chanted. During a manic/hypomanic episode, a brief period of high-intensity practices such as Sun salutations and fast breathing (*kapalbahati* and bhastrika) should be followed by slow, gentle and soothing practices such as slow left-nostril breathing (27 cycles), cooling pranayama (9 rounds) and gentle humming breath (3 min) in *shavasana*.
Obsessive–compulsive disorder (Bhat 2016)	Deep mental relaxation should be emphasised. Rather than a strict regimen with minute details, practices with more general instructions are better. Mindfulness during the practice should be the focus. Awareness and relaxation should move from different body parts (body awareness, 2 min; slow, gentle joint-loosening practices with breath and mind synchronisation, 5 min) to breath, and from breath (fast breathing practice, 3 min; left-nostril breathing 27 cycles; loud chanting and then soft chanting of mantras such as humming chant, 3 min) to a brief period of complete silence and letting go of all the efforts (in *shavasana).* The cycle should be repeated two or three times, without a longer pause in between. An expanded, relaxed, non-judgemental and open state of mind should be targeted.
Mild cognitive impairment and dementia (Hariprasad 2013)	Short modules of easy practices that have been proven useful in enhancing cognition, such as humming breath (5 min), right-nostril breathing (27 cycles) followed by left-nostril breathing (27 cycles), slow, gentle *kapalabhati* breathing (20 breaths/min, 2–3 min), loosening of the joints with breath synchronisation and loud mantra chanting focusing on the vibration of the sound in the body. Encourage imitation of postures using all sensory components, including touch, sound, light and proprioception). Simple mental imagery techniques and group yoga practices should be promoted. *Trataka kriya* (focusing on a candle flame kept at 1 m distance in a dark draught-free room) can be advised twice a week. Laughter yoga can be performed towards the end of a session.

(*Continued*)

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TABLE 1 (*Continued*)

Diagnosis/indication	Yoga practices to be emphasised[a]
Somatoform pain disorders, chronic pain syndromes, lower-back pain and neck pain (Jha 2021)	Equal awareness of every part of the body should be emphasised by using poses that involve stretching and tightening of different body parts (maintain for 10 s), e.g. reverse boat pose (*vipreet naukasana*), wind-releasing pose (*pavanmuktasana*). This should be followed by relaxation of that part of the body. Mild backward-bending poses such as serpent pose (*bhujangasana*), half-camel pose (*ardha-ustrasana*) or half-wheel pose (*ardha-chakrasana*) are useful for lower-back pain and neck pain. Slow and deep abdominal breathing, alternate-nostril breathing and deeply relaxing practices such as yoga nidra or guided yogic relaxation in *shavasana* should be emphasised and performed for a longer duration at the end of a session (at least 20 min of relaxation in a 1 h module).
Migraine and other headaches (Varambally 2021)	Slow deep breathing practices such as alternate-nostril breathing (5 min) and left-nostril breathing (27 cycles) maintaining a ratio of breathe in:hold:breathe out of 1:4:2 (i.e. breathe in for 4 counts, hold for 16 counts, breathe out for 8 counts) every morning before breakfast. This should be followed by humming breath (*bhramari* with *shanmukhi mudra*, closure of the ears and eyes with the palm) for 3–5 min, where the massaging effect of the gentle humming chant should be felt in the head region. Hands may be supported by a table. It is important to note that the chant is gentle and soothing, and not loud and harsh. After this, whole-body joint loosening with breath synchronisation followed by deep relaxation of body parts from head to toe should be practised.
Substance use disorders and other behavioural addictions (Bhargav 2021a)	During the acute withdrawal phase, practices that are advised for anxiety disorders should be taught. In the maintenance phase, more challenging poses and breathing practices could be added. Individuals may require shorter yoga capsules of 15–20 min performed 2–3 times a day rather than performing the whole programme in a single session. In the maintenance phase, emphasis should be on building physical and mental strength with more intense practices such as Sun salutations, warrior pose (*veerabhadrasana*) variations, sectional breathing (*vibhagiya pranayama*), *kapalabhati*, *bhastrika*, victorious breath (*ujjayi*), *trataka*, humming breath (*bhramari)* and chanting of mantras such as 'om' during brief periods of relaxation in *shavasana*.
Seizure disorders (Varambally 2021)	Individuals require easy-to-learn practices that are relaxing and calming. Techniques such as Sun salutations, whole-body joint loosening, alternate-nostril breathing, humming breath with closure of the eyes with the hands (*bhramari* in *shanmukhi mudra*) and gentle chanting of mantras (such as 'om') should be emphasised.
Autism and attention-deficit hyperactivity disorder (Varambally 2021)	For children, practices that can be performed together in groups, such as *mandala* yoga where children come together and form a combined pose, e.g. a lotus flower, with each child contributing as a petal. Chanting mantras in chorus. Interesting breathing practices through which children can relate to different animals, such the dog, rabbit or lion. These will not only increase adherence but will also enhance the children's social connectivity with each other. Imitation of postures with multisensory components should be encouraged.
Sleep quality enhancement (Suman 2017)	Morning yogasana practice should be more helpful in improving night sleep than evening yogasana. All sleep specific practices should be performed on the bed. Start with tiger breathing in table pose for 5–6 rounds, then lie down on the back and perform a twisted abdominal stretch (*udaraakarshan asana*). Then perform 'point meditation' with movement of awareness on different parts of the body, starting from the top of the head down to the toes and back. This should be followed by left-nostril breathing for 5 min and then continuation of very gentle humming breath (*bhramari pranayama*) while lying down with the eyes closed. Yoga nidra may also be helpful practice.
Improving appetite	'Digestive fire' can be ignited by performing asanas and kriyas that involve twisting or flapping movements of the abdomen. Examples include: sitting twisted pose (*vakrasana*), Earth salutation pose (*bhunamansana*), seated forward-bend pose (*paschimottanasana*), *kapalabhati kriya* and *agni-sara kriya*. The practice of Sun salutations, butterfly (200 strokes per cycle), and right-nostril breathing may also help in improving digestive function and enhancing appetite. These practices may also help regulate the menstrual cycle.

a. Yogic practices should be performed at least three times per week for sustained effects. Fast breathing practices should not be performed less than 2 h after a meal.

Clinical yoga techniques for common psychiatric disorders

Although evidence points to the utility of yoga for various psychiatric conditions, it is difficult to say precisely what form of yoga should be recommended for specific symptoms or disorders. This is primarily due to the heterogeneity in the styles of yoga used in different studies and the lack of quality studies comparing different styles of yoga. Given these caveats, the suggestions below are based on our combined experience of clinical psychiatry and yoga therapy, and the self-reports of our patients. Table 1 offers some tips on the kind of yoga practices that should be emphasised in specific psychiatric disorders. We believe these will help clinicians understand

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therapeutic yoga techniques that can benefit their patients. Preliminary research shows that, on average, 8–12 weeks of yoga practice, with a minimum of three 1 h sessions per week, are required to produce observable benefits in major psychiatric conditions (Streeter 2020; Arasappa 2021).

Safety and adverse events

A systematic review assessing the frequency of adverse events in RCTs of yoga (94 RCTs published between 1975 and 2014 and involving 8430 participants) concluded that yoga was as safe as usual care and exercise (Cramer 2015). A few studies have reported aggravation of psychotic symptoms after meditative practices among patients with pre-existing psychotic disorders: a narrative review of 19 studies and 28 cases observed that the types of meditation involved were transcendent, mindfulness, Buddhist meditation such as vipassana, qigong, zen and theraveda, and practices such as bikram yoga, pranic healing and Hindustan-type meditation. However, the review authors noted that it was difficult to attribute a causal relationship between the meditation and worsening of psychotic symptoms and suggested further studies (Sharma 2019). Similarly, indirect evidence indicates that hyperventilation can be a cause, a correlate or a consequence of panic attacks, and practices reversing hyperventilation may be effective (Meuret 2010). Fast yoga breathing practices such as *kapalbhati* and *bhastrika* involve hyperventilation, whereas *kumbhaka* (holding of the breath) reverses the hyperventilation process. *Kumbhaka* has been used as a part of regulated breathing and slow pranayama in yoga. Thus, faster yoga breathing may be avoided, whereas slow pranayama may be promoted in anxiety disorders, including panic disorder. Learning yoga from media sources such as YouTube and self-practice without supervision can result in serious side-effects due to incorrect practices and should be avoided (Suchandra 2021).

It is important for clinicians to understand the potentially harmful effects of yoga practices and Table 2 lists practices that may preferably be avoided in patients with particular psychiatric disorders.

Possible neurobiological mechanisms of action of yoga in mental disorders

Downregulation of the HPA axis

Yoga has been found to reduce cortisol levels by downregulating the hypothalamic–pituitary–adrenal (HPA) axis. Studies have also shown that yoga practice (from the acute effect of a single session to 6 months of regular practice) can reduce cortisol levels in people with psychiatric disorders (Thirthalli 2013; Bershadsky 2014).

Increase in BDNF levels

Studies have also demonstrated that yoga practice of 12 weeks can enhance neuroplasticity (levels of brain-derived neurotrophic factor, BDNF) in people with major depressive disorder (Naveen 2016; Tolahunase 2018).

Enhancement of GABAergic transmission

Another major central mechanism through which yoga produces a calming and relaxing effect is by enhancing the levels of the neurotransmitter γ-aminobutyric acid (GABA). Studies have also found that Iyengar yoga intervention, varying from a single session to 12 weeks, can increase thalamic GABA levels in healthy individuals (Streeter 2007; Streeter 2010). Similar findings have also been observed with 12 weeks of yoga practice in patients with major depressive disorder (Streeter 2020). This GABAergic mechanism of yoga has also been demonstrated using transcranial magnetic stimulation (TMS) in people with depressive disorder (Bhargav 2021b).

Reduction in inflammatory cytokines

Inflammation is another biological process that is associated with psychiatric conditions. Two RCTs demonstrated a reduction in interleukin-6 (IL-6) after 10 weeks of hatha yoga (Nugent 2021) and 12 weeks of yoga and meditation-based lifestyle (Tolahunase 2018) in people with major depressive disorder.

Modulation of autonomic nervous system functions

Certain yoga practices, especially breathing through a specific nostril or at a particular frequency, have shown differential effects on the sympathetic and parasympathetic nervous systems (Raghuraj 2008). Slow yoga breathing practices may result in a state of parasympathetic dominance (Kromenacker 2018), whereas faster yoga breathing practices (*kriyas*) may produce the opposite effect.

Morphological and functional brain changes

In a recent review article, 34 international peer-reviewed neuroimaging studies of the effects of yoga on the brain using magnetic resonance imaging (MRI), positron emission tomography (PET) or single-photon emission computed tomography (SPECT) were analysed. Three consistent findings from the studies were: (a) increased grey matter volume in the insula and hippocampus; (b) increased activation of prefrontal cortical regions; and (c) functional connectivity changes in the default mode network (van Aalst 2020).

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TABLE 2 **Yoga practices to be avoided and precautions to be followed for various psychiatric disorders**

Diagnosis	Yoga practices to be avoided
Moderate to severe depression (Naveen 2013)	Advanced meditative practices that involve withdrawal of the senses (*pratyahara*) and contemplation with maintenance of the same posture for a long time (more than 3 min).
Anxiety disorders (More 2021)	Fast breathing practices such as *kapalbhati* (skull shining breath) and *bhastrika* (bellows breath) exceeding the speed of 30 breaths a minute (especially for the beginners). High-intensity physical practices.
Schizophrenia and other psychotic disorders (Suchandra 2021)	Meditation that involves withdrawal of the senses (*pratyahara*) and internalisation of awareness (e.g. vipassana meditation) or those involving guided imagery (such as yoga nidra). Very slow-paced yogic practices, maintenance of a yoga posture for more than 1 min and closure of the eyes for more than 1 min during any yogic practice. Practices that are complex or physically risky (e.g. *sirsasana* (head-stand pose). Theoretical discussions related to mystic effects of yoga.
Bipolar affective disorder (Varambally 2021)	Overdoing yogic practices may be harmful and slow-paced instructions and techniques may make the person more agitated. A balance must be achieved by keeping the person engaged with dynamic change of practices from one to another, interspersed with brief periods of relaxation in *shavasana* (corpse pose).
Obsessive–compulsive disorder (Bhat 2016)	Emphasis on performing a particular practice a specific number of times or for an exact duration should be avoided, as it might make the patient more anxious to achieve the target; instructions should be more generalized, clear and simple.
Mild cognitive impairment and dementia	Avoid teaching too many practices at a time and do not change the sequence of the practices in the yoga module frequently. For elderly people, standing poses should always be performed beside a wall for support. Fast breathing practices should not exceed the speed of 30 breaths per minute. Postures with increased risk of fall, such as *trikonasana* (triangle pose), *vrikshasana* (tree pose) and forward–backward bending, should be avoided. Elderly people should not be asked to close their eyes while performing any standing posture. Individuals with any cardiac disease should avoid acute forward bends and raising the hands above the head (Hariprasad 2013).
Somatoform pain disorders, chronic pain syndromes, lower-back pain and neck pain (Jha 2021)	Extreme forward and backward bends should be avoided; in particular, individuals with lower-back pain should avoid practices that involve bending forward, e.g. *padahastasana* (hand to feet pose), *paschimottanasana* (seated forward-bend pose), *surya namaskara* (Sun salutations) or *shashankasana* (Moon pose). Poses that involve raising the hands above the head, neck rotation and neck movements should be avoided in individuals with neck pain. Fast breathing practices such as *kapalbhati* and *bhastrika* should be performed very gently with caution by those with back/neck pain.
Migraine and other headaches (Varambally 2021)	Fast breathing practices (*kapalbhati* and *bhastrika)* that involve hyperventilation should be avoided. Loud chanting of mantras and rapid forward and backward bending should be avoided.
Substance use disorders and other behavioural addictions (Bhargav 2021a)	Fast breathing practices and intense yoga postures should be avoided if the person is experiencing acute withdrawal symptoms. Practices that are very slow and those requiring maintenance of a pose for more than 2–3 minutes (except for *shavasana* which can be maintained for up to 10 minutes) or highly contemplative practices involving imagery (e.g. yoga nidra) should be avoided in the initial phase.
Seizure disorders (Varambally 2021)	Practices that involve hyperventilation may precipitate a seizure episode and therefore practices such as *kapalbhati* and *bhastrika* are contraindicated. The yogic cleansing technique called *jyoti trataka*, which involves intense focus of the gaze on a candle flame without blinking, should also be avoided.
Autism and attention-deficit hyperactivity disorder	Complex practices that are difficult to learn should be avoided. Very slow-paced practices may not hold the individual's sustained attention (Gulati 2021).
Sleep disorder	Avoid dynamic yogasana, right-nostril breathing and fast yoga breathing practices in the evening (Suman 2017).

Further information

Further details on mechanisms of action may be found in a recent review article summarising biomarker evidence for the effects of yoga in psychiatric disorders (Bhargav 2021c).

Yoga in current psychiatric treatment guidelines

In 2016, the Canadian Network for Mood and Anxiety Treatments (CANMAT) updated its evidence-based clinical guidelines for treating depressive

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disorders. Section 5 of the guidelines deals with two broad categories of intervention using complementary and alternative medicine (CAM): (a) physical and meditative treatments and (b) natural health products. For major depressive disorder of mild to moderate severity, the guidelines recommend exercise, (bright) light therapy, St John's wort, omega-3 fatty acids, S-adenosyl-L-methionine (SAMe) and yoga as first- or second-line treatments (Ravindran 2016). Similarly, for adults with depression for whom psychotherapy or pharmacotherapy is either ineffective or unacceptable, the American Psychological Association's guidelines include a 'conditional recommendation for use' of exercise, St John's Wort, bright light therapy or yoga (Guideline Development Panel for the Treatment of Depressive Disorders 2019). Yoga is also recommended as a complementary intervention for the management of schizophrenia in the UK's updated National Institute for Health and Care Excellence guidelines (NCCMH 2014).

Barriers and limitations to the use of yoga in psychiatry

At an individual level, yoga requires significant motivation and effort. It also requires dedicated time and space for practice. In a survey of people with schizophrenia, it was observed that travel distance from home to the yoga centre was the primary barrier to yoga practice (Baspure 2012). Complex and challenging practices pose other obstacles. To overcome these barriers and enhance motivation, the yoga therapist should initially spend a good amount of time with the patient in rapport building and start with simple and easy yoga practices. Tele-yoga might be used to overcome the barriers of distance and time, with more frequent short sessions rather than a single long session. However, there is currently a disconnect between psychiatric care facilities and yoga services in most of the world. There are many reasons for this, such as the lack of trained yoga therapists/mental health professionals in most hospitals (perhaps because of funding limitations) and also the lack of awareness among mental health professionals about the benefits and precautions of yoga in relation to psychiatric disorders. We hope this article will help improve the connection (the root of the word 'yoga' means 'to connect'). A limitation of yoga therapy is lack of standardisation of practices for given clinical conditions. Clinical trials of yoga in psychiatric disorders use various interventions, ranging from predominantly asana-based approaches (the Iyengar school) to practices that are purely contemplative and meditative (Rajayoga meditation). This heterogeneity in published trials hinders application in clinical settings and calls for standardisation of modules and replication of studies.

How yoga services evolved at our tertiary mental healthcare hospital

The National Institute of Mental Health and Neurosciences (NIMHANS) is a major tertiary mental healthcare hospital in South India, with 932 in-patient beds and an average of 1500 patients attending out-patient services every day. The integration of yoga into clinical practice began in 2007 with the establishment of a centre funded by the Government of India's Ministry of Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH). Initially, services were provided on the basis of referrals (only one or two patients per day) from the NIMHANS' Departments of Psychiatry, Neurology and Psychology and were limited to patients with non-specific complaints or those who asked for yoga or those who had mild anxiety or depression and were unwilling to take medications. Referrals increased over the years and the centre was absorbed into NIMHANS' core services in 2014. In-patients and out-patients at NIMHANS were referred to the yoga centre by psychiatrists, psychologists, neurologists and neurosurgeons. In 2019, the yoga centre evolved into a separate clinical department – the Department of Integrative Medicine at NIMHANS – which integrates biomedicine, yoga and Ayurveda, with faculty and scientists from all three disciplines.

After coming to the yoga centre, the patient is first seen by the senior resident in psychiatry, who assesses the severity of illness and rules out contraindications for yoga. After assessment the patient is sent to a senior/junior scientific officer (MD yoga), who formulates the yoga programme and offers yoga-based lifestyle tips related to physical activity, diet, stress and sleep based on the assessment of the individual's constitution from traditional viewpoints (*gunas* – mental attitudes; *doshas* – physical factors). The patient is then introduced to the yoga therapist (Master's degree in yoga) who delivers the yoga sessions. Patient is given a yoga registration card that shows the patient's details, the name of the therapist, the time of sessions and an attendance chart. The first session is conducted by the therapist one-on-one, either on the day the patient first visits the department or the next day. In the first session, the therapist demonstrates indicated and contraindicated practices from the yoga module for the specific condition (e.g. the depression or anxiety module) and any errors in the patient's practice are corrected. Subsequently, from day 2, the patient joins 1 h group sessions for their particular condition. For most people, ten supervised yoga sessions are sufficient to learn and practice the module on their own at home with the help of a

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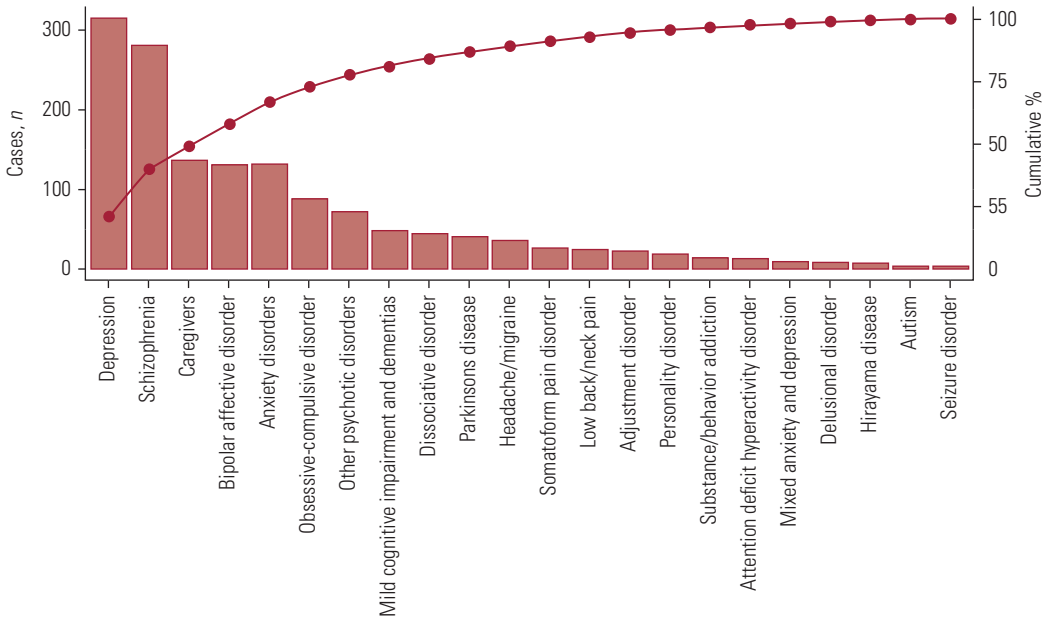

FIG 1 Pareto chart showing the diagnosis-specific pattern of referrals for yoga therapy to the Department of Integrative Medicine at the National Institute of Mental Health and Neurosciences, a tertiary mental and neurological healthcare hospital in South India, from 1 January to 31 December 2019.

practice chart or a video. Individuals with chronic psychoses and elderly people with cognitive impairment often need a month of supervised practice (approximately 20 sessions) to learn the module. For children with autism, 3–4 months are usually required to accustom the child to the class and practice, and substantial improvements in imitation are often observed only after 6–9 months of regular practice.

Indications for yoga referral

More than 70% of individuals referred for yoga therapy to the Department of Integrative Medicine at NIMHANS are treated primarily for one of the following disorders: (a) depressive disorders; (b) schizophrenia and other psychotic disorders; (c) anxiety disorders or obsessive–compulsive disorder; (d) mild cognitive impairment. The first two categories account for more than half of total referrals (53%). Hence, a yoga therapy centre in a tertiary mental healthcare setting could expect depression and schizophrenia (with other psychotic disorders) to be the most important psychiatric disorders for which yoga therapy is sought as an adjunctive treatment. Figure 1 shows the distribution of referrals by diagnosis in 2019. Apart from the conditions depicted in Fig. 1, about 1% of referrals were for the following diagnoses: ADHD, seizure disorder, Hirayama disease and autism spectrum disorders.

Role of a yoga-based lifestyle in preventive psychiatry

Preventive psychiatry is a branch of psychiatry that aims at health promotion, protection from specific mental illnesses, early diagnosis, effective treatment, disability limitation and rehabilitation. Prevention in neuropsychiatric conditions is particularly important as many of them run a chronic disabling course. Lifestyle factors, including psychosocial environment and stress, play key roles in the causation of psychiatric disorders. A yoga-based lifestyle has been found to be helpful in reducing lifestyle-related risk factors in major non-communicable diseases, and several studies have demonstrated the utility of yoga in combating psychological stress (Cocchiara 2019). Freedom from stigma, and the increasing popularity of tele-yoga in recent times, have made yoga more acceptable and accessible to people. Although potentially useful, research into the role of yoga in preventive psychiatry is limited.

Future directions in integrative psychiatry

Given the safety and beneficial effects of yoga in treatment of psychiatric disorders and promotion of mental well-being, we anticipate that it will become an integral part of multidisciplinary psychiatric care in the near future, similar to clinical psychology and psychiatric social work. However, this needs continuing generation of evidence on both the efficacy and mechanisms of action of yoga in mental health disorders.

Authors contributions

All authors contributed to the conception of this artcile, writing the first draft, revision and preparing the final version of this manuscript.

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Declaration of interest

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MCQ answers
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MCQs
Select the single best option for each question stem:

1 Which of the following is not a part of eight-limbed approach of yoga (Ashtanga yoga)?
a physical posture (asana)
b withdrawal of the senses (pratyahara)
c focused concentration (dharana)
d perception through the senses (pramana)
e ethical precepts (yama).

2 It is advisable to avoid the practice of meditation in:
a anxiety disorders
b depression
c schizophrenia
d somatoform pain disorder
e post-traumatic stress disorder.

3 The following yogic practice should be emphasised more in anxiety disorders:
a right-nostril breathing
b left-nostril breathing
c bellows breath (*bhastrika*)
d skull shining breath (*kapalabhati*)
e loud mantra chanting.

4 Fast yoga breathing practices such as bellows breath and skull shining breath should be avoided in:
a depression
b chronic psychotic disorders
c substance use disorders
d panic/anxiety disorder
e mild cognitive impairment.

5 Strongest evidence for the beneficial effects of yoga has been observed in:
a anxiety disorders
b chronic psychotic disorders
c substance use disorders
d depression
e mild cognitive impairment.

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