Yoga is a traditional life-style practice used for spiritual reasons. However, the physical components like the asanas and pranayamaas have demonstrated physiological and therapeutic effects. There is evidence for Yoga as being a potent antidepressant that matches with drugs. In depressive disorder, yoga ‘corrects’ an underlying cognitive physiology. In schizophrenia patients, yoga has benefits as an add-on intervention in pharmacologically stabilized subjects. The effects are particularly notable on negative symptoms. Yoga also helps to correct social cognition. Yoga can be introduced early in the treatment of psychosis with some benefits. Elevation of oxytocin may be a mechanism of yoga effects in schizophrenia. Certain components of yoga have demonstrated neurobiological effects similar to those of vagal stimulation, indicating this (indirect or autogenous vagal stimulation) as a possible mechanism of its action. It is time, psychiatrists exploited the benefits if yoga for a comprehensive care in their patients.

**Key words:** Depression, neurobiology, schizophrenia, yoga

**ABSTRACT**

Yoga school of thought and psychiatry: Therapeutic potential

Naren P. Rao1,2, Shivarama Varambally1, Bangalore N. Gangadhar1

1Department of Psychiatry, Advanced Centre for Yoga, National Institute of Mental Health and Neurosciences, Bangalore, India
2Centre for Addiction and Mental Health, Toronto, Canada

**INTRODUCTION**

Psychiatric disorders are a major source of disability, with depression and schizophrenia ranking among the top 10 disorders that contribute to global burden. Effective interventions to treat these disorders and reduce morbidity as well as disabilities are the need of the hour. Despite the best currently available treatments, a significant proportion of patients continue to be symptomatic and fail to achieve remission. Moreover, side effects of medications, long duration and cost of treatment are significant concerns to patients and their family. In view of the above limitations and stigma associated with psychiatric consultations/treatments, a good proportion of patients seek alternative/complementary treatments. Depression is among the common disorders for which patients seek alternative/complementary treatment.[1]

Yoga is an ancient holistic system which originated in India more than 3,000 years ago. Although there are several definitions for yoga, most schools of yoga incorporate elements of Asanas (physical movements) including relaxation, Pranayama (breathing practices), and dhyana (meditation). Most modern yoga schools are influenced by Patanjali Yoga Sutras and focus on unification of body, mind and spirit to promote health and well-being. However, different schools of yoga focus on different elements; while Sudarshan Kriya Yoga (SKY) focuses almost exclusively on pranayama, Iyengar’s yoga focuses on asanas and Vinyasa yoga focus on breath-linked movement.

Yoga is practiced by a considerable proportion of the population, not only in India but in other countries as well; a survey on the prevalence and practice of yoga in the United States estimate that around 7.5% of population practice yoga to promote physical and mental health.[2] Moreover, yoga is gaining recognition worldwide as a treatment for different physical and psychiatric disorders. Considering the growth and interest in yoga, it is essential to explore the potential benefits of yoga in psychiatry.

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utility of yoga as a potential alternative or complementary treatment for psychiatric disorders. Scientific evidence for yoga as a treatment for major mental illness is emerging, and studies conducted have methodological concerns. In this review, we focus on yoga as a treatment for the major psychiatric disorders depression and schizophrenia. We review studies examining yoga as a treatment for depression and schizophrenia, possible mechanisms of action of yoga in these disorders and limitations of current literature.

**YOGA AS A TREATMENT FOR DEPRESSION**

Yoga has been reported to improve self-reported perceptions of stress and well-being in the general public, and consequently, makes an intuitive appeal for treatment of depression in which the role of stress is well documented. Different yoga packages for patients with depression have been developed and examined. One well examined package is SKY, introduced and popularized by the Art of Living Foundation, Bangalore. SKY involves a set of breathing practices over a 45 min procedure. These include (a) Ujjayi: A slow breathing of 2-3 cycles per min, (b) Bhastrika: Rapid breathing with forced expirations through a partially closed glottis at 20-30 cycles per min, and (c) The kriya or cyclical breathing going through increasing frequency of cycles from 20 per min to 80 cycles per minute akin to hyperventilation. The three different breathing procedures are performed in a sitting posture over 30-40 min. At the end of these three breathing procedures the subject goes to supine posture in yoga nidra, a state of tranquility in the awaken state with the body being relaxed.

A series of studies conducted at National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore established the efficacy of SKY as a treatment for dysthymia and major depression. One of the initial studies examined outpatients with dysthymia (without any co-morbidity) in an open-label design and reported much or very much improvement in 76% of participants at the end of three months. On sub analysis, 83% of patients who were practicing SKY regularly remitted. Despite the limitations associated with an open-label study, this study used rigorous rating procedures and reasonable duration, which were strengths of the study. Moreover, there was an increase in prolactin level following SKY, which supported the possible biological changes as a result of yoga.

Subsequently, roles of individual components of SKY were tested in a randomized controlled study. Patients with diagnosis of major depression were randomized to receive either full SKY or partial SKY (without cyclical breathing). The latter group performed only Ujjayi and Bhastrika. 12 of 15 patients practicing full SKY responded while seven of 15 patients responded with partial SKY. The difference was trend-worthy (P = 0.058; OR = 4.6). Findings from this study suggested that full SKY probably had better antidepressant effects and possibly the different components of SKY are either additive or supportive to each other. In another study, patients with depression and melancholia were randomized to receive either Electroconvulsive therapy (ECT), a standard antidepressant (imipramine 150 mg per day) or full SKY. All three treatments produced significant reductions in depression ratings over the 4 weeks and similar proportions of patients remitted at the end of 4 weeks. At the end of trial, the mean Beck depression inventory score of the SKY group was not different from that of the Imipramine group but was significantly higher than in the ECT group. This study had several strengths. A limitation of this study was the absence of the placebo group. Another limitation which is inherent to almost all yoga studies was that the patients were not blinded to treatments.

Other yoga practices have also been examined as treatment for depression. In one of the earliest studies, yoga was compared with progressive muscle relaxation and no-treatment in a randomized trial and was found to be more efficacious than no treatment. This was followed by another study, which reported improved efficacy of Iyengar’s yoga in comparison to a wait-list control group. However, this study recruited subjects who had depressive symptoms but not psychiatric diagnosis of depression. In one large sample study of yoga, participants were randomized to three limbs; meditation + yoga with psychoeducation, group therapy with psychoeducation and psychoeducation alone. The results indicated that significantly more participants in meditation + yoga group remitted compared to control groups at 9-month follow-up. Another randomized controlled study from India compared yoga versus attention control as add on to antidepressants. Study indicated significant efficacy of yoga over attention control. However, one study comparing exercise and yoga did not report any difference.

**YOGA AS A TREATMENT FOR SCHIZOPHRENIA**

Despite considerable pharmacological advances in treatment of positive symptoms, significant lacunae remain in the treatment of cognitive and negative symptoms of schizophrenia. While older (typical) antipsychotics caused extrapyramidal side effects, the newer (atypical) antipsychotics cause significant metabolic side effects. Even after being adequately treated with antipsychotics, a sizeable proportion of patients are resistant to treatment, and continue to be symptomatic, requiring long-term in-patient care. Even those who have symptom remission may continue to have functional impairment and as a result, lead to substantial burden to caregivers. Thus, add-on treatments for schizophrenia as an adjuvant to antipsychotic have received attention. Yoga, in non-psychiatric populations, has demonstrated success in improving cognition, metabolic syndrome and correcting excess weight as well as menstrual disturbances. It is in this context, add on treatment with yoga has been conceived as an adjuvant to ongoing antipsychotic treatment. A yoga package based on Pancha Kosha model has been developed.
at NIMHANS in collaboration with Sri Vivekananda Yoga Anusandhana Samsthana (SVYASA), Bangalore.

In one randomized study, two groups of patients on stabilized doses of antipsychotics were given add-on yoga or add-on physical exercise. Decreased scores on in negative symptoms and social dysfunction were observed in both groups, with yoga showing better results than exercise.[13] Subsequent studies have compared add-on yoga to a waitlist control group and have supported the efficacy of yoga treatment, Visceglia et al. randomized clinically stable inpatients with schizophrenia to either supervised yoga program or waitlist and reported significant improvement in PANSS and quality of life with add on yoga treatment.[13]

In a recent study, patients were randomized to yoga, exercise or waitlist arms. Patients were assessed by raters who were blind to group status. The findings confirmed that yoga treatment improves negative symptoms significantly.[14] The waitlisted group in this study was later offered yoga thus forming a naturalistic cross over design. At the end of one month of yoga treatment, there was demonstrable benefit in negative symptoms but not positive symptoms. A recent systematic review of published yoga studies also reported improvement in psychopathology and quality of life, supporting the above.[15] However, in a recently conducted study with acutely ill patients with psychosis, there was no significant difference between yoga and exercise as regards BPRS scores, though patients on yoga obtained better antidepressant effects.[16] Thus, the currently used yoga modules seem to offer more benefit to patients with predominant negative symptoms. This is especially important given the fact that negative symptoms are more difficult to treat with medication, as described above.

A related study specifically assessed the effect of yoga on social cognition. Subjects participating in the above mentioned randomized controlled study were assessed using a culturally valid tool-Tool for Recognition of Emotions in Neuropsychiatric Disorder to measure facial emotion recognition. Patients in the yoga group had significant improvement in social cognition compared to patients in exercise or waitlisted groups.[17] In a recently published study, the authors examined the effect of adjuvant yoga therapy on cognitive functions in patients with schizophrenia. Patients who received adjuvant yoga therapy (asanas and pranayama) were compared with those who received treatment as usual. Patients who received yoga showed improvement in certain cognitive domains in indices of speed, accuracy and efficiency. Absence of comparable placebo group and non-randomized design were limitations of the study.[18]

POSSIBLE MECHANISMS

Different mechanisms of action and neurobiological substrates have been proposed, which could mediate beneficial effects of yoga;[19] (a) Autogenous sub-convulsive seizure: Studies have shown that in healthy volunteers, seizure-like EEG pattern was elicited, while practicing SKY. This was, however, not associated with any clinical seizure. This autogenous sub-convulsive seizure physiology was hypothesized to act similar to the induced seizures used against depression (for example, ECT) and hence the antidepressant effects thereof (b) SKY was shown to increase prolactin response in male depressive subjects. Elevated prolactin could be due to sub-convulsive seizure or could possibly be due to vagal afferent nerve stimulation.[20] (c) P300 changes: Patients with depression have decreased P300 amplitude and yoga therapy normalized P300 amplitude at the end of 3 months[20] (d) Neuroimmunological–depression is associated with elevated levels of pro-inflammatory cytokines and antidepressant drugs lower levels of these cytokines. Interestingly, tumor necrosis factor (TNF)-alpha levels decreased after regular yoga treatment. However, the sample size of this study was small and thus conclusions need to be drawn carefully[21] (e) Neuroplastic effects: Patients with depression have low levels of brain derived neurotrophic factor (BDNF) in blood, and antidepressant medications as well as ECT elevate the levels of BDNF. Our recently completed study at NIMHANS showed an increase in BDNF after regular yoga practice but not after irregular practice (unpublished data). (f) Changes in Oxytocin: A recent study demonstrated increase in oxytocin levels following yoga treatment, but not in the waitlisted group.[22] Elevation in oxytocin was paralleled by improvement in emotion recognition. Oxytocin, being labeled as the cuddling hormone may be the mediating mechanism for improvement in emotion recognition and also feeling of well-being. (g) Cortisol reduction: Yoga has been shown to decrease cortisol levels by different investigators.[23,24] Elevated cortisol level is a feature of depression, anxiety and stress and has deleterious effects on hippocampus and other limbic structures. Yoga, by reducing cortisol levels may have a neuro protective action. (h) Vagus Nerve afferent Stimulation (VNS): Indirect evidence suggests VNS may be one of the mediating mechanisms for therapeutic effect of yoga. VNS produces antidepressant effect and is an approved form of treatment in selected population.[23] Moreover, exogenous VNS results in elevation of prolactin and similar effect was seen with SKY. Some procedures involved in yoga like OM chanting may result in actual vibrations or such sensations in and around glottis, larynx, pharynx and ear. The sense of vibration around the ears is experienced due to the signals via external auricular nerve, a branch of the vagus. Thus, yoga may indirectly result in effects similar to exogenous VNS.[24] 

Yoga–neuroimaging findings

Based on the above mentioned studies, we hypothesized that OM chanting evokes neurophysiological responses similar to those found in VNS. To test this, we employed functional magnetic resonance imaging. Healthy volunteers had a decrease in BOLD signal in limbic structures (thalami,
antior cingulum, hippocampi, Insula and parahippocampi) during OM chanting but not during silence, suggesting deactivation during OM chanting. Interestingly, these regions were similar to the ones deactivated during VNS and activated in depression and anxiety. Thus, OM chanting may produce autogenous VNS-like effects and has the therapeutic potential.[26]

**BARRIERS FOR YOGA THERAPY IN PSYCHIATRIC DISORDERS—LIMITATIONS OF YOGA AND CURRENT RESEARCH**

It is surprising to note that despite being widely practiced by general population, yoga has not been an active component of psychiatrists’ armamentarium. Similarly, yoga is not widely popular among the psychiatrically ill seeking hospital treatment. The reasons for these are many; (a) Limited scientific evidence for efficacy of yoga in major mental disorders – there are very few studies, which meet the contemporary criteria for evidence-based medicine. In a recently published systematic review of yoga treatment trials for schizophrenia, only three studies met the eligibility criteria for inclusion. However, some methodological limitations are inherent to yoga studies. For example, due to the innate nature of yoga practice, blinding patient to the treatment is not possible. Strategies like partial yoga techniques as described in the earlier study[5] may be helpful to counter this limitation. (b) Yoga is time consuming, and current research does not provide guidelines on the minimum effective dose of yoga nor the ideal yoga module for a given condition. However, findings from different studies described earlier indicate that regular practice of yoga is necessary for its effect (c) People with disability or comorbid medical conditions may have difficulties in practicing yoga. In such situations, yoga needs to be tailored to individual abilities (d) Logistical reasons – yoga specific to psychiatric disorders is offered in only few centers and logistic difficulties in frequently visiting the tertiary care center is one important reason. In a recent study, it was shown that common reasons for not participating in yoga research study were, ‘staying far away from the yoga service’, ‘no one to bring the patient’ and ‘patient is going to work’[27] (e) As yoga is an indigenous technique, it may be considered foreign in patients from other cultures. However, widespread popularity of yoga in western countries suggests that it is acceptable to majority of the individuals.

Acceptability with yoga: In addition to the efficacy and lack of side effects of yoga used for the treatment of major mental illness as discussed above, an important strength of yoga as a treatment is acceptability, especially in Indian culture. Yoga, being a product of Indian wisdom over centuries, has no associated stigma unlike other treatments for mental illness. This has been seen in both urban and rural population and also in both the illiterate and educated. Moreover, yoga can be practiced indoor, a distinct advantage for women who may have constraints for outdoor physical activities due to cultural aspects, particularly in rural areas.

**FUTURE DIRECTIONS**

Yoga as a treatment is yet to be established in standard medical care. As of now, it is available in a few tertiary care centres only, and has no place in the armamentarium of physicians. In addition to some of the inherent limitations of yoga research, there are other issues, which need to be considered and addressed in future research:

- The classification of mental and physical illness at present are based on allopathic understanding of body-mind dualism and thus differs from yogic concept of body-mind interaction. Thus, expecting specific yoga treatment for these individual disorders may be difficult. Yoga practitioners need to consider an alternate, comprehensive (but closely matched to allopathic categories) diagnostic system to develop specific treatment packages. As a totally different system, yoga carries the risk of being not acceptable to the majority of medical practitioners. Therefore, a careful approach is required to match as close as possible to the existing system.

- One of the common criticisms for yoga research is the role of faith in improvement. While this may be a hindrance for scientific rigor, it may be a useful concept for practice of medicine. If it adds to the acceptability and therapeutic effect, it is important to look at the faith effect from a positive perspective to improve utility of this treatment. At the same time, it is important to demonstrate biological changes occurring with yoga to establish the scientific basis. Work done so far in this direction, though promising, is preliminary, and needs to be expanded in future. Furthermore, trials controlling for specific components of yoga, similar to the one carried out with SKY, may help to answer the role of specificity.

- Until date, yoga research is usually conducted in a single center (usually a specialized yoga centre) which limits its inculcation into routine practice. Multi-centric trials are required to examine not only the efficacy but the effectiveness, of yoga treatment, which can then be translated to routine medical care across the country. For a multi-centric trial, one needs to have standardized training programs and objective ways of measuring yoga training and yoga practice. This is essential to establish a dose-related effect for yoga treatment. Video recording and blinded rating may be a useful approach, which is currently under investigation.

**SUMMARY AND CONCLUSIONS**

Studies conducted in the past two decades have supported the therapeutic potential of yoga as a treatment for major mental illnesses. These studies have revealed important findings, both therapeutic and methodological; efficacy of
yoga as a treatment is demonstrated for major mental illness like depressive disorders, negative and cognitive symptoms of schizophrenia. Yoga being safe and devoid of side effects, has a distinct advantage over pharmacotherapy in terms of acceptability. Preliminary findings indicate changes in neurophysiological, neuroimmunological and neuroimaging measures, thus establishing a scientific basis for yoga treatment. Now, we know that randomized, controlled trials with blinded ratings are possible using yoga and future studies need to address the methodological limitations of earlier studies to provide an evidence base for translation into clinical practice. In conclusion, we have traveled far in building evidence for yoga therapy in mental illness, but still have a long way to go to translate this evidence to practice.

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