# Role of Yoga and Mindfulness in Severe Mental Illnesses: A Narrative Review


## Abstract

**Background:** Yoga has its origin from the ancient times. It is an integration of mind, body, and soul. Besides, mindfulness emphasizes focused awareness and accepting the internal experiences without being judgemental. These techniques offer a trending new dimension of treatment in various psychiatric disorders. **Aims:** We aimed to review the studies on the efficacy of yoga and mindfulness as a treatment modality in severe mental illnesses (SMIs). SMI includes schizophrenia, major depressive disorder (MDD), and bipolar disorder (BD). **Methods:** We conducted a literature search using PubMed, Google Scholar, and Cochrane Library with the search terms "yoga," "meditation," "breathing exercises," "mindfulness," "schizophrenia spectrum and other psychotic disorders," "depressive disorder," and "bipolar disorder" for the last 10-year period. We also included relevant articles from the cross-references. **Results:** We found that asanas and *pranayama* are the most commonly studied forms of yoga for schizophrenia. These studies found a reduction in general psychopathology ratings and an improvement in cognition and functioning. Some studies also found modest benefits in negative and positive symptoms. Mindfulness has not been extensively tried, but the available evidence has shown benefits in improving psychotic symptoms, improving level of functioning, and affect regulation. In MDD, both yoga and mindfulness have demonstrated significant benefit in reducing the severity of depressive symptoms. There is very sparse data with respect to BD. **Conclusion:** Both yoga and mindfulness interventions appear to be useful as an adjunct in the treatment of SMI. Studies have shown improvement in the psychopathology, anxiety, cognition, and functioning of patients with schizophrenia. Similarly, both the techniques have been established as an effective adjuvant in MDD. However, more rigorously designed and larger trials may be necessary, specifically for BD.


**Keywords:** *Bipolar disorder, major depressive disorder, mindfulness, schizophrenia, severe mental illnesses, yoga*


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## Introduction

The term "yoga" stands for "union." It is a philosophical science seeking unity of an individual's soul with absolute reality. Yoga is gaining importance across the world. While the western world views yoga as a form of physical exercise (PE), the eastern world recognizes yoga more holistically as a means of integration of the body and the mind.[1]

Yoga has been demonstrated to have several positive effects on the cardiorespiratory performance,[2] glucose tolerance,[3] and musculoskeletal system.[4] Similarly, recent evidence has shown promising results of yoga in various psychiatric disorders.

Basically, three forms of yogic practices, namely asana-based (bodily), breathing-based (breath), and meditation-based (mental), are inherent to any form of yoga. An asana-based practice involves various bodily postures coordinated with breathing. Meditation-based yoga involves dissociating oneself from the disturbing thoughts and focusing on breathing. Thirdly breathing-based yoga, which is referred to as "*pranayama*," involves slow and focused breathing providing designated time for inhalation and exhalation.

Similar to yoga, another age-old technique that is gaining special attention in the recent years is mindfulness. Mindfulness is an ancient practice from the Buddhist culture, and it emphasizes on the focused attention of present moment, acceptance of internal experiences, and being nonjudgemental.[5] Evidence is favoring



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positive effects of mindfulness on mental health such as improvement in coping and self-compassion and reduction of stress, anxiety,[6] depression,[7] and obsessions.[8]

Schizophrenia is a severe mental disorder with heterogeneous cluster of symptoms. It is a challenge to attain complete remission in most patients with the current pharmacological agents. The drawback of side effects and minimal effect on cognitive deficits with medications have necessitated the use of yoga and mindfulness in schizophrenia. Similarly, the persistence of depressive symptoms in patients with major depressive disorder (MDD) has led to the trials of complementary therapies, including yoga and mindfulness.[9]

These complementary therapies are finding importance in bipolar disorder (BD) which is one among the severe mental disorders due to similar difficulties.

Here, we aimed at reviewing the available literature for the role of yoga and mindfulness interventions in severe mental illnesses (SMIs) such as schizophrenia, MDD, and BD.

## Methods

We conducted an independent search on MEDLINE through PubMed, Google Scholar, and Cochrane Library. The keywords are specific medical subject heading terms, namely "yoga" or "breathing exercises" or "meditation" or "mindfulness." A time limit of 10 years has been specified, and we restricted the search to English-language articles. We also used the Boolean operator with these terms to combine with "schizophrenia spectrum and other psychotic disorders" yielding 106 results and combining with "bipolar disorder" yielded 22 results. We also used the search term "depressive disorder" and obtained 827 articles. Few studies ($n$ = 6) has been included for the review from the cross-references of these articles.

We screened these results based on title and abstract for suitability to be included in the review. We included all types of human studies such as clinical trials, randomized trials, and nonrandomized trials, as well as open-label studies, case–control studies, and case reports. We excluded opinions expressed on the subject in the form of correspondence and review papers. We specifically excluded the studies on depression that included only depressive symptoms and done in special population with comorbid medical conditions as the feasibility and fidelity of the intervention were doubtful. We also excluded studies that reported mindfulness-based cognitive-behavioral therapy (MBCT) as we believed that these studies were more in the domain of psychotherapies and CBT, which imbibed only some principles from yoga and mindfulness.

We got a total of 49 studies based on the above steps as demonstrated in the flow diagram of Figure 1. The full text of these studies was obtained, and two authors independently extracted the available data using a common format. We assessed the available information and presented under various themes.

## Results

Forty-nine eligible studies were reviewed for studying the role of yoga and mindfulness in SMI.

### Sample characteristics

Sample size in the yoga therapy (YT) studies ranged from 19[10] to 286[11] and in the mindfulness-based intervention (MBI) studies ranged from 5[12] to 340.[13] The above-mentioned sample size range is not inclusive of case report or case series type of studies. Sample size calculation has been mentioned only in a few studies.[13-20] The mean age ranged from 21.50 ± 3.21[21] to 65.5 ± 4.8[20] years in the YT studies and from 23.8 ± 6.8[13] to 53.2 ± 6.1[12] years in the MBI studies. YT and MBI studies included both genders, but few YT studies included either men[18,22] or women,[17,23] and one MBI study included only men.[6] Number of women in MBI studies ranged from 1[12] to 66.[13] The patient group comprised mostly individuals with a diagnosis of either schizophrenia, MDD, or BD as per the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, except for a few studies which used the ICD-10 criteria.[18,22,24,25] Apart from individuals with schizophrenia, a few studies included certain other disorders such as schizoaffective disorder,[6,12,17,26,27] unspecified psychosis,[7,17,21,28] schizophreniform, brief psychotic and delusional disorders,[17] and psychotic depression.[14,29] In YT studies, baseline mean total positive and negative syndrome scale (PANSS) score varied from 47.5 ± 15.4[17] to 85.10 ± 19.82[10] and positive subscale score ranged from 10.2 ± 3.7[17] to 21.60 ± 5.99.[10] Vancampfort *et al*. have included schizophrenia individuals with a clinical global impression-severity (CGI-S) score ≥4.[30] Few of the YT studies included participants with the mean baseline total scale for the assessment of positive symptoms and scale for the assessment of negative symptoms scores ranging from 6.6 ± 2.3 and 10 ± 4.7[31] to 12.44 ± 11.50 and 23.58 ± 18.09,[11] respectively. In the MBI studies, baseline mean total PANSS score ranged from 77.2 ± 13.7[12] to 88.5 ± 15.8[13] and the positive subscale score ranged from 17.4 ± 2.8[12] to 26.9 ± 8.3.[13] Few studies on MBIs used the brief psychiatric rating scale (BPRS) to assess the severity of the illness and the range varied from 30.6 ± 7.5[16] to 41.83 ± 13.59.[7] YT and MBI studies on depression that used standardized scales are described in Table 1a and b, respectively. Baseline depression severity ranged from 12.5[32] to 26.20 ± 6.60[35] in YT studies and from 7.62 ± 3.92[34] to 30 ± 9.1[35] in MBI studies. Murray *et al*. have recruited individuals with a baseline mean total young mania rating scale of 2.45 ± 3.00 and Hamilton depression rating scale (HDRS) score of 8.03 ± 9.02.[15]

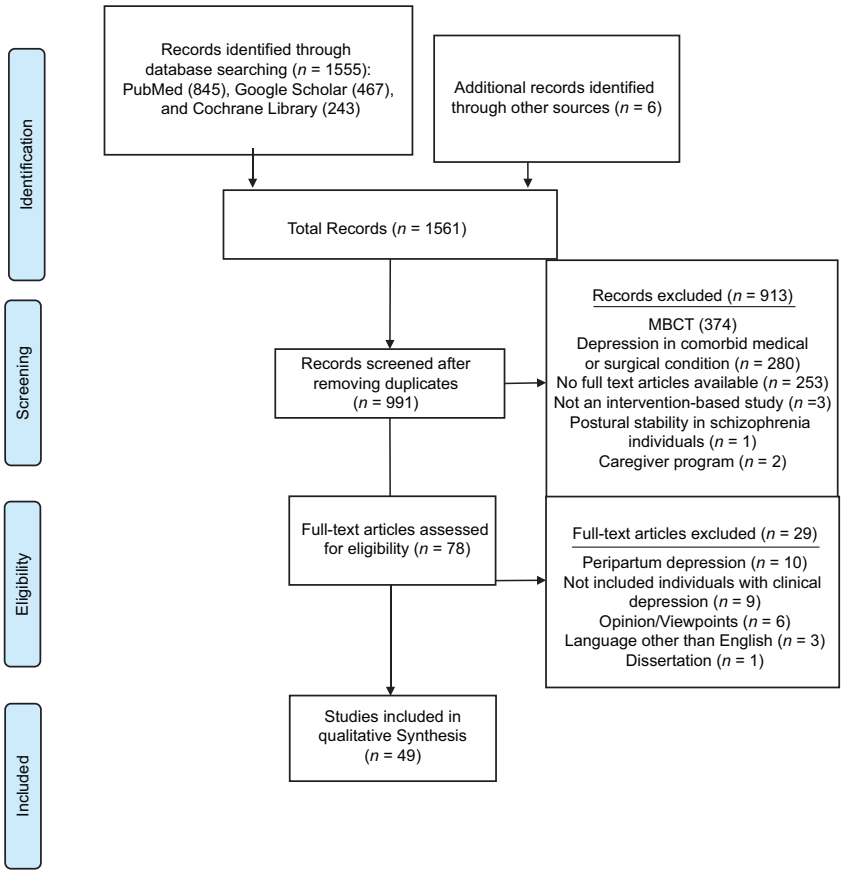


**Figure 1: Flow chart of the study-selection process**

## Intervention paradigm

Details of the YT are described in Table 2. MBI paradigm are included in Tables 3a and 1b. In majority of the studies, the training for the intervention groups has been offered by experts. The duration of sessions ranged from 40 to 90 min and 60 to 120 min in the YT and MBI groups, respectively. Training sessions were either completed during the 1st week or conducted at the frequency of one/two sessions per week. During other days, participants were encouraged to practice the intervention in their homes.

## Effects of yoga in schizophrenia and other psychotic spectrum disorders

The results of various studies on YT in schizophrenia are described in Table 4a. Evidence has clearly demonstrated that YT has benefited individuals with schizophrenia.

### *Yoga and psychopathology*

YT demonstrated a significant improvement in PANSS total score,[26,28,36] positive subscale,[10,31,37] negative subscale,[10,17,18,31,36,37] and general psychopathologic subscale.[10,18,28] A few of the aforementioned studies have identified a significant improvement in specific domains of PANSS negative subscales such as blunted affect, emotional withdrawal, passive social withdrawal, and difficulty in abstract thinking with relatively better improvement in poor rapport and lack of spontaneity.[18] Similarly, in the general psychopathologic subscale, somatic concerns, guilt feelings, motor retardation, depression, unusual thought content, disorientation, preoccupation, and active social avoidance domains showed a significant improvement.[18] Manjunath *et al*. have reported significant improvement in CGI-S and HDRS of YT group as compared to the PE group.[28]

### *Yoga and functional outcome*

YT has shown promising results in improving functional outcome of schizophrenia individuals, which includes better social and occupational functioning,[26,31,36] quality of life,[26] achieving functional remission,[19] subjective well-being, personal hygiene, life skills, interpersonal activities, and communication.[22] Individuals on YT demonstrated better scores in Tool for Recognition of Emotions in Neuropsychiatric Disorders (TRENDS) accuracy score[31,37] and TRENDS over identification score.[31]

### *Yoga and cognition*

In schizophrenia individuals, YT has demonstrated significant improvement in speed index of attention and emotion domains and accuracy index of abstract thinking and mental flexibility domains.[11,38] Both YT and PE have

**Table 1a: Details of the studies of yoga in major depressive disorder**

| Author & year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD/ range) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Shahidi *et al*., 2011[20] | -RCT<br>-N=70<br>-n=60 | Depressed women with an age range of 60-80 years of age | Laughter yoga therapy group (*n*=20) 65.5 (4.8)<br>All the included participants were women | PE group (*n*=20) 65.7 (4.2)<br>TAU group (*n*=20) 68.4 (6.3) | -Yesavage GDS<br>-Diener LSS | - Individuals in both laughter therapy and PE groups showed significant improvement in their GDS scores<br>- Only subjects in Laughter Yoga group showed significant improvement in their LSS scores compared with controls | NM | 10/70 | NM |
| M. Niemi *et al*., 2016[24] | -Cluster RCT, superiority trail<br>-N=1951<br>-n=56 | Patients classified with moderate Depression in PHQ 9 | YT (*n*=34) 63 (56-69.5) 21:13 | CG (*n*=22) 64.5 (58-69) 11:11 | -PHQ 9<br>-MINI | YT group had significantly lower PHQ-9 scores than the control group. | Baseline and 8 weeks | 6/34<br>5/22 | NM |
| Shapiro *et al*. 2007[32] | -Pilot study<br>-N=37<br>-n=17 | Unipolar major depression in partial remission; taking anti depressant medication for at least 3 months | YT 44.8 (20-71) 10:27 | Nil | -HAM-D<br>-QIDS<br>-SCL<br>-ANGIN<br>-ANGOUT<br>-STAI<br>-Cook-Medley Hostility Scale<br>-SLEEP<br>-SF-36<br>-HR and BP<br>-HRV<br>-FIR<br>-BRS<br>-Mood Ratings | -Significant reduction in HAM-D, STAI, ANGOUT, SCL, RESF36 and LF-HRV.<br>-Remitted participant showed greater reduction in QIDS, SCL, HF-HRV and HFTOT-HRV.<br>-Significant immediate change in mood from before to after each class was reported.<br>-Mood did not change significantly over the course of the session except for happiness. | NM | 20/37 | NM |
| N. Sarubin *et al*., 2014 [33] | -RCT<br>-N=60<br>-n=53 | -Intention -to -treat sample<br>-18 to 65 years and suffering from a major depressive episode according to DSM-IV criteria | YT with (QXR/ ESC) (*n*=22) 37.27 (11.85) 14:8 | CG with (QXR/ESC) (*n*=31) 42.36 12.85) 24:7 | - HAMD-21<br>- COR AUC values within the DEX/ CRH test | -A more pronounced down regulation of the HPA axis activity due to yoga could not be detected.<br>-The stepwise long-term cortisol reduction was seen in both medication groups irrespectively of yoga add-on treatment.<br>-Cortisol improvers in week 1 of therapy (reduction in cortisol peak value within the DEX/CRH test) reached significant greater amelioration of depressive symptoms after 5 weeks. | -HAMD-21 was used at day 0, 4, 7,14, 21, 28 and 35<br>-DEX/ CRH was performed before treatment, after 1 week and after 5 weeks of treatment. | NM | NM |

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**Table 1a: Contd...**

| Author & year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD/range) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Sharma *et al*., 2017[34] | -Randomized, rater-blind, waitlist-controlled study<br>*N*=60<br>n=25 | MDD (defined by DSM-IV-TR) depressed despite ≥8 weeks of antidepressant treatment | YT (SKY)<br>(*n*=13)<br>39.4 (13.9)<br>4:9 | WL<br>(*n*=12)<br>34.8 (13.6)<br>3:9 | -HDRS-17<br>-BDI<br>-BAI<br>-Columbia-Suicide Severity Rating Scale | -SKY arm showed a greater improvement in HDRS-17 total score compared to waitlist control<br>- SKY also showed greater reduction in BDI total score versus waitlist control<br>- Mean changes in BAI total score from baseline were significantly greater for SKY than waitlist control group. | Baseline and 2 months | 3/13<br>0/12 | Not present |
| K.J. Schuverand B.A. Lewis 2016[35] | -Prospective, randomized, controlled 12-week intervention pilot study.<br>*N*=85<br>*n*=40 | Yoga naïve, 18 years or older individuals with at least mild to moderate level of depression and able to commit to two sessions (yoga or walking) per week for 12 weeks | Mindfulness-based YT<br>(*n*=20)<br>45.55 (12.30)<br>All the participants were women | Walking control condition<br>(*n*=20)<br>39.8 (11.23) | -BDI<br>-RRS | -Both groups reported decreases in depressive symptoms from baseline to post-intervention, and from baseline to one-month follow-up<br>-No significant between group differences in depression scores immediately post-intervention and at one-month follow-up<br>-The mindfulness-based YT reported significantly lower levels of rumination than the control condition post-intervention | -Baseline, post-12-week intervention and one-month follow-up | 2/20<br>4/20 | NM |

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**Table 1a: Contd...**

| Author & year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD/range) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Descilo *et al*., 2010 [37] | Non-randomized intervention study (pre and post intervention)<br>*N*=350<br>*n*=183 | Tsunami survivors who scored 50 or above on the PCL-17 | -BWS<br>(*n*=60)<br>30.8<br>9:51 | BWS+TIR<br>(*n*=60)<br>35.1<br>2:58<br>WL group<br>(n=63)<br>34.7<br>9:51 | -PCL-17<br>-BDI-21<br>-GHQ-12 | -Depression improved significantly along with PTSD in both BWS alone and in combination with TIR.<br>-Improvement was noted at 6 weeks and maintained till 24 weeks follow up | Baseline and at 6, 12 and 24 weeks | BWS - 5/60<br>BWS + TIR 3/60<br>(After 12 weeks of follow up) | -No adverse reactions in the BWS group.<br>-BWS+TIR group reported more stress in the process of recollection of the trauma |
| Prathikanti S *et al*., 2017[38] | -Prospective, single-centre, single-blind, randomized, controlled, parallel group pilot trial<br>*N*=97<br>*n*=38 | Mild-to-moderate major depression, as per evaluation with the Mini International Neuropsychiatric Interview and scores of 14±28 on the BDI - II | YT<br>(*n*=20)<br>43.1 (15.2), 22-64;<br>5:15 | AC<br>(*n*=18)<br>43.8 (14.7), 7:11 | -BDI scores<br>-GSES<br>-RSES | -Yoga participants exhibited significantly greater 8-week decline in BDI scores than controls<br>-Yoga participants were more likely to achieve remission, defined per final BDI score less than or equal to 9<br>- Intervention groups did not differ significantly in 8-week change scores for either the GSES or RSES | - BDI every 2 weeks from baseline to 8 weeks<br>-GSES and RSES at baseline and 8 weeks | 5/20<br>8/18 | -No serious adverse events related to participation in either intervention.<br>-In minor adverse events, 5 of 18 participants (28%) who attended at least one yoga practice session reported transient musculoskeletal discomfort when learning yoga poses. |

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**Table 1a: Contd...**

| Author & year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD/range) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Butler *et al*. 2008[51] | -Randomized pilot study<br>*N*=139<br>*n*=46 (74% females & 26% males) | Dysthymia (50%),<br>Double depression (28%),<br>MDE in partial remission (15.2%) and Chronic<br>major depression (6.5%) diagnosed as per DSM-IV | Meditation group<br>(*n*=15)<br>50.4 (14.8), Sex ratio not mentioned for independent groups. | Hypnosis group<br>(n=15)<br>Control group<br>(n=16) | -HRSD<br>-CDRS | -At follow up meditation<br>group demonstrated better remission rate than controls but not significantly better than the hypnosis group.<br>-Hypnosis group participants also experienced remission, but the difference from controls was not statistically<br>significant<br>-Neither<br>psychotherapy nor antidepressant use at 9 months was significantly correlated with<br>the slopes for the CDRS or the HRSD. | Baseline and 9 months follow up | NM | NM |
| Uebelacker *et al*., 2010 [52] | -Pre and post intervention open trail<br>*N*=32<br>*n*=11 | -Individuals with mild-to-moderate levels of depression on stable medications during the subsequent<br>2 months and committed to<br>attend 2 yoga classes per week | YT<br>(n=11)<br>33.9 (9.6);<br>1:10 | Nil | -QIDS<br>-PHQ-9<br>-TRAQ<br>-RRS<br>-BADS<br>-FFMQ | -Significant improvement was noted in two measures of depression (QIDS and PHQ-9).<br>-Statistically<br>significant improvement in activation and nonjudging of experience.<br>-YT showed an increasing trend in other aspects of mindfulness as well. | -Contacted participants<br>by telephone at 2, 4, and 6 weeks to assess depression (using the PHQ-9) and the number of yoga classes attended in the past 2 weeks<br>-In-person final assessment at 8 weeks. | 1/11 | NM |

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**Table 1a: Contd...**

| Author & year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD/range) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Kinser *et al*., 2013[53] | -Randomized, controlled, mixed methods community-based study *N*=48 *n*=27 | Yoga naïve adult women with a diagnosis of MDD or dysthymia as confirmed by MINI 6.0 depression module and moderate to severe depression, defined by a score of 10 or above on the PHQ-9. | YT (*n*=15) 40.93 (15.84) | AC (*n*=12) 46.17 (15.40) | -PHQ-9 -PSS-10 -STAI -RRS -Subscales of the Brief Symptom Inventory | - All the participants had decreasing levels of depression over time with no significant differences in depression scores over time between YT and AC groups - YT had reduced rumination scores over time compared to the control group - No differences in anxiety, stress, and interpersonal/ hostility between the YT and AC groups over time. - YT group reported increased connectedness and gaining a coping strategy. | -Depression severity (timepoints-baseline, 2 weeks, 4 weeks, 6 weeks, 8 weeks) | 9/27 | NM |

PE – Physical Exercise therapy, TAU – Treatment As Usual, GDS - Geriatric Depression Scale, LSS - Life Satisfaction Scale, YT – Yoga Therapy group, CG – Control Group, PHQ-9 - Patient Health Questionnaire, MINI - M.I.N.I.Neuropsychiatric Interview, HAMD/ HDRS – Hamilton Depression Scale, QIDS - Quick Inventory of Depression Symptoms—Clinician Rating, ANGIN - Spielberger Anger Expression Scale (suppression of anger), ANGOUT - Spielberger Anger Expression Scale (expression of anger), STAI - Spielberger Trait Anxiety Inventory, SLEEP - Pittsburgh Sleep Scale, SF-36 - Short form health survey, HRV – Heart Rate variability, FIR - Finite Impulse Response, BRS - Baroreflex Sensitivity, HF-HRV- High frequency HR variability, LF-HRV – Low frequency HR variability, HFTOT-HRV - Ratio of log-transformed variance of HF-HRV to the sum of the logs of the two bands, LFTOT-HRV - Ratio of log-transformed variance of LF-HRV to the sum of the logs of the two bands, DSM-IV - Diagnostic and Statistical Manual of Mental Disorders, QXR – Extended release Quetiapine, ESC – Escitalopram, COR AUC - cortisol concentration time curve/area under the curve, DEX/CRH – Dexamethasone/ Corticotopin Releasing Hormone, HPA – Hypothalamic Pituitary Adrenal, MDD – Major Depressive Disorder, BDI – Beck Depression Inventory, BAI – Beck Anxiety Inventory, RRS – Rumination Response Scale, PCL-17 - Post-traumatic Checklist-17, BDI 21 – 21 item Beck's Depression Inventory, GHQ -12 - General Health Questionnaire, AC – Attention control group, GSES – General Self-Efficacy Scale, RSES – Rosenberg Self-Esteem Scale, HRSD - Hamilton Rating Scale for Depression, CDRS - Cornell Dysthymia Rating Scale-Self Report, IR - the Inner Resources program, MDE – Major depressive episode, BWS - Breath Water Sound, TIR - trauma reduction exposure technique, WL – Waitlist group, SKY - Sudarshan Kriya, SK - Sudarshan Kriya, PTSD - Post-Traumatic Stress Disorder , TRAQ - Treatment Response to Antidepressant Questionnaire, BADS - Behavioral Activation for Depression Scale, FFMQ - Five-Facet Mindfulness Questionnaire, PSS-10 - Perceived Stress Scale-10, STAI - State-Trait Anxiety Inventory, NM – Not mentioned

**Table 1b: Details of the studies of mindfulness in major depressive disorder**

| Author and year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| J. Sundquist *et al*., 2015[25] | -RCT<br>-N=215<br>-n=196 | Newly diagnosed patients as well as those who had a history of psychiatric disorders, who sought treatment for their psychiatric disorder. | MBI (*n*=110) 42 (11) 21:89 | CG (*n*=105) 41 (11) 11:94 | -Adapted from two mindfulness -based therapies MBSR and MBCT.<br>-8 weeks and was given in 2 h sessions, once a week<br>-Practice mindfulness at home for 20 min/day | -MADRS-S<br>-HADS<br>-PHQ-9 | -Scores for all the scales in both groups decreased significantly.<br>-There was no significant difference between the mindfulness and control groups. | Baseline and 8th week | MBI - (27/110) CG - (19/105) | NM |
| A. Costa and T. Barnhofer 2016[36] | -RCT<br>-N=140<br>-n=40 | Current diagnosis of major depression aged between 18 and 65. | MBI (*n*=20) 39.0 (12.0) 5:14 | Guided imagery (*n*=20) 38.0 (9.7) 4:14 | -One-hour, one -to -one session at the start of the intervention period.<br>-Participants practised the meditation once a day for the following 6 days | -BDI II<br>-FFMQ<br>-Decentring Scale of EQ<br>-DERS<br>-ACS | -Symptoms of depression significantly decreased in both groups<br>-Self regulatoryfunctioning significantly increased in both groups<br>-When controlled for the change in depressive symptoms, MBI group had significantly higher improvements in emotion regulation at follow-up. | Assessment pre and postintervention, and at a one-week follow-up | MBI-1/20 Guided imagery -2/20 | NM |
| H.H.M. Lo *et al*., 2013[39] | -RCT<br>-N=117<br>-n=82 | Individuals with a BDI - II of 15 or above or a score of 8 or above on the anxiety subscale of HADS were recruited. | C-MT (*n*=41) 44.2 (8.9) 9:32 | WL (*n*=41) 44.4 (11.2) 13:28 | Group-based program delivered in eight weekly sessions.<br>Each session lasted for 2 ½ hrs. | -BDI II<br>-HADS<br>-BMSWBI<br>-SS | - Participants who received C-MT evidenced significant changes in depression, anxiety, stagnation and all other physical and mental health variables.<br>- Stagnation mediated the improvement in depression. | NM | C-MT -23/41 WL -5/41 | NM |

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**Table 1b: Contd...**

| Author and year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| J.M. Greeson *et al*., 2015[40] | - Open trial<br>-N=322<br>-n=213 | Patients with depressive symptoms with 50% likely cases of clinical depression | MBSR<br>45 (12.2)<br>84:238 | Nil | -8-week, community -based MBSR program<br>-20<br>-45 minutes of formal meditation daily, 6 days per week<br>-Weekly classes lasted 2.5 hours | - HADS<br>- Daily Spiritual Experience Scale.<br>- CAMS-R | - Depressive symptom severity decreased significantly.<br>- Decreased depressive symptoms significantly correlated with both increased mindfulness and enhanced perceptions of daily spiritual experiences.<br>-Increased mindfulness and enhanced perceptions of spirituality were also significantly correlated. | - Surveyed within 1 week before the first MBSR class session and again within 1 week after<br>the last MBSR class | 109/322 | NM |
| J. Felder *et al*., 2014[54] | -Case report | A woman in her late 40s, was treated for her third episode of major depression with citalopram, 40 mg/day | Nil | Nil | Online 8 sessions and home practice assignment | Nil | Decrease in Residual depressive symptoms | NM | Nil | NM |

MBI - Mindfulness Based Intervention group, CG - Control Group, MBSR – Mindfulness Based Stress Reduction, MBCT – Mindfulness Based Cognitive Therapy, MADRS-S - Montgomery–Asberg Depression Rating Scale, HADS - Hospital Anxiety Depression Scales, PHQ-9 - Patient Health Questionnaire-9, BDI II - Beck Depression Inventory-II, FFMQ – Five Facet Mindfulness Questionnaire, EQ – Experiences Questionnaire, DERS - Difficulties in Emotion Regulation Scale, ACS- Attentional Control Scale, C-MT - Compassion-Mindfulness Therapy, BMSWBI - Body Mind Spirit Well-Being Inventory, SS - Stagnation Scale, MBSR - Mindfulness-based stress reduction, CAMS-R - Cognitive and Affective Mindfulness Scale-Revised, NM – Not Mentioned

enhanced memory and attention over the follow-ups, specifically the speed index.[11] YT enhances plasma oxytocin levels, which has been implicated in social cognition.[31]

### *Yoga, brain imaging, and other markers*

Findings of functional magnetic resonance imaging and serum and salivary markers in YT studies are reported in Table 4a.[23,27]

### *Yoga and physical exercise*

Combination of yoga and aerobic exercises in moderately ill individuals with schizophrenia produced a significant reduction in the state anxiety and stress with significant improvement in the positive sense of well-being.[30]

The details of case reports of yoga-induced psychosis are described in Table 4b.

## Effects of mindfulness technique in schizophrenia and other psychotic spectrum disorders

The results of various studies and case reports on mindfulness interventions in schizophrenia are described in Table 3a and b, respectively.

**Table 2: Details of the yoga postures and duration of the intervention including the training period**

| Study | Intervention and Postures | Total duration of the intervention/ supervised training period (in months) |
|---|---|---|
| Duraiswamy *et al*., 2007[S] | Swami Vivekananda Yoga | 4/0.5 |
| Behere *et al*., 2011[S] | Anusandhana Samsthana (SVYASA) | 3/1 |
| Varambally *et al*., 2012[S] | that comprised of loosening exercise, | 4/1 |
| Gangadhar *et al*., 2013[S] | asanas, breathing practise and relaxation | 1/1 |
| Manjunath *et al*., 2013[S] | techniques (31) | 1.5/0.5 |
| | Standing | |
| Descilo *et al*., 2010[De] | Anuvittasan[V&L] | 0.13 (4/30)/6 |
| Visceglia and Lewis 2011[V&L] | Kati chakrasan[V&L, B] | 2/2 |
| | Lolasan[P] | |
| D. Vancampfort *et al*., 2011[D] | Padottanasan[V&L] | 0.03 (1/30 - Single session) |
| | Santulanasan[P] | |
| | Surya Namaskar[P,S] | |
| Paikkatt *et al*., 2012 & 2015[P] | Tadasan[P,B&D] | 1/1 |
| | Tarasan[P] | |
| Bhatia *et al*., 2012 & 2017[B] | Trikonasan** | 0.7/0.7 & 6/0.7 |
| | Utkatasan[P] | |
| Breitborde *et al*., 2015 | Uttanasan[V&L] | 0.23 (7/30)/0.03 (1/30) |
| | Veerabhadrasan[V&L] | |
| | Supine lying | |
| Kavak and M. Ekinci 2016 | Ananda Balasana[V&L] | 1.5/1.5 |
| | Apanasan[V&L] | |
| Sharma *et al*., 2017[Sa] | Chakrasan[Sh] | 2/2 |
| | Matsyasan[S] | |
| | Naukasan** | |
| | Pastchimotasan[P] | |
| | Pawanmuktasan** | |
| | Sarvangasan[V&L,P&S,Sh] | |
| | Savasan** | |
| | Supta Matsyendrasan[V&L] | |
| | Setu Bandhasan[V&L] | |
| | Uttanpadasan** | |
| | Uttanasan[P] | |
| | Viparita Karani[V&L,Sh] | |
| | Prone lying | |
| | Bhujangasan[#] | |
| | Bidalasan[D] | |
| | Dhanurasan[#] | |
| | Makarasan**[,Sh] | |
| | Marjariasan[Sh] | |
| | Salamba Bhujangasan[V&L] | |
| | Shalabhasan[#] | |
| | Sitting | |
| | Ardhmatsyendrasan** | |
| | Balasan[V&L] | |
| | Gomukasan** | |
| | Janu Sirsasan[V&L] | |
| | Padmasan[P] | |
| | Paschimottanasan[V&L,B&S] | |
| | Shasakasan[P] | |
| | Ushtrasan[B,S] | |
| | Vajrasan** | |
| | Vakrasan[S] | |
| | Yogmudrasan[P] | |

*Contd...*

**Table 2: Contd...**

| Study | Intervention and Postures | Total duration of the intervention/ supervised training period (in months) |
|---|---|---|
| | Balancing | |
| | Adho Mukha Vrksasana[Sh] | |
| | Ardha Chandrasan[V&L] | |
| | Bharmanasan[V&L] | |
| | Dandayamna[V&L] | |
| | Garudasan[V&L] | |
| | Purvotanasan[V&L] | |
| | Sirsasana[Sh] | |
| | Vriksasan[V&L,D] | |
| | Breathing exercise | |
| | Pranayama[#] | |
| | Bhastrika[De] | |
| | Sudarshan Kriya[De,Sa] | |
| | Ujjayi[De] | |
| Butler *et al*., 2008 | Hatha yoga | 3/9 |
| Kinser *et al*., 2013 | | 0.03 (1/30)/2 |
| Sarubin *et al*., 2014 | | 1.25/1.25 |
| Ikai *et al*., 2014 | | 2 (8 sessions) |
| J. Lin *et al*., 2015 & 2016 | | 3/3 |
| Prathikanti S *et al*., 2017 | | 2/2 |
| Shahidi *et al*., 2010 | Laughter yoga | 10 sessions |
| Uebelacker *et al*., 2010 | Vinyasa yoga | 2/2 |
| M. Niemi *et al*., 2016 | NM | 2/2 |
| K. J. Schuver *et al*., 2016[x] | | 0/3 |

S=Duraiswamy *et al*., Behere *et al*., Varambally *et al*., Gangadhar *et al*., Manjunath *et al*. (Studies that adapted SVYASA). B=Bhatia *et al*., Bu=Butler *et al*., D=D. Vancampfort *et al*., De=Descilo *et al*., P=Paikkatt *et al*., Sa=Sharma *et al*., Sh=Shaprio *et al*., V & L=Visceglia and Lewis. **=Included in Bhatia *et al*., Breitborde *et al*., D. Vancampfort *et al*., Paikkatt *et al*., F. Kavak and M. Ekinci, Visceglia and Lewis studies. #=Included in Bhatia *et al*., Breitborde *et al*., D. Vancampfort *et al*., Paikkatt *et al*., F. Kavak and M. Ekinci, Visceglia and Lewis, Duraiswamy *et al*., Behere *et al*., Varambally *et al*., Gangadhar *et al*. and Manjunath *et al*. studies. NM=Not Mentioned, x=Mindfulness based yoga

### *Mindfulness and illness-related variables*

MBI has demonstrated significant reduction of stress, anxiety,[6,12] depression, obsession,[8] anger, impulsivity, lack of concentration,[12] and agoraphobic symptoms.[29] It also improves the awareness of the psychotic experiences and helps individuals to articulate their distress.[14]

Mindfulness-based psychoeducation program (MBPP) has significantly reduced the PANSS score with faster recovery. Further, the number of rehospitalizations[13] and the duration of readmissions[16] decreased over time with MBPP.

MBI has demonstrated significant improvement in certain domains of BPRS, such as anxiety, self-neglect, and somatic concerns, and improvement approached significance for depression, despite having mixed results for total BPRS score.[7]

There are a few case reports implicating the positive role of mindfulness meditation in improving social anxiety, flexibility of thinking, experiencing more positive emotions, and minimal effect on negative symptoms in individuals with schizophrenia.[39] In addition, another case series has demonstrated reduction of paranoid beliefs apart from depression and anxiety in individuals with delusional disorder.[40]

### *Mindfulness and individual related variables*

MBI has demonstrated significant improvement in self-maintenance and community living skill[16] apart from better coping skills, self-compassion,[6] self-care,[7] and general well-being.[29] Further, there have been mixed reports for social functioning and insight.[7,16] A study has demonstrated an increase in stress levels in some patients immediately following the intervention.[41]

### *Mindfulness and regulation of emotions*

In patients, mindfulness has been associated with significant improvement in regulating negative emotions such as self-blaming, rumination, and catastrophizing and developing more adaptive emotion regulation.[7,42]

## Yoga and mindfulness in bipolar disorder

We could find only one study of YT and three studies that assessed the role of mindfulness in BD.

### *Hatha yoga*

Uebelacker *et al*. conducted a qualitative study on yoga practice and the impact of yoga among 70 self-identified yoga practitioners with BD. Positive effects of yoga have

**Table 3a: Details of the studies of mindfulness in schizophrenia/psychotic spectrum disorder (Contd.)**

| Author & Year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD) Sex (M: F) | Control group (*n*) mean age (SD) Sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome | Timeline of assessment | Dropout rates | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| Dais LW *et al.* 2007[6] | -Pilot study<br>-N (*n*)=5 | Schizophrenia/ Schizoaffective disorder confirmed by SCID-1, DSM-IV | MBI (*n*=5) 51 (5.22) All were men | Nil | 1-hour mindfulness classes twice per week for 8 weeks | Nil | +Reduced anxiety and stress, improved coping.<br>-Developed self-compassion. | After 8 weeks | Nil | One participant reported of increased paranoia |
| B. Khoury *et al.* 2015[7] | -Pilot study<br>-*N*=17<br>-*n*=12 | First psychotic episode (Paranoid Schizophrenia, Schizophrenia NOS, Psychosis NOS | MBI (*n*=12) 29.08 (8.13) 8:4 | Nil | 8 mindfulness sessions each of 60-75 mins | -BPRS<br>-SFS<br>-FMI<br>-BCIS<br>-Cognitive emotion regulation questionnaire<br>-Psychological distress manifestation measure scale | -The participants who completed ≥4 sessions reported significant improvement in regulating both positive and negative emotions and self-care.<br>-At 3 months follow up, no significant improvement was found in social functioning, insight, distress and BPRS total score but anxiety, self-neglect and somatic concerns showed significant improvement but improvement approached significance for depression | Baseline, post treatment t & at 3rd month follow up. | 5/17 | Nil |
| S. Moritz *et al.* 2015[8] | -RCT<br>-*N* (*n*)=90 | Established diagnosis of schizophrenia/ psychosis | MBI (*n*=38) 38.11 (9.0) 16:22 | PMR (*n*=52) 37.46 (10.15) 22:30 | Participants were asked to practise the interventions for 6 weeks by themselves with the help of respective manual and audio files | -POD<br>-CES-D<br>-CAPE<br>-Psychosis lie scale | At the end of six weeks the participants reported improvement in obsession and depression irrespective of the group. | Baseline & 6th week | Retention rates=71% | Nil |

*Contd...*

**Table 3a: Contd...**

| Author & Year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD) Sex (M: F) | Control group (*n*) mean age (SD) Sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome | Timeline of assessment | Dropout rates | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| Davis *et al.* 2015[12] | -RCT<br>-*N*=34<br>-*n*=32 | Schizophrenia/ Schizoaffective disorder diagnosed as per DSM-IV in a stable phase of illness in the previous month were recruited | MIRRORS (*n*=18) 53.2 (6.1) 17:1 | IS (*n*=16) 50.1 (10.6) All were men | MIRRORS group received twice a week 75 min group session for 16 weeks in 2 continuous cycles of 8 weeks each. IS group received a weekly 90 minutes group session | -PANSS<br>-WBI<br>-CAS<br>-MFS<br>-CSQ-8 | -MIRRORS participants focused better letting go the negative thoughts and coped well with both general and psychotic symptoms and more specifically anxiety, stress, anger, impulsivity and lack of concentration.<br>-Additionally, the number of work hours, performance and work quality were significantly better in the MIRRORS group. | Baseline, 8th, 16th & 24th weeks | MIR<br>ROR<br>S=3/18<br>IS=2/16 | One participant reported "Mountain Meditation" activated his delusion of being all powerful |
| Wang *et al.* 2016[13] | -RCT<br>-*N*=340<br>-*n*=138 | Schizophrenia diagnosed as per DSM-IV with ≤5 years of illness duration at recruitment | MBPP (*n*=46) 23.8 (6.8) 24:22 | CPEP (*n*=46) 24.1 (6.3) 23:23<br>TAU (*n*=46) 25 (7) 25:21 | Intervention group received 12 fortnightly, 2 h sessions over 24 weeks with 12-15 participants per group | -SLOF<br>-PANSS<br>-ITAQ<br>-QPR<br>-FFMQ | -MBPP group demonstrated significantly better level of functioning at 1 week and 6 months and significantly improved insight at 6 months as compared to the CPEP and TAU group.<br>-MBPP group demonstrated significant reduction in the PANSS score and better progress to recovery from illness as compared to the TAU and CPEP groups.<br>-MBPP group showed minimal rehospitalisation over 6 months when compared to the other 2 groups.<br>-CPEP group reported significant improvement in functioning than the TAU group at 6 months. | Baseline, 1 week & 6 months post-intervention | MBP P=2/46 CPEP=2/46 TAU=3/46 | Nil |

*Contd...*

**Table 3a: Contd...**

| Author & Year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group (*n*) Mean age (SD) Sex (M: F) | Control group (*n*) mean age (SD) Sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome | Timeline of assessment | Dropout rates | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| N. Abba *et al.* 2008[14] | -Pilot study<br>-*N* (*n*)=16 | Individuals with distressing psychosis [Paranoid schizophrenia (81%), psychotic depression (13%) & psychotic episode (6%)] | MBI + Medicines + Standard care (*n*=16) 22-58 12:4 | Nil | All the 16 individuals completed a group & attended at least 4 sessions of mindfulness therapy that was given using a standard protocol | An interview was conducted using a set of standard questions and it lasted for 20-45 mins | Awareness for the psychotic experiences improved and participants could articulate their distress better | Not specified | Nil | Nil |
| Chien and Thompson 2014[16] | -RCT<br>-*N*=107<br>-*n*=106 | Schizophrenia diagnosed as per DSM-IV with ≤5 years of illness duration at recruitment | MBPP (*n*=36) 25.1 (6.8) 20:16 | CPEP (*n*=36) 25.8 (7.9) 21:15 TAU (*n*=35) 26.0 (8.5) 20:15 | Intervention group received 12 fortnightly, 2 h sessions over 24 weeks with 11-13 participants per group, in addition to usual psychiatric care | -BPRS<br>-SLOF<br>-SSQ6<br>-ITAQ | -MBPP group demonstrated significant improvement in BPRS, ITAQ, SLOF along with significant reduction in the duration of readmission to the hospital than the control groups.<br>-CPEP group demonstrated significant improvement in the SLOF & BPRS scores, whereas only modest improvement was noted in ITAQ and duration of readmission than the TAU group. | Baseline, 1 week, 12 months and 24 months post intervention | MBPP - 2/36<br>CPEP - 1/36<br>TAU - 1/35 | Nil |
| R. van der Valk *et al.* 2013[29] | -Pilot Study<br>-*N*=16<br>-*n*=13 | Individuals with first episode psychosis that included schizophrenia spectrum disorders and depressive disorder with psychotic features of moderate severity with onset ≤6 months | MBI (*n*=16) 31.8 (5.2) 12:4 | Nil | 8 × 1-h sessions over 4 weeks comprising of 3-min breathing meditation, 10-min body scan meditation, walking meditation & meditative yoga | -PANSS<br>-SCL-90<br>-SMQ<br>-CSQ-8 | Improvement in general well-being and a decrease in symptom checklist 90 scale with regard to agoraphobia symptoms | 1 month | 3/16 | One participant reported aversive reaction between the sessions |

*Contd...*

**Table 3a: Contd...**

| Author & Year | Design, Total sample size (*N*) analysed sample size (*n*) | Type of sample | Treatment group(*n*) Mean age (SD) Sex (M: F) | Control group (*n*) Mean age (SD) Sex (M: F) | Intervention paradigm | Outcome measures (Tools used) | Outcome | Timeline of assessment | Dropout rates | Side effects |
|---|---|---|---|---|---|---|---|---|---|---|
| Jacobsen *et al*. 2011 [46] | -Pilot study<br>-*N* (*n*)=8 | Individuals with distressing psychosis. Diagnosis not mentioned. | MBI + Medicines (*n*=8) 21-43 3:5 | Nil | Each session included facilitated group discussion and two 10 minutes breathing meditation followed by mindfulness interventions adapted from the protocol used by Chadwick et al. (2005) once a week for 6 weeks | -PSYRAT<br>-SMQ | -Stress score decreased in 1 and increased in 3 patients.<br>-Symptoms interference scores decreased and increased in 2 patients each | Before & after each session | 2/8 - Did not complete the interview<br>1/8 - Did not complete the feedback | Increase in stress and high dropout rates were noted |

BPRS - The Brief Psychiatric Rating Scale, SFS - Social Functioning Scale, FMI - Freiburg Mindfulness Inventory - short version, BCIS - The Beck Cognitive Insight Scale, POD - Paranoia-Obsession-Depression Scale, CES-D - The Center for Epidemiologic Studies-Depression Scale, CAPE - The Community Assessment of Psychic Experiences Scale, PANSS - Positive and negative syndrome scale, WBI - Work Behaviour Inventory, CAS - The Change Assessment Scale, MFS - The Mindfulness Fidelity Scale, CSQ-8 - The Client Satisfaction Questionnaire, SLOF - Specific Levels of Functioning Scale, ITAQ - Insight and Treatment Attitudes Questionnaire, QPR - Questionnaire for the Process of Recovery, FFMQ - The Five-facet Mindfulness Questionnaire, SSQ6-6-item Social Support Questionnaire, SCL-90 - The Symptoms Checklist 90, SMQ - Southampton, Mindfulness Questionnaire, PSYRATS - Psychotic Symptoms Rating Scales

**Table 3b: Details of the case studies of mindfulness and schizophrenia/psychotic spectrum disorder**

| Author and Year | Type of study and no. of participants | Participant characteristics | Intervention details | Outcomes |
|---|---|---|---|---|
| Johnson *et al*. 2009[44] | Case Series N (*n*)=3 | Case 1: Schizophrenia with social anxiety disorder | Practised Love-Kindness Meditation (LKM) for about 5 min each day, 5-7 days each week | Case 1: Improvement in her social anxiety and flexibility of thinking which helped her to undergo Cognitive Behavioural Therapy (CBT) and benefit from it. |
| | | Case 2: Schizophrenia with prominent negative symptoms | Practised basic mindfulness based meditation | Case 2: She could enjoy the activities and experience more positive emotions which lead to effective problem solving. |
| | | Case 3: Schizophrenia with negative symptoms | Attended every LKM session | Case 3: LKM also seemed to have little appreciable effect on his targeted negative symptoms of asociality, avolition, flat affect, and alogia. |
| Ellett, 2013[45] | Case Studies N (*n*)=2 | 2 participants with Delusional Disorder (DSM-IV) on antipsychotic medication. | 1 h session per week | -Mindfulness training resulted in reductions in key dimensions of paranoid beliefs, namely conviction, distress, preoccupation and impact. |
| | | Case 1: 34-year-old man | | -Depression and anxiety also reduced for both participants. |
| | | Case 2: 49-year-old man | | |

been described under cognitive, emotional, and physical domains. Cognitive effects include better-focusing ability, ability to distract from negative thoughts, and a sense of accomplishment. Emotional effects include relaxation and reduction in both anxiety and depression. Moreover, physical effects are the improvement in circulation, heart rate, sleep, weight reduction, and increased energy. In addition, certain negative effects such as agitation with rapid breathing, transition from hypomania to mania with heated energetic yoga style, increased depression-like symptoms with meditation, and physical injury or increased pain have been suggested.[43]

### *Mindfulness*

Chadwick *et al*. studied 12 stable individuals with BD diagnosed as per the ICD-10, and all the participants received treatment as usual (TAU). They all attended at least six weekly mindfulness sessions, each lasting for 90 min. The participants reported that it enables them to integrate it into all aspects of life and respond wisely. Furthermore, it has been reported to minimize the impact of mood change and prevent further relapse.[44]

Muray *et al*. studied the role of online MBI like online, recovery-focused, bipolar individual therapy (ORBIT) in 26 clinically stable individuals with late-stage BD with at least six or more episodes. ORBIT focused chiefly on emotion regulation, relationship to self, and improving sleep quality. Sixteen completers demonstrated significant improvement in the quality of life, but the improvement in anxiety did not reach significance ($P = 0.06$). No significant negative effects have been reported.[45]

### *Self-management strategies*

Murray *et al*. studied 33 clinically stable individuals with BD Type I or II adapting various self-management strategies. We focused mainly on the reflective and meditative practices among the various self-management strategies which included Tai Chi, yoga, mindfulness, meditation, inspirational reading, and praying. Individuals who practiced Tai Chi and yoga reported that it provided a ground of stability enabling them to manage symptoms of BD well. Moreover, those who engaged in mindfulness cited that it facilitated them in reframing negative thoughts.[15]

## Yoga and mindfulness in major depressive disorder

### *Effects of yoga in major depressive disorder*

Results of YT studies in MDD are described in Table 1a. Yoga has demonstrated significant improvement in depression as an adjuvant to antidepressants in several trials.[24,32,33,46-50] Other demonstrated advantages of yoga in depression are improvement in anxiety,[32,50] behavioral activation, and nonjudging facet of mindfulness.[47] Shahidi *et al*. have established significant improvement in depression and life satisfaction in elderly depressed women as compared to the TAU control group but not against the PE group.[20] A study by Descilo *et al*. have demonstrated significant improvement in depression among patients with posttraumatic stress disorder. Breathing interventions alone and in combination with exposure therapy in real-life situations were both useful in the improvement of symptoms.[51] Sarubin *et al*. have demonstrated that in depressed individuals, YT neither demonstrated significant benefit in regulating hypothalamus–pituitary axis nor has any additional benefit over the control group.[52] Similarly, Butler *et al*. did not demonstrate a significant benefit of YT over group therapy with hypnosis.[46]

### *Effects of mindfulness in major depressive disorder*

MBI other than mindfulness-based cognitive therapy (MBCT) has demonstrated significant improvement

**Table 4a: Details of the studies of yoga in schizophrenia/psychotic spectrum disorder**

| Author & Year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Visceglia and Lewis 2011[10] | -RC Pilot study<br>-*N*=19<br>-*n*=18 | Clinically stable schizophrenia individuals with long stay (projected or current length of stay >3 months) | YT (*n*=10), 37.40 (13.75), 6:4 | WL (*n*=8), 48.13 (11.24), 6:2 | -PANSS<br>WHOQoL | -YT group showed better improvement in PANSS total, positive, negative and general psychopathology scales and depression, activation and paranoia subscales.<br>-Improvement in QOL, physical and psychological health domains noted with YT | Baseline & 2nd month | Not mentioned | Nil |
| Bhatia *et al.* 2017[11] | RCT<br>*N*=286<br>*n*=219 | Schizophrenia as per DSM-IV. Treatment was kept stable during the study | YT (*n*=104), 34.76 (9.56), 62:42 | PE (*n*=90), 35.20 (9.49), 62:28<br>TAU (*n*=92), 35.72 (10.06), 57:35 | -Penn CNB<br>-ILSS<br>-GAF<br>-SANS<br>-SAPS | -YT group showed greater improvement in the speed index of attention and emotion domains as compared to PE and TAU groups respectively. Additionally, accuracy index of abstract thinking and mental flexibility in the YT group improved significantly as compared to the TAU group at 3 months follow up point.<br>-PE group performed significantly in the accuracy domain of attention at 6 months follow up compared to the TAU group.<br>-Both YT and PE interventions enhanced memory and attention over the follow-ups, specifically the speed index. | Baseline, 3rd week, 3rd and 6th months of follow up | YT=25/104<br>PE=25/90<br>TAU=21/92 | Nil |
| J. Lin *et al.* 2015 (17) | -Single blind RCT<br>-*N*=140<br>-*n*=124 | Schizophrenia, schizoaffective disorder, schizophreniform disorder, brief psychotic disorders, psychosis not otherwise specified and delusional disorder (according to the DSM-IV) within 5 years of onset | YT (*n*=45) 23.8 (6.8) All were females | PE (*n*=40) 24.6 (7.9)<br>WL (*n*=39) 25.3 (8.1)<br>All were females in both the control groups | -Digit span-Letter cancellation<br>-Stroop colour & word tests<br>-HKLLT<br>-PANSS<br>-CDS<br>-MRI<br>-FRS<br>-CRS<br>-SF-36<br>-$VO_2$ max | -YT group has demonstrated significant improvement in verbal acquisition, working memory and attention and PE group has demonstrated significant improvement in the verbal retention and working memory as compared to the WL group.<br>-Negative symptoms improved significantly in the YT group, whereas depressive symptoms and health related quality of life improved significantly in both the groups | Baseline, 12th week & 18th month | YT=11/45<br>PE=11/40<br>WL=7/39 | Nil |

*Contd...*

**Table 4a: Contd...**

| Author & Year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| B. Paikkatt *et al.* 2015[18] | -RCT<br>-*N*=30<br>-*n*=28 | Schizophrenia diagnosed as per ICD -10 of mild to moderate severity with an illness duration of minimum of 2 years. | YT + Medications (*n*=15) 20-50<br>All were men | TAU (*n*=15) 20-50<br>All were men | PANSS | -All negative symptoms and general psychopathology showed significant improvement from baseline in YT group.<br>-YT group showed significant improvement in blunted affect, emotional withdrawal, passive social withdrawal and difficulty in abstract thinking domains of negative subscale.<br>-Relatively better improvement was noted in poor rapport and lack of spontaneity domains of negative subscale and somatic concerns, guilt feelings, motor retardation, depression, unusual thought content, disorientation, preoccupation and active social avoidance domains of general psychopathology subscale as compared to TAU group at the end of 1 month | Baseline & 1st month | YT=1/15<br>TAU=1/15 | Nil |
| F. Kavak and M. Ekinci 2016[19] | Observational study<br>-*N*=250<br>-*n*=100 | Conducted in Göztepe Community Mental Health Centre - Schizophrenia patients | YT (*n*=50) 18-50 37:13 | WL (*n*=50) 18-50 36:14 | FROGS | -YT group showed significant improvement from baseline.<br>-YT group did significantly better than the control group in all the domains of FROGS that includes social functioning, health and treatment, daily living skills and occupational functioning | Nil | Nil | Nil |
| Breitborde *et al.* 2015[21] | -Pilot study<br>*N* (*n*) = 10 | Individuals with schizophrenia (6), BPAD (3) & Pychosis NOS (1) with median duration of the illness in months are 16.44 | YT (*n*=10) 21.50 (3.21) 8:2 | Nil | -ECG<br>-RMSSD | Reduce arousal following stress exposure | Baseline and 1 week | Nil | Nil |
| B. Paikkatt *et al.* 2012[22] | -RCT<br>-*N*=30<br>-*n*=28 | Schizophrenia diagnosed as per ICD 10 of mild to moderate severity with an illness duration of minimum of 2 years | YT + Medicines (*n*=15) 20-50 All were men | TAU (*n*=15) 20-50 All were men | -PGI Checklist for Basic Living Skills<br>-IDEAS | YT as an add on therapy significantly improved subjective well-being, selfcare, personal hygiene, basic life skills, interpersonal activities and communication | Baseline & 1st month | YT=1/15<br>TAU=1/15 | Nil |

*Contd...*

**Table 4a: Contd...**

| Author & Year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| J. Lin *et al.* 2017[23] | -Single blind RCT<br>-*N*=124<br>-*n*=58<br>(58 Patient's fMRI data from previous study was included in the analyses) | Schizophrenia spectrum disorder diagnosed as per DSM-IV within 5 years of onset | YT (*n*=23) 23.8 (6.8) All were females | PE (*n*=23) 24.6 (7.9)<br>WL (*n*=12) 25.3 (8.1)<br>All were females in both the control groups | f-MRI | -Reduced amplitude of low-frequency fluctuations (ALFF) in precuneus of YT group<br>-It correlated significantly with the changes in blunt affect domain of negative subscale of PANSS | Baseline & after 12 weeks | Nil | Nil |
| Duraiswamy *et al.* 2007[26] | -RCT<br>-*N*=64<br>-*n*=41 | Schizophrenia/ Schizoa ffective disorder confirmed by SCID-IV with CGIS score of ≥4 | YT (*n*=31) 32.53 (7.9) 19:12 | PE (*n*=30) 31.30 (7.9) 23:7 | -PANSS<br>-SOFS<br>-QOL | PANSS and SOFS scores dropped significantly from baseline in both the groups. PANSS, SOFS & QOL improvement was better in the YT group | Baseline & 4th month | YT=10/31<br>PE=10/30 | Nil |
| Ikai *et al.* 2014[27] | -RCT<br>-*N*=81<br>-*n*=50 | Schizophrenia (*n*=41) & Schizoaffective Ds (*n*=9) diagnosed as per ICD-10 on stable medications for the preceding 8 weeks & duration of the study. | YT (*n*=25) 53.5 (9.9) 16:9 | TAU (*n*=25) 48.2 (12.3) 17:8 | -PANSS<br>-Resilience Scale<br>-DIEPSS<br>-FACT-Sz<br>-EQ-5D -Serum, salivary BDNF & SAA levels | No significant differences were measured in the PANSS, resilience score, drug induced parkinsonism symptoms, functional outcome and the levels of SAA and both salivary and serum BDNF. But completer analysis has revealed significant group difference in PANSS total score and general psychopathology | Baseline & 8 weeks | YT=18/25<br>TAU=18/25 | Nil |
| Manjunath *et al.* 2013[28] | -Single blind RCT<br>-*N*=88<br>-*n*=60 | Moderately to severely ill individuals with psychotic spectrum disorder diagnosed as per DSM-IV and MINI [Paranoid schizophrenia (46.6%), Other subtypes of schizophrenia (41.9%), and unspecified psychosis (11.5%) | YT (*n*=35) 31.7 (8.8) 26:18 | PE (*n*=25) 31.1 (7.8) 23:21 | -PANSS<br>-HDRS<br>-CGIS<br>-Simpson Angus EPS scale | YT group showed reduction in the CGIS, HDRS, PANSS total and general psychopathology scores. However, significant reduction was noted in the CGIS and HDRS scores in the YT group as compared to the PE group. | Baseline, 2nd week and 6th week | YT=9/44<br>PE=19/44 | Nil |
| D. Vancampfort *et al.* 2011[30] | -Pilot study<br>-*N*=49<br>-*n*=40 | Individuals with schizophrenia with CGI severity score of ≥4 | YT (*n*=40)<br>The same 40 participants were made to undergo all the intervention. Male - 31.8 (8.7), Female - 32.74 (8.93), 22:18 | PE (*n*=40)<br>No intervention group (*n*=40) | -SAI<br>-SEES | After the yoga and aerobic exercises, participant's state anxiety and psychological stress showed significant reduction and the positive sense of wellbeing was significantly higher | 5 minutes before and immediately after the interventions | 9/49 | Nil |

*Contd...*

**Table 4a: Contd...**

| Author & Year | Design, total sample size (*N*) analyzed sample size (*n*) | Type of sample | Treatment group (*n*) mean age (SD) sex (M: F) | Control group (*n*) mean age (SD) sex (M: F) | Outcome measures (Tools used) | Outcome domains | Timeline of assessment | Dropout rates (as fraction of total sample) | Side effects |
|---|---|---|---|---|---|---|---|---|---|
| Gangadhar *et al.* 2013[31] | -RCT<br>-*N*=43<br>-*n*=27 | Schizophrenia diagnosed as per DSM-IV of mild severity on stable treatment. | YT (*n*=15) 28.33 (4.7) 12:3 | WL (*n*=28) 29.5 (8.2) 7:5 | -SAPS<br>-SANS<br>-SOFS<br>-TRENDS & Plasma oxytocin levels | -Both groups showed significant improvement in negative and positive symptoms from baseline.<br>-YT group showed significant improvement in SOFS, TRACS, TOI and plasma oxytocin levels from baseline as compared to WL group. | Baseline & 1st month | YT=0/15<br>WL=16/28 | Nil |
| Varambally *et al.* 2012[41] | -Single blind RCT<br>-*N*=120<br>-*n*=95 | Schizophrenia diagnosed as per DSM-IV of moderate severity on stable treatment and has not received any Electro Convulsive Therapy in the previous 3 months | YT (*n*=47) 32.8 (10.0) 28:19 | PE (*n*=37) 30.6 (7.3) 28:9<br>WL (*n*=36) 33.6 (9.5) 27:9 | -PANSS<br>-SOFS<br>-SAS | -YT group showed significant improvement in the PANSS total, positive and negative subscales and SOFS score.<br>-YT was found to have higher chance of improving negative symptoms as compared to the PE group. | Baseline & 4th month | YT=39/47<br>PE=22/37<br>WL=34/36 | Nil |
| Behere *et al.* 2011[42] | -RCT<br>-*N*=91<br>-*n*=66 | Schizophrenia confirmed by DSM IV with CGI Score ≤3 | YT (*n*=27) 31.3 (9.3) 18:9 | PE (*n*=17) 30.2 (8.0) 14:3<br>WL (*n*=22) 33.6 (9.9) 15:7 | -PANSS<br>-SOFS<br>-TRENDS<br>-TRACS | Positive, negative symptoms and emotion recognition abilities improved significantly in YT group which in turn improved their socio-occupational functioning as compared to the other 2 groups | Baseline, 2nd & 4th month | YT - 7/27 PE - 14/17<br>WL - 4/22 | Nil |
| Bhatia *et al.* 2012[43] | -Open nonrandomized trial<br>-*N*=160<br>-*n*=88 | Schizophrenia evaluated using the Hindi version of DIGS | YT (*n*=65) 33.27 (9.8) 43:22 | TAU (*n*=23) 32.75 (12.1) 11:12 | Penn CNB | -YT group showed significant improvement in the speed indices for abstraction and attention both at 3rd week and 2 months post treatment.<br>-Additionally, at 2 months post treatment, YT group had significantly greater improvement in the accuracy index of attention | Baseline, 3rd week & 2 months following completion | YT=35/65<br>TAU=0/23 | Nil |

PANSS - Positive and negative syndrome scale, WHOQoL-BREF - World Health Organization Quality of Life, Penn CNB - University of Pennsylvania Computerised Neurocognitive battery, ILSS - Independent Living Skills Survey, GAF - Global Assessment of Functioning Scale, SANS - Scale for Assessment of Negative Symptoms, SAPS - Scale for Assessment of Positive Symptoms, HKLLT - Hong Kong list learning test, CDS - Calgary depression scale, MRI - Structural Magnetic Resonance Imaging, FRS - Figure rating scale, CRS - Compliance rating scale, SF-36 - The short form (36) health survey, VO2 max - Maximum oxygen consumption, FROGS - Functional Remission of General Schizophrenia Scale, RMSSD - root mean square of successive differences of the interbeat interval series, IDEAS - The Indian Disability Evaluation and Assessment Scale, f-MRI - Functional magnetic resonance imaging, SOFS - Social and Occupational Functioning Scale, QoL - WHO Quality of Life BREF Version, DIEPSS - Drug Induced Extrapyramidal Symptoms Scale, FACT-Sz - Functional Assessment for Comprehensive Treatment of Schizophrenia, EQ-5D - EuroQol-5 dimensions classification system, BDNF - Brain-Derived Neurotrophic Factor, SAA - Salivary Alpha-Amylase, HDRS - Hamilton Depression Rating Scale, CGIS - Clinical Global Impression Severity scores, SAI - State Anxiety Inventory, SEES - Subjective Exercise Experiences Scale, TRENDS - Tool for Recognition of Emotions in Neuropsychiatric Disorders, TRACS - TRENDS accuracy score, TOI - TRENDS over identification score, SMS - Simpson-Angus Scale (for extra pyramidal symptoms)

**Table 4b: Details of the case studies of yoga and schizophrenia/psychotic spectrum disorder**

| Author & Year | Type of study and no. of participants | Participant characteristics | Intervention details | Outcomes | Other details |
|---|---|---|---|---|---|
| Hwang 2007[67] | Clinical case study *N*(*n*)=1 | 48-year-old female had past history suggestive of recurrent depressive disorder. But, she never experienced any psychotic symptoms in the past nor she abused any substance anytime in the past | She practised Qigong several times a week for 2 years next to a mountain lake. She presented with features suggestive of Brief Psychotic Disorder. | Her presentation was considered as Qi-gong induced psychosis. | Qi-gong is a form of meditative practice involving deep breathing, mental focusing, and meditation. |
| LU and Pierre 2007[68] | Case report *N*(*n*)=1 | A 33-year-old man, with a history of brief hallucinogen-induced psychosis 10 years before, with full interval remission. | Bikram Yoga (26 postures performed in hot room at 105°F) | He became psychotic while participating in a Bikram yoga instructors' training seminar lasting several days secondary to dehydration, poor oral intake and sleep. | This case demonstrated side effects of yoga. Clinicians should screen patients who are prone to either mania or psychosis against stress and sleep deprivation, and consider the cultural contexts of yoga-induced psychosis before suggesting yoga to certain patients. |

in depression.[25,34] An adaptation of MBI from mindfulness-based stress reduction/MBCT, namely compassion-mindfulness therapy, also demonstrated significant improvement in depression.[53] In the study by Costa and Barnhofer, depression improved significantly with both MBI and guided imagery groups. However, the maintenance of the effects required continued practice of mindfulness skills.[35] Although Sundquist *et al*.'s study demonstrated significant reduction in depressive symptoms from baseline with MBI, no significant advantage has been demonstrated over the TAU control group. In the mindfulness group, those who underwent at least 6–8 sessions have demonstrated significant reduction in depressive symptoms.[25] Another study has established that improvement in depressive symptoms appear to be directly related to the baseline magnitude of depression and may not be related to religious affiliation, spiritual experiences, sex, or age.[36]

Case report of mindfulness mood program (MMB), adapted from MBCT, was found to be cost-effective approach targeting residual depressive symptoms.[54]

## Discussion

Yogic practices, though ancient, are being rediscovered by modern medicine. As per the principles of evidence-based medicine, any method of treatment has to prove its efficacy in treating a disorder against a placebo or another preexisting effective treatment. Hence, several medical specialties are conducting studies on the effectiveness of yoga as an intervention so as to be able to recommend it to their patients. In accordance with this trend, yoga is being increasingly used in psychiatric disorders. Commonly, it is used for anxiety and other neurotic disorders; however, there have been several trials in recent times that have studied the efficacy of yoga in SMI.

The studies reviewed have shown that yoga as an add-on to antipsychotics was beneficial in reducing psychopathology and improving socio-occupational functioning. Most studies have included patients with mild-to-moderate levels of current psychopathology as evidenced by PANSS total scores.

Yoga has been shown to improve both positive and negative symptoms of schizophrenia, thereby decreasing the illness severity.[10,17,18,26,28,38,39] This could possibly be explained by the psychobiological changes of yogasanas as evident by reduced amplitude of low-frequency fluctuations in the precuneus which correlated significantly with the PANSS – blunted affect subscore.[23] Further studies are required to replicate the findings on a larger scale to identify whether yoga is associated with similar psychobiological changes.

YT has also been found to significantly improve the facial emotion recognition deficits (FERDs) and socio-occupational functioning.[31,39] FERD can affect socio-occupational functioning by impairing the ability to interact in social situations.[55,56] The finding of increased oxytocin levels in the patients assigned to YT gives a biological basis to the observed behavioral improvements.[31] The use of oxytocin in improving social cognition deficits has been demonstrated in earlier studies.[57]

Both YT and PE interventions showed significant improvement in several cognitive domains including attention and working memory.[11,17] Yoga has a larger

effect on verbal acquisition than PE.[17] Yoga can improve cognitive functions possibly by the emphasis on mental concentration and control of the body movements, which can lead to alterations in brain structures and immune functions enhancing cognitive abilities.[58] Cognitive improvement with a brief intervention sustained even after a duration of unsupervised period and certain cognitive domains have also demonstrated delayed improvement.[11] Hence, to have the maximum benefit, yoga must be practiced for certain period. Most of the studies described here have a maximum intervention period of 6 months.

It is still not clear how each of the various postures used in these studies has produced a therapeutic effect. Attention is an inherent component of yoga as it involves synchronizing of bodily postures and breathing pattern. Cognitive remediation techniques use attention-enhancing tasks, and its significance has been well established in schizophrenia.[59] This could be an additional benefit of yoga over PEs. Yogasanas could cause beneficial effects by stimulation of vagal afferents through the pressure receptors and diaphragmatic receptors. These vagal afferents through their projections to limbic system influence the mood and affect regulation.[60]

In MDD, YT has demonstrated to be an effective adjuvant to antidepressants, except for few studies. The lack of an advantage of yoga over group therapy with hypnosis in the study by Butler *et al*. could be due to poor motivation levels and poor adherence to treatment. Similarly, the study by Shahidi *et al*. failed to demonstrate benefit of yoga over PE. However, instead of conventional asanas, this study used laughter yoga as the intervention. Many of the other studies have methodological issues such as single-group outcome study without any placebo or control arm.[32,49]

Other studies like that of Schuver and Lewis used visual media for instruction rather than sessions by a therapist. This would have limited the participant learning and practice greatly. The lack of a waitlist control group[35,50] and the low frequency of yoga training (once or twice per week)[33,35,53] may have been responsible for failure of YT in few studies. Hence, it is difficult to comment on the number of sessions per week for effective yoga intervention in depression due to methodological issues in the aforementioned studies. However, the duration of the intervention in the included studies ranged from 5 weeks[52] to 9 months.[48]

A study with a waitlist control group and the yoga group receiving interventions by trained professionals with at least two supervised sessions per week and ensuring home-based continuation of the yoga sessions during rest of the days in a week has clearly demonstrated benefit of yoga as an add-on treatment for depression.[50] Therefore, future studies of yoga intervention could have two or more weekly sessions of personal instruction from a trained yoga therapist. There could also be instructions for regular practice of yoga at home with a method to measure adherence to the therapy during the period of intervention.

Possible mechanisms by which the yoga improves depression include positive self-talk and self-acceptance. It minimizes negative thinking bias, enhances self-confidence, and promotes more adaptive thinking.[9] Other possible mechanisms include increasing gamma-aminobutyric acid neurotransmitter in the brain,[61,62] improving sleep,[63] decreasing ruminations,[64] and promoting behavioral activation.[49]

Similarly, in the recent times, mindfulness technique has been gaining importance as an integrated approach in schizophrenia, MDD, and BD. In schizophrenia individuals, mindfulness interventions are found to be effective in various symptom domains of the illness. However, methodologically, rigorous randomized clinical trials (RCTs) were only few in number.[8,12,13,16] A study by Davis *et al*. demonstrated that MBI may work synergistically with vocational rehabilitation for improving work persistence and performance. They predominantly involved male samples, and they were employed in a basic-level job with low pay.[12] Hence, the generalizability is limited. Moritz *et al*. did not establish the superiority of mindfulness over progressive muscle relaxation technique for reducing depressive symptoms in individuals with psychosis possibly due to lack of proper training, lengthy manuals, and difficulty in ensuring adherence.[8] Findings of Jacobsen *et al*.'s study of increase in stress levels immediately following the intervention must be viewed with caution as the study involved only a small sample size.[43] Mindfulness techniques modulate the individual's relationship with psychotic experiences either by increasing patient's acceptance and awareness of the nature of symptoms, or by minimizing subjective distress. It also facilitates developing self-compassion, regulating negative emotions, and removing guilt feelings.[6,7]

In depression, while the effectiveness of MBCT is well established, other MBIs have also been showing promising results. It has been shown that mindfulness can lead to improvement in depression, anxiety, physical distress, positive affect, and daily functioning.[53]

Possible mechanisms for such improvement may include decentering from negative thinking and reducing the difficulties in emotion regulation. Mindfulness techniques are known to increase meta-cognitive awareness and facilitate decentering. Although such gains may be seen even with guided imagery, the gains are maintained in patients who are able to employ principles of mindfulness even during follow-up. Another mechanism could be the development of non-judgemental, observing stance to the ruminations, thereby facilitating the ruminators to disengage and mitigate the maintaining effect of ruminations in depression.[65]

Recent literature cautions the use of meditative practices in patients with psychosis as it might exacerbate the psychotic experiences.[66] While concerns are raised by the case

reports of precipitation of acute psychotic states after certain yogic practices,[67,68] none of the controlled studies involving a larger number of patients have demonstrated such adverse effects with either yoga or MBI. Hence, it appears to be a feasible intervention for individuals with psychotic symptoms and it has been replicated in a few studies.[7,29]

However, we must note that the studies of YT and MBI in schizophrenia and MDD have included patients who had a low level of symptom severity.

One major limitation of RCTs is that double-blinding is not feasible. Compliance in the intervention group after training was not assessed rigorously, except a few studies which used log book, but this has its own limitations. Willingness and attitude toward such alternatives might also influence the outcome significantly. There is often criticism that the observed benefits of yoga may be due to the placebo effect. However, some of the studies have found that there are definite changes in biological markers such as oxytocin increase corresponding to improved social cognition. Such use of biomarkers in the trials of yoga is essential to demonstrate that the effects are specific, genuine, and not merely due to chance or placebo effects.

This review attempts to provide a comprehensive narrative review of two most commonly used complementary therapies in psychiatric disorders, yoga and mindfulness which enable the readers to have a complete understanding of both these interventions. Furthermore, all the included studies were independently reviewed by two authors to extract relevant data and concur on the findings. Limitations include lack of systemic analysis and heterogeneity in the studies. Thus, we have written a narrative review rather than attempt a meta-analysis.

## Conclusion

We would like to highlight the importance of integrating yoga and mindfulness interventions as add-on therapy for major mental health disorders. The mental health professionals should work in close association with the therapists to cater the needs of the patients. It is interesting to note that hardly few patients in the included studies had few adverse effects and worsening of positive symptoms during the intervention. This probably suggests that yoga and mindfulness techniques can be practiced by patients with schizophrenia, MDD, and BD without much worsening of symptoms. Further systematic studies are needed to study the beneficial effects and potential neurobiological mechanisms of yoga and mindfulness intervention in patients with schizophrenia, MDD, and BD.

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### Conflicts of interest

There are no conflicts of interest.

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