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ORIGINAL PAPER

Integrative Body–Mind–Spirit (I-BMS) Practices for Schizophrenia: An Outcome Literature Review on Randomized Controlled Trials

Xiafei Wang[1] · James Beauchemin[2] · Chang Liu[3] · Mo Yee Lee[3]

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Abstract

Prior reviews show that certain complementary and alternative practices are promising for patients with schizophrenia. The aim of this study is to review the outcome literature on intervention studies using integrative body–mind–spirit (I-BMS) practices on schizophrenia. This is an outcome literature review of randomized controlled trials (RCTs) on I-BMS practices from 2004 to 2016. The review used a modified Delphi List to assess methodological rigor and the California Evidence-Based Clearinghouse Scientific Rating Scale to evaluate the level of research support for each identified I-BMS practice. This review identified 13 RCTs of I-BMS practices, including mindfulness interventions (5), yoga (3), tai-chi (2), and relaxation (3). I-BMS practices were effective with medium to large effect sizes for alleviating symptoms, decreasing anxiety and stress, improving insight and mindfulness, subjective well-being and social/occupational functioning, as well as decreasing the frequency and duration of re-hospitalization. This review expands the knowledge base of treatment effectiveness pertaining to patients with schizophrenia.

Keywords Integrative body–mind–spirit practice · Schizophrenia · Outcome literature review

Approximately 1.1% of adults in the United States are affected by schizophrenia (NIMH 2016), a chronic and severe mental disorder that primarily consists of positive, negative, and cognitive symptoms. Patients with schizophrenia suffer from reduced life expectancy (Vancampfort et al. 2012), high rates of disability and compromised social functioning (Barbato and WHO 1997), as well as social and internalized stigma (Krupchanka and Katliar 2016). Additionally, schizophrenia incurs treatment and caregiving costs for families and society. Estimates of direct costs of schizophrenia accounted for 7–12% of the gross national product in Western countries, and the United States spent $60 billion per year for patients with schizophrenia (Chong et al. 2014). Finally, patients with schizophrenia are disproportionately represented within the homeless population and the criminal justice system, raising social justice concerns for this population (Insel 2010).

Interventions have been developed to alleviate the patient's suffering and reduce social expenditures. The conventional medical practices of using antipsychotic and atypical antipsychotic medications can effectively manage positive symptoms, yet they leave the negative and cognitive symptoms unaddressed (Vancampfort et al. 2012). Moreover, the side effects of psychotropic medicines—ranging from sedation, weight gain, anticholinergic effects to extrapyramidal effects, or even neuroleptic malignant syndrome—result in a high rate of medication non-adherence and detrimental impacts on the patient's remission and function (Van Os and Kapur 2009). Given these limitations, an integrative treatment approach with multi-model practices should be adopted to improve the symptom management and recovery prognosis for patients with schizophrenia (Ho et al. 2012).

✉ Xiafei Wang
wangxiafei.mun@gmail.com

James Beauchemin
jamesbeauchemin@boisestate.edu

Chang Liu
liu.1682@osu.edu

Mo Yee Lee
lee.355@osu.edu

[1] School of Social Work, The David B. Falk College of Sport and Human Dynamics at Syracuse University, 400 White Hall, Syracuse, NY 13244, USA

[2] Boise State University, Boise, USA

[3] College of Social Work, The Ohio State University, Columbus, USA

Complementary, alternative, and integrative practices have grown tremendously in medical and other allied health professions within the past decade, and the importance of these practices for mental health problems has been emphasized in multiple disciplines including neuroscience (Froeliger et al. 2012), psychoneuroimmunology (Irwin 2008), psychosocial genomics (Garland and Howard 2009), and epigenetics (Curley et al. 2011). Prior reviews illustrated that certain complementary and alternative practices were promising for patients with schizophrenia, such as yoga (Vancampfort et al. 2012) and mind–body medicine (Helgason and Sarris 2013). However, how widely and how effectively those specific methods of complementary and alternative practices have been used for treating schizophrenia is still unknown. Moreover, the research rigor and evidence of each complementary and alternative practice should be examined to determine whether they could be adjunctive to traditional medicine. An important starting point is to review the outcome literature on current intervention studies using complementary and alternative practices on schizophrenia.

There are a variety way to define complementary, alternative, and integrative practices but most of them emphasize the "non-mainstream origin. For the purpose of exploring practices that can empower mental health clients, this study focused on examining practices that utilized body, mind, and/or spiritual techniques in schizophrenia treatment that an individual can engage on one's own. Body, mind, and spiritual techniques are practices that tap into an individual's internal resources, which distinguishes these practices from approaches that use natural products (such as diets and supplements) that are external to the person. This outcome literature review uses the term integrative body–mind–spirit (I-BMS) to refer to these practices and "assumes the dynamic balance of and interrelationship among mind, body and spirit as fundamental to health, mental health, and the well-being of individuals" (Author et al. 2009, p. 44).

Methods

Data Collection and Reviewing Process

The data in this study was part of a larger study that reviewed the outcomes of I-BMS practices on mental health conditions (Lee et al. 2018). The search process followed a protocol developed by a research team that included experts in integrative practices (See details in this report http://www.naddssw.org/pages/wp-content/uploads/2017/01/NADD-IBMS-in-SWE-2004-2013-Report-FINAL.pdf). Studies were identified through electronic databases including Health Source, Medline, PsycINFO, PubMed, Social Work Abstracts, and SocINDEX using the keywords: acupressure OR aromatherapy OR body work OR body-mind OR mind–body OR complementary and alternative OR holistic OR massage OR meditat* OR mindful* OR qi gong OR chi gong OR relax* OR reiki OR spirit OR tai chi OR tai qi OR therapeutic touch OR yoga NOT back pain. The selection of the search terms was guided by the focus of this review, which was on practices that utilized body, mind, and/or spiritual techniques in mental health treatment as determined by a panel of three experts in this area. The team has met twice to develop a list of BMS intervention based on their expert knowledge of the field.

Inclusion criteria were: (1) randomized controlled trials (RCTs) related to mental health, psychosocial functioning, and social work practice; (2) English language articles; (3) published articles in peer-reviewed journals; and (4) articles published between January 2004 and December 2016. The exclusion criterion was research that tested interventions primarily for physical illnesses.

The review process consisted of the following steps. The search first yielded 7784 articles for title and abstract review. We excluded all studies that did not meet the inclusion criteria as well as those overlapping studies from different databases. Full article review was conducted on the remaining articles. The process of detailed full article review yielded eligible articles of studies treating 16 mental health conditions. Among those studies, the researchers in this study selected those that focus on schizophrenia to conduct this outcome literature review ($N = 13$). Information regarding research design, sample characteristics, sampling method, fidelity, rigor of method, transparency, reporting quality, and treatment outcomes was extracted and recorded (Bronson and Davis 2011).

This outcome literature review aimed to present both the research rigor (mainly methodological quality) of each included study and the level of research support for each identified I-BMS intervention. A modified Delphi List (Verhagen et al. 1998) was chosen to rate the methodological quality and California Evidence-Based Clearinghouse (CEBC) for Child Welfare Scientific Rating Scale (CEBC 2016) was used to assess the level of research support for individual I-BMS interventions. Two independent reviewers were involved in the rating process who regularly met and compared their ratings. When there were discrepancies, the two reviewers discussed the details of the discrepancies, identified potential reasons, and sought consultation from a senior researcher to seek clarification as needed. The reviewers re-rated the study again until consensus was achieved.

Assessing Methodological Quality of Studies

To assess the research rigor of each RCT, this literature review adopted a modified scale from the Delphi List (Verhagen et al. 1998; see Table 1). The original Delphi list developed by 33 international method experts consists of

Table 1 Modified Delphi list

	Score
1. Was there a description of dropouts/withdrawals?	1 = Y; 0 = N
2. Was the method of randomization specified?	1 = Y; 0 = N
3. Were the groups similar at baseline regarding the most important prognostic indicators?	1 = Y; 0.5 = DK; 0 = N
4. Was the eligibility criterion clearly laid out?	1 = Y; 0 = N
5. Was there an objective strategy followed for treating missing data?	1 = Y; 0 = N
6. Was the study adequately powered for the primary outcomes?	1 = Y; 0 = N
7. Point estimates and associated variability estimates (Cl) presented for the primary outcome measures?	1 = Y; 0 = N

1 = *Yes*; 0.5 = *Don't Know*; 0 = *No*

9 items with each item scored on a 3-point scale (*Yes* = 1; *No* = 0; *Don't know* = 0.5). This review modified the original Delphi List by removing the items assessing blinding, but adding an item assessing statistical power. The rationale for modifications was based on the nature of mental health treatment research. Different from medical research design that prioritizes double-blinding, the research design of a mental health treatment study emphasizes ensuring adequate power to detect the effectiveness of the intervention. The scale assesses the explicit description of dropouts, method of randomization, baseline equivalence, eligibility criteria, missing data, power, and point estimates for outcomes. In addition, some response categories were redefined as dichotomies and excluded "Don't know" for items that should be clearly described in the article (see Table 1). Total scores of the modified scale ranged between 0 and 7 with higher scores indicating a study of superior methodological quality.

Assessing Levels of Research Evidence

This study used the CEBC for Child Welfare Scientific Rating Scale (CEBC 2016) to assess the level of research support for an individual I-BMS practice. The CEBC Scientific Rating Scale is a 1–5 scale that has been widely adopted in child welfare for assessing the level of scientific evidence supporting each program, with a lower score indicating a greater level of research support (Level 1 = *Well Supported by Research Evidence*, Level 2 = *Supported by Research Evidence*, Level 3 = *Promising Research Evidence*, Level 4 = *Evidence Fails to Demonstrate Effect*, and Level 5 = *Concerning Practice*). The overall criteria of rating is based on (1) multiple sites replication and follow up, (2) reliable and valid outcome measures, (3) overall weight of outcome supports the benefits of the practice, (4) risk of harm, (5) availability of manual or writings that specify components of the service and describe how to administer it.

All authors certify responsibility for the study and the manuscript.

Results

This review identified 13 RCTs of I-BMS practices, applying mindfulness interventions (5), yoga (3), tai-chi (2), and relaxation (3) to adult populations with schizophrenia originating from the UK (1), Spain (1), China and Taiwan (6), Belgium (1), Bulgaria (1), India (2) and the USA (1). The sample size in each study ranged from 18 to 107. I-BMS practices were compared to control conditions including waiting list, treatment as usual (TAU), other types of treatment, and placebo intervention (see Table 2). For each RCT, the authors of this study calculated Cohen's *d* as the principal summary measure to assess the intervention effect size as compared to the control condition.

Mindfulness Interventions

Five studies utilizing mindfulness-based interventions with quantified effect sizes of primary outcomes were examined as follows (see Table 3).

Chadwick et al. (2009) examined the impact of a group mindfulness-based intervention with an experimental ($n = 11$) and wait list ($n = 11$) control group design. The intervention participants met twice weekly for 5 weeks, and were provided guidance and practice through two 10-min guided mindfulness sessions followed by 15–20 min guided discovery group discussion. The results suggested the symptoms of auditory hallucination and paranoia were reduced for intervention group ($d = -0.26$, $p > 0.05$; $d = -0.12$, $p > 0.05$, respectively) with small to medium effect sizes. Mindfulness to distressing thoughts and images ($d = 0.86$, $p < 0.05$), as well as mindfulness to voices ($d = 0.47$, $p > 0.05$) increased with medium to large effect sizes for the intervention group. The methodological quality score (rated on a scale of 0–7) for this study was 3.

Langer et al. (2012) examined the effects of a Mindfulness-Based Cognitive Therapy intervention. Experimental group members ($n = 7$) participated in 8 weekly 60-min sessions, and followed the protocol developed by Segal et al. (2002) which included training and practice in mindfulness

Table 2 Summary of identified studies

Interventions	Citation	Study population	Treatment conditions		Methodological quality
			Experimental	Comparison	
Mindfulness Well supported by research evidence	Chadwick et al. (2009)	UK adult patients with a psychotic disorder with prominent distressing voices	Mindfulness training N = 11	Waitlist N = 11	3
	Langer et al. (2012)	Spain adult patients with a diagnosis of schizophrenia, schizophreniform disorder, schizoaffective disorder or delusional disorder according to the DSM-IV-TR	Mindfulness group therapy N = 7	Wait list N = 11	4
	Chien and Lee (2013)	Chinese adult patients received diagnosis of schizophrenia Based on the DSM-IV	Mindfulness-based psycho-education N = 48	Usual psychiatric care N = 48	4
	Chien and Thompson (2014)	Chinese adult patients received diagnosis of schizophrenia Based on the DSM-IV	Mindfulness psycho-education N = 36	A conventional psycho-education N = 36 Routine care alone N = 35	6
	Wang et al. (2016)	Chinese adult patients received diagnosis of schizophrenia spectrum disorders based on the DSM-IV	Mindfulness psycho-education N = 46	A conventional psycho-education N = 46 Routine care alone N = 46	6
Yoga Promising research evidence	Duraiswamy et al. (2007)	Indian adult patients with schizophrenia attending out-patient and in-patient services of National Institute of Mental health and Neuro Sciences	Yoga therapy N = 31	Physical exercise therapy N = 30	4
	Visceglia and Lewis (2011)	USA adult patients with schizophrenia	Yoga therapy N = 10	Waitlist N = 8	4
	Behere et al. (2011)	Indian adult patients with schizophrenia based on the DSM-IV	Yoga therapy N = 27	Physical exercise therapy N = 14 Waitlist group N = 22	4
Tai-chi Promising research evidence	Ho et al. (2012)	Chinese adult patients with chronic schizophrenia based on the DSM-IV, residing in a mental health rehabilitation hostel	Tai-chi N = 15	Waitlist N = 15	6
	Ho et al. (2016)	Chinese adult patients with chronic schizophrenia based on the DSM-IV, residing in a mental health rehabilitation hostel	Tai-chi N = 51	Exercise group N = 51 Waitlist group N = 51	6

Table 2 (continued)

Interventions	Citation	Study population	Treatment conditions		Methodological quality
			Experimental	Comparison	
Relaxation Promising research evidence	Vancampfort et al. (2011)	Belgian adult patients with schizophrenia based on DSM-IV	Progressive muscle relaxation (PMR) N = 27	Resting control condition N = 26	5
	Georgiev et al. (2012)	Bulgaria adult patients with schizophrenia	PMR N = 31	Resting control condition N = 30	5
	Chen et al. (2009)	Taiwan adult patients with schizophrenia	PMR N = 9	Placebo intervention N = 9	5

of breathing, body scan, sitting meditation, metaphors, and sessions summaries. Control group members ($n = 11$) were placed on a wait list for the mindfulness intervention. Results suggested decreases of major symptoms of schizophrenia ($d = -0.74$, $p > 0.05$) and the patient's avoidance of internal experience ($d = -0.43$, $p > 0.05$) with medium to large effect sizes, although they were not statistically significant. Despite the relatively small sample size, results included a significant improvement of ability to respond mindfully to distressing thoughts and images among intervention participants ($d = 1.23$, $p < 0.05$). The methodological quality score for this study was 4.

The effectiveness of a mindfulness-based psychoeducation program (MBPP) for a Chinese sample was assessed by Chien and Lee (2013). Participants in the MBPP intervention ($n = 48$) attended 12 bi-weekly, 2-h group sessions designed to teach individuals to enhance understanding of schizophrenia, increase insight into symptoms, and improve acceptance and control of psychotic symptoms. Control group members ($n = 48$) received routine psychiatric care including monthly medical consultation, community services, and education sessions. The results demonstrated statistically significant improvements for all outcomes over the 18-month follow-up: effect sizes for the decrease of symptom severity, improvement of insight, increase of functioning, decrease of frequency of re-hospitalization, and duration of re-hospitalization were −0.67, 2, 0.57, −0.53, and −1.29 (all $p < 0.05$) respectively. The study suggested that MBPP for Chinese patients with schizophrenia was more effective than usual psychiatric care with sustained effects for over 1 year. The methodological quality score for this study was 4.

Chien and Thompson (2014) further assessed the MBPP effectiveness with Chinese patients by randomly assigning 107 participants to either MBPP ($n = 36$), a conventional psychoeducation program group (CPGP, $n = 36$), or a usual outpatient care group (TAU, $n = 35$). Results from the 2-year follow-up showed that compared to the conventional psycho-education program, the effect sizes of decreasing major symptoms, improving of insight, increasing function, and reducing frequency of re-hospitalization and duration of re-hospitalization for intervention group members were −1.87 ($p < 0.05$), 1.52 ($p < 0.05$), 1.45 ($p < 0.05$), −0.42 ($p > 0.05$), −1.02 ($p < 0.05$) respectively; and compared to the usual care, the respective effect sizes were −2.96, 1.52, 2.57, −0.92, −1.83 respectively (all $p < 0.05$). The methodological quality score for this study was 4. It should be noted that large effect size (e.g. $d > 2$) could be attributed to the research design of comparing MBPP practice with treatment as usual.

Utilizing the same research design of Chien and Thompson (2014), Wang et al. (2016) reassessed the MBPP effectiveness in China by randomly assigning another 138 participants to either MBPP ($n = 46$), CPGP ($n = 46$), and TAU

Table 3 Effect sizes: mindfulness interventions

Outcomes	Instruments	Chadwick et al. (2009)	Langer et al. (2012)	Chien and Lee (2013)	Chien and Thompson (2014)	Wang et al. (2016)
General symptom severity	Clinical global impression-Schizophrenia Scale (Langer et al. 2012); Brief Psychiatric Rating Scale (Chien and Lee 2013; Chien and Thompson 2014); Positive and Negative Syndrome Scale Score (Wang et al. 2016)		−0.74	−0.67*	−1.87*/−2.96*	−1.44*/−2.67*
Positive symptoms	PANSS Positive Syndrome Scale Score					−0.79*/−1.51*
Auditory hallucination	Psychiatric Symptom Rating Scale Subscales of auditory	−0.26				
Paranoia	Psychiatric Symptom Rating Scale Subscales of Paranoia	−0.12				
Negative symptoms	PANSS Negative Syndrome Scale Score					−0.55*/−0.76*
Avoidance of internal experience	Acceptance and Action Scale		−0.43			
Respond mindfully to distressing thoughts and images	Southampton Mindfulness Questionnaire	0.86*	1.23*			
Respond mindfully to voices	Southampton Mindfulness Voices Questionnaire	0.47				
Insight into illness and treatment	Insight and Treatment Attitudes Questionnaire			2*	1.52*/1.52*	0.41/0.61*
Increase of functioning	Specific Level of Functioning Scale			0.57*	1.45*/2.57*	1.78*/2.53*
Re-hospitalization (number)				−0.53*	−0.42/−0.92*	−0.26/−0.51*
Re-hospitalization (duration)				−1.29*	−1.02*/−1.83*	−0.38/−0.47*

For the studies of Chien and Thompson (2014) and Wang et al. (2016), the first value is the effect size of mindfulness intervention compared with conventional psychoeducational program, whereas the second value is the effect size of mindfulness intervention compared with the treatment as usual

*$p < 0.05$, there is statistically significant difference between the experimental group and the control group

($n = 46$). The results from the 6-month follow-up showed that compared to the CPGP, the effect sizes of decreasing general symptoms, positive symptoms, negative symptoms, improving of insight and functioning, as well as reducing frequency and duration of re-hospitalization for MBPP members were: −1.44 ($p < 0.05$), −0.79 ($p < 0.05$), −0.55($p < 0.05$), 0.41 ($p > 0.05$), 1.78 ($p < 0.05$), −0.26 ($p > 0.05$), and −0.38 ($p > 0.05$); and compared to the TAU, the respective effect sizes were −2.67, −1.51, −0.76, 0.61, 2.53, −0.51, and −0.47 respectively (all $p < 0.05$). Large effect sizes were identified because participants in comparison group received TAU. This study's methodological quality score of 6 confirmed the previous research that supported a mindfulness-based psychoeducation approach for schizophrenia treatment.

According to the treatment outcomes of five RCT studies, mindfulness related interventions for schizophrenia could be recommended as *Well Supported by Research Evidence* (*Level 1*) based on CEBC ratings primarily because more than two RCT studies revealed mindfulness related interventions were superior to an appropriate comparison practice. Meanwhile, the studies of Chien and Lee (2013) and Chien and Thompson (2014) have demonstrated lasting effects of at least 1 year (CEBC 2016).

Yoga

This outcome literature review identified three studies utilizing yoga interventions that met eligibility criteria. The quantified effect sizes of primary outcomes were examined as follows (see Table 4).

Visceglia and Lewis (2011) examined the effectiveness of an 8-week therapeutic yoga program by assigning ten participants to yoga therapy and 8 to a waitlist control group.

Table 4 Effect sizes: yoga interventions

Outcomes	Instruments	Duraiswamy et al. (2007)	Visceglia and Lewis (2011)	Behere et al. (2011)
General symptom severity	Positive and Negative Syndrome Scale Score (PANSS)—Total Score	−0.74*	−2.27*	
Positive syndrome	PANSS Positive Syndrome Subscale	−0.41	−1.24*	0.37/0.05
Negative syndrome	PANSS Negative Syndrome Subscale	−0.90*	−1.43*	0.29/0.27
Anergia	PANSS Anergia Subscale	−0.77*	−1.11*	
Depression	PANSS Depression Subscale	−0.91*	−1.23*	
General psychopathology	PANSS General Psychopathology Subscale		−1.76*	
Activation	PANSS Activation Subscale		−1.08*	
Paranoia/belligerence	PANSS Paranoia/Belligerence Subscale		−1.36*	
Thought disturbance	PANSS Thought disturbance Subscale		−0.47	
Social/occupational functioning impairment	Social and occupational functioning scale	−0.48*		0.50*/0.07

For the study of Behere et al. (2011), the first value is the effect size of yoga therapy compared with exercise, whereas the second one is the effect size of yoga therapy compared with the waitlist group. However, those findings need to be interpreted cautiously because significantly differences existed in the baseline: yoga group had significantly worse symptoms than the other two groups at the beginning

*$p < 0.05$, there is statistically significant difference between the experimental group and the control group

Intervention group participants received yoga therapy for 45 min twice per week, during which skills such as breathing exercises, yoga stretches, and coordinated movements were introduced and practiced. Participants in yoga therapy demonstrated a significant reduction in most PANSS scales with large effect sizes: total ($d = -2.27$, $p < 0.05$); positive syndrome ($d = -1.24$, $p < 0.05$), negative syndrome ($d = -1.43$, $p < 0.05$), anergia ($d = -1.11$, $p < 0.05$), depression ($d = -1.23$, $p < 0.05$), general psychopathology ($d = -1.76$, $p < 0.05$), activation ($d = -1.08$, $p < 0.05$), paranoia/belligerence ($d = -1.36$, $p < 0.05$), and thought disturbance ($d = -0.47$, $p > 0.05$). Large effect sizes found here could be attributed to the research design of comparing participants receiving Yoga therapy with a waiting list group. Despite the small sample size, this study supports the therapeutic benefit of an 8-week yoga intervention for both positive and negative symptoms of individuals with schizophrenia. The methodological quality score for this study was 4.

Behere et al. (2011) examined the efficacy of yoga intervention to pharmacological therapy. Study participants were randomly assigned to one of three treatment groups: yoga ($n = 34$), exercise ($n = 31$), or waitlist ($n = 26$). Yoga participants were provided training for 1-month by a trained yoga instructor in techniques such as breathing practices, sitting, supine, prone posture asanas, pranayama, and relaxation techniques, followed by 2 months of at-home practice. Similarly, exercise participants were provided training in brisk walking, jogging, and relaxation, with continued practice of techniques for the following 2 months. Results did not demonstrate significant improvements in positive and negative symptoms for yoga group participants compared to the exercise and waitlist groups, as well as significantly worse outcomes in socio-occupational functioning compared with the exercise group. However, those findings need to be interpreted cautiously because the yoga group had significantly worse symptoms than the other two groups at baseline. The methodological quality score for this study was 4.

Duraiswamy et al. (2007) examined the efficacy of yoga as an adjunctive therapy to ongoing antipsychotic treatment. A total of 61 patients with schizophrenia were randomly assigned to yoga ($n = 31$) or physical exercise ($n = 30$). Subjects in both groups attended training 1-h per day for 5 days/week for 3 weeks, followed by continued daily practice individually. Results assessed at the 4-month mark indicated that participants in the yoga group experienced significant improvements in most outcome measures compared with those in the physical exercise group. The effect sizes regarding general symptom severity, positive symptom, negative symptom, anergia, depression, and social/occupational functioning impairment were −0.74 ($p < 0.05$), −0.41 ($p > 0.05$), −0.90 ($p < 0.05$), −0.77 ($p < 0.05$), −0.91 ($p < 0.05$), and −0.48 ($p < 0.05$) respectively. This indicates that yoga therapy as an add-on to antipsychotic treatment was more effective than physical exercise, particularly for the improvement of negative symptoms. The methodological quality score for this study was 4.

According to the treatment outcomes of three RCT studies, yoga interventions for schizophrenia could be recommended as have *Promising Research Evidence* (*Level 3*) based on CEBC ratings since the studies of Duraiswamy et al. (2007) and Visceglia and Lewis (2011) demonstrated that yoga was superior to an appropriate comparison practice, and neither of the studies showed lasting effects.

Tai Chi

This review included two studies by Ho et al. (2012, 2016), examining the effects of tai chi on symptoms alleviation and mood coordination of Chinese residential patients with chronic schizophrenia (see Table 5).

In the 2012 study, participants were randomly assigned to either a 6-week tai chi program in addition to standard residential care ($n=15$) or a control group receiving standard care only ($n=15$). The tai chi intervention involved 1-h classes twice weekly for 6 weeks, along with additional 30-min weekly practice sessions. Sessions were led by mental health professionals with formal tai chi training. At a 6-week follow-up, effect sizes of decreases in negative symptoms were: anhedonia/asociality ($d=-0.09$, $p>0.05$), avolition/apathy ($d=-0.12$, $p>0.05$), alogia ($d=-0.55$, $p<0.05$), affective flattening ($d=-0.01$, $p>0.05$), and attention impairments ($d=-0.66$, $p<0.05$) respectively for the tai chi group as compared to the wait list control. Additionally, improvements in movement coordination for tai chi participants resulted in large effect sizes, specifically the decreases of deficits in placing ($d=-0.88$, $p<0.05$), turning ($d=-1.06$, $p<0.05$), and displacing ($d=-0.91$, $p<0.05$). The methodological quality score of this single study was 6.

The 2016 study compared treatment efficacy of a tai chi intervention with aerobic exercise and a wait list group, yielding mixed results. Participants in the tai chi group ($n=51$) were offered a weekly 60-min class, and 45-min twice-weekly practice sessions for 12 consecutive weeks. The exercise group ($n=15$) received the same amount of physical activity, consisting of exercises such as joint movements, walking, stepping, mind weight training, and cool down stretching, while the waitlist group ($n=51$) received routine care. The 6-month follow-up results suggested that tai chi benefited participants by alleviating motor deficits ($d=-0.50$, $p<0.05$), sequencing deficits ($d=-0.73$, $p<0.05$), and improving short-term memory and attention ($d=0.46$, $p<0.05$) when compared with the wait list group. However, compared to the aerobic exercise group, tai chi participants showed higher levels of positive, negative, excitement, and depression symptoms; this means that although tai chi improved some aspects of patients' functioning compared to the wait list group, tai chi was inferior to the aerobic exercise in decreasing symptoms. This finding suggested aerobic exercise as a viable strategy for mental health while more studies should be conducted to explore the underlying mechanism of the change emerging from the body-mind connection of tai chi. The methodological quality score of this single study was 6 (Table 5).

Table 5 Effect sizes: tai chi intervention

Outcomes	Instruments	Ho et al. (2012)	Ho et al. (2016)
Positive symptoms	PANSS positive syndrome subscale		0.54*/0.28
Negative symptoms	PANSS negative syndrome subscale (PANSS, Ho et al. 2016) scale for the assessment of negative symptoms (SANS, Ho et al. 2012)		0.41*/0.13
Anhedonia/asociality	SANS anhedonia/asociality subscale	−0.09	
Avolition/apathy	SANS avolition/apathy subscale	−0.12	
Alogia	SANS Alogia subscale	−0.55*	
Affective flattening	SANS Affective flattening subscale	−0.01	
Attention impairment	SANS Attention impairment subscale (Ho et al. 2012)	−0.66*	
Excitement symptoms	PANSS Excitement Subscale		0.48*/0.30
Depression symptoms	PANSS depression subscale		0.47*/0.34
Cognitive symptoms	PANSS cognitive subscale		0.10/0.13
Deficits in movement coordination	Minnesota Rate of Manipulation Test (CMDT, Ho et al. 2012); Chinese neurological evaluation scale (NES, Ho et al. 2016)		
Placing	CMDT placing subscale	−0.88*	
Turning	CMDT turning subscale	−1.06*	
Displacing	CMDT displacing subscale	−0.91*	
Motor deficit	NES motor subscale		0.04/-0.50*
Sequencing deficit	NES sequencing subscale		−0.07/−0.73*
Short-term memory and attention	Chinese Wechesler Adult Intelligence Scale-backward digit spans (Ho et al. 2016)		0.33/0.46*

For the study of Ho et al. (2016), the first value is the effect size of tai chi compared with the exercise, whereas the second one is the effect size of tai chi compared with the wait list group

*$p<0.05$ there is statistically significant difference between the experimental group and the control group

According to the treatment outcomes of two RCT studies, tai chi interventions for schizophrenia could be recommended as have *Promising Research Evidence* (*Level 3*) based on CEBC ratings since the study of Ho et al. (2012) demonstrated that tai chi was superior to an appropriate comparison practice, but did not present a lasting effect due to the research design.

Progressive Muscle Relaxation

Progressive muscle relaxation (PMR) is a technique originally developed by Edmund Jacobson (1939) and later revised and shortened by Bernstein and Borkovec (1973). PMR involves the tensing and relaxing of targeted muscle groups. Each specific muscle group is tensed and held for approximately 8 s, and subsequently relaxed for about 30 s. In this review, three studies with quantified effect sizes of primary outcomes were examined as follows (see Table 6).

Vancampfort et al. (2011) examined the effectiveness of a single 25 min session of PMR on state anxiety, psychological stress, fatigue, and subjective well-being for Belgian adult patients with schizophrenia based on DSM-IV. In a 25 min session, 27 participants received PMR, while 26 resting control group members did the reading for 25 min (they were told that they could read and reading materials were provided for those who did not bring their own material. Both two group participants completed pre and post assessments. Results indicated significant decreases in state anxiety ($d=-1.25$, $p<0.05$), psychological stress ($d=-1.02$, $p<0.05$), and increase in subjective well-being ($d=1.26$, $p<0.05$) among the intervention group participants. No significant change was found for fatigue ($d=-0.46$, $p>0.05$). The methodological quality score of this study was 5.

Vancampfort's study was replicated by Georgiev et al. (2012) with a sample of patients in a state psychiatric hospital in Bulgaria diagnosed with schizophrenia. In the study, 31 participants from the PMR group and 30 from the control group who did the reading for 25 min completed pre and post questionnaires. Results indicated that a single 25 min session of PMR could significantly reduce psychological stress ($d=-0.96$, $p<0.05$) while improving subjective well-being ($d=1.01$, $p<0.05$), but not significantly decrease anxiety ($d=-0.22$, $p>0.05$). The methodological quality score for this study was 5. The multisite evidence supported the effectiveness of single session PMR in reduction of feelings of stress and improving subjective well-being in patients with schizophrenia.

Chen et al. (2009) also examined the effect of PMR on anxiety symptoms in a Taiwanese inpatient sample diagnosed with schizophrenia. Participants in the experimental group ($n=9$) received daily PMR for 11 consecutive days, while the control group ($n=9$) participants received a placebo intervention by sitting in a therapy chair without other interventions given. Participant anxiety levels were assessed via the Beck Anxiety Inventory (BAI) compared between groups at baseline, on day 11 of the intervention, and 1 week post-test. Results demonstrated significant differences in BAI scores among PMR group participants as compared to control group members at 1 week follow-up ($d=-0.53$, $p<0.05$), suggesting that PMR would be helpful for alleviating the level of state anxiety for patients with schizophrenia. The methodological quality score for this study was 5.

According to the treatment outcomes of three RCT studies regarding PMR, relaxation intervention for schizophrenia could be recommended as have *Promising Research Evidence (Level 3)* based on CEBC ratings since three studies demonstrated that PMR was superior to an appropriate comparison practice, yet neither of the studies showed the long lasting effects.

Discussion

This study reviewed the outcomes of 13 RCTs published between 2004 and 2016. The results lend support to the effectiveness of I-BMS practices—including mindfulness based intervention, yoga, tai chi, and progressive muscle relaxation—for adults with schizophrenia in different countries and regions. Mindfulness based practices have shown to be effective in reducing general symptoms and

Table 6 Effect sizes: progressive muscle relaxation

Outcomes	Instruments	Chen et al. (2009)	Vancampfort et al. (2011)	Georgiev et al. (2012)
State anxiety	Beck Anxiety Inventory (Chen et al. 2009) State Anxiety Inventory (Vancampfort et al. 2011)	−0.53*	−1.25*	−0.22
Psychological stress	Subjective Exercise Experience Scale		−1.02*	−0.96*
Subjective well-being	Subjective Exercise Experience Scale		1.26*	1.01*
Fatigue	Subjective Exercise Experience Scale		−0.46	

*$p<0.05$, there is statistically significant difference between the experimental group and the control group

hospitalization re-admission, increasing mindfulness and insight, and improving functioning. Yoga therapy demonstrated its effectiveness on alleviating both positive and negative symptoms. Tai chi reduced the patient's alogia and attention impairment while improving movement coordination. PMR effectively diminished the patient's state anxiety, psychological stress and increased subjective well-being. The effect sizes of those four interventions were mostly medium to large for the treatment outcomes. Based on CEBC ratings, mindfulness based practices were rated as well supported by research evidence (Level 1), while yoga, tai chi, and PMR were rated as having promising research evidence (Level 3).

The specific effectiveness of each I-BMS intervention holds important implications for treating schizophrenia. First, existing research demonstrates that almost 50–80% of patients lack insight on their symptoms (Lincoln et al. 2007). The absence of insight is primarily conceptualized as a lack of awareness of the symptoms and disorder, difficulty understanding the social consequences, and ignorance about the need for treatment (Amador and David 1998), resulting in a low level of treatment adherence and compromised long-term functioning of patients with schizophrenia (Lincoln et al. 2007). Given the essential role that insight may play in schizophrenia treatment and recovery, the mindfulness interventions that can improve insight into illness and treatment could be endorsed as an effective practice. Moreover, studies suggested that instead of the occurrence of psychotic symptoms, it was the way the patient reacted to his/her psychosis symptoms, or the meaning they construct and perceive about their symptoms, that actually incurred a distressing experience (Chadwick et al. 2009; Ho et al. 2012). Mindfulness practice helps to ease the distressing feeling by having the patients learn to let go and accept the unwanted symptoms. Consequently, the patients are empowered to achieve illness management, rather than making futile effort to fight against the symptoms.

Second, mainstream antipsychotic medication treatment primarily focuses on addressing the positive symptoms defined by psychosis, although research shows that negative symptoms (e.g., anhedonia, avolition, and blunt affect) are highly associated with poor recovery process and functional outcomes. However, few effective treatments have been developed to target negative symptoms (Aleman et al. 2016; Dauwan et al. 2016). The large effect sizes of yoga therapy for alleviating negative symptoms provided support for adopting yoga as an adjunctive approach to mainstream medical treatment.

Meanwhile, antipsychotics often result in severe side effects, particularly extrapyramidal effects such as akathisia, Parkinsonism, and tardive dyskinesia (Van Os and Kapur 2009). The deterioration of motor functioning caused by side effects largely restricted the social, clinical, and functional outcomes of the patients and diminished their quality of life (Ho et al. 2012). This review showed the improvement of movement coordination through practicing tai chi. Therefore, this potential benefit of preventing movement deterioration makes tai chi a promising treatment. Similarly, tai chi practice involving memorizing and concentrating on movement sequences addresses the third aspects of schizophrenia symptoms—cognitive impairment—to further complement the pharmacological treatment.

Furthermore, symptoms of schizophrenia can be related to, or exacerbated by, stress and anxiety. Thus, practices that lead to reduced levels of stress and anxiety may be effective for symptom management. This review identified that PMR produced large effect sizes related to reducing state anxiety and stress, and increasing psychological well-being with this population. Given that anxiety and stress are often triggers for increasing schizophrenia symptoms, muscle relaxation could be a beneficial symptom management strategy for patients with schizophrenia.

This review also holds implications for the intervention research of I-BMS practices. Methodological rigor of the research design is important when evaluating study effectiveness. Despite the inclusion of only RCTs in this review, the methodological rigor varied between 3 to 6 based on the 0–7 scale Modified Delphi List. The three most common causes for the lowered methodological rigor scores included: not describing an objective strategy for treating missing data, the study not being adequately powered or not considering power issues, and not specifying the procedure of randomization. Given these limitations, there is a clear need for additional rigorous RCT studies designed with adequate samples and advanced statistical methods for data analysis to examine the effectiveness of I-BMS treatments.

In terms of research design, this review found only mindfulness practices could be recommended as *Well Supported by Research Evidence* (*Level 1*) based on CEBS since this type of practice included multiple site replication, was shown to be superior to an appropriate comparison practice, and had at least one study showing a sustained effect at least 1 year post-treatment. The other three practices—yoga, tai chi, and PMR—were recommended as practices with *Promising Research Evidence (Level 3).* The primary reasons for the Level 3 rating were due to not satisfying criteria pertaining to having a sustained effect beyond the end of treatment (1 year) when compared to a control group. Thus, future study design incorporating 1-year follow up assessment is highly recommended.

Limitations

This literature review has several limitations. First, our research team decided to only include studies published in English due to feasibility concerns of a lack of resources to translate non-English published studies. Second, the results of the literature review were more likely to be influenced by the selection of search terms, which means other I-BMS interventions beyond the search terms might not be identified, thereby resulting in some biases. However, biases have been minimized by consulting with a panel of experts who have been actively involved in integrative practices to identify the search terms. Finally, the sample sizes of several included studies in this review were small, so the findings from this review should be interpreted cautiously.

Conclusion

Current practices have made strides in developing psychopharmacological and psychosocial treatments for schizophrenia. Empirical evidences to support first and second generations of antipsychotic medications, assertive community, and family based services have been well established (Kreyenbuhl et al. 2010). However, few studies have carefully examined the complementary, alternative, and integrative treatments for treating schizophrenia. This outcome literature review fills the current practice and research gaps, suggesting that I-BMS practices are empirically supported for treating patients with schizophrenia, and are particularly promising for attending to the negative symptoms, alleviating side effects, and improving psychological well-being where psychotropic medications have shown limitations. As the holistic ways to connect an individual's body, mind, and/or spiritual experience via tapping a person's internal resources, I-BMS practices empower patients to enhance illness management to achieve improved quality of life. This is consistent with the paradigm shift in schizophrenia—from focusing on disability to focusing on optimism and recovery (Kreyenbuhl et al. 2010).

The empirically supported I-BMS practices—mindfulness based intervention, yoga, tai chi, and relaxation—are suggested to be incorporated into the treatment model; while more evidence should be gathered for other less studied I-BMS practices. Future I-BMS intervention research should emphasize improving research rigor in terms of procedure of randomization, the strategy of handling missing data, and power of the study. The longitudinal research design is highly recommended to show the sustained treatment effects. Systematic review and meta-analysis can be done to demonstrate more definitive conclusion and determine relevant moderators (e.g., gender, age, severity of symptoms) that compound treatment effects.

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Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

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