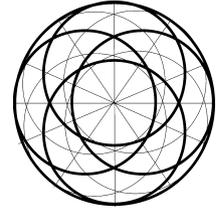




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Yoga for addictions: a systematic review of randomised clinical trials

Paul Posadzki, Jiaè Choi, Myeong Soo Lee, Edzard Ernst

Abstract

Background It has been suggested that yoga may be effective in the management of mental health disorders including addictions.

Objective To critically evaluate the evidence of effectiveness of yoga as a treatment for addictions.

Methods Fourteen electronic databases were searched from inception to January 2013. Randomised controlled trials (RCTs) that evaluated any type of yoga against any type of control in individuals with any type of addiction were eligible. Methodological quality was appraised using Cochrane criteria.

Results Eight RCTs met the eligibility criteria. Most of these RCTs were small with serious methodological flaws. The types of addictions included in these studies were alcohol, drug and nicotine addiction. Seven RCTs suggested that various types of yoga, including hatha yoga (HY), Iyengar yoga, nidra yoga, pranayama or cognitive behavioural therapy (CBT) plus vinyasa yoga, led to significantly more favourable results for addictions compared to various control interventions. One RCT indicated that a methadone maintenance programme (MMP) plus HY had no effect on drug use and criminal activities compared with MMP plus psychotherapy.

Conclusions Although the results of this review are encouraging, large RCTs are needed to better determine the benefits of yoga for addiction.

Keywords

Addictions • complementary and alternative medicine • effectiveness • systematic review • yoga

Introduction

Addiction is defined as ‘a behavior over which an individual has impaired control with harmful consequences’.¹ Addiction is a debilitating psychiatric disorder with a complex aetiology involving the interaction of inherited genetic predispositions and psychological, social, economic and specific situational factors.^{2,3} Individuals can be addicted to tobacco, alcohol, illicit or prescription drugs, eating, gambling and other activities. Although various assumptions affect the estimation, the overall 12-month prevalence of addiction in US adults varies from 15–61%, with an estimated 47% suffering from maladaptive signs of an addictive disorder.⁴ The

estimated economic costs of tobacco, alcohol and illegal drug abuse and addiction in US society are US\$524 billion per year.⁵

Yoga has been defined as ‘a part of Ayurvedic medicine that can consist of one or more of the following: specific postures, breathing exercises, body cleansing, mindfulness meditation, and lifestyle modifications’.⁶ A total of 15.8 million adults in the USA practise yoga, and these numbers continue to rise.^{7,8} Multidimensional reasons explain this popularity, among which are notions that yoga promotes health, strengthens well-being and prevents disease. A growing body of research supports the effectiveness of yoga for the management of various psychiatric conditions,^{9–11} including anxiety or anxiety

disorders,^{12,13} depression,^{14,15} eating disorders,¹⁶ schizophrenia^{11,17} and sleeping disorders.¹⁸ The mechanisms of action for yoga's effect in addiction may be attributed to reductions in anxiety and depression,^{19,20} stress,^{20,21} impulsive, addictive behaviours and psychosis.²² Yoga may also promote personal development; increase emotional stability, life-satisfaction and self-awareness; improve mental, physical and social health; or strengthen initiative, motivation and confidence to improve maturation, intention, attitude and behaviour necessary to overcome addiction.^{16,23}

Several RCTs of yoga for various addictions were recently published. To the best of our knowledge, systematic reviews (SRs) of yoga for addiction are missing. The present SR aims to critically evaluate the evidence of effectiveness of yoga for the treatment of addiction.

Methods

The recent Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) were adhered to for this review. The following 14 databases were searched from their inception to November 2012: AMED, CINAHL, EMBASE, Indian Council of Medical Research, MEDLINE, PsycINFO, The Cochrane Library and seven Korean databases (CNKI, DBPIA, KISS, KISTI, KM base, Korea Medical and RISS). Box 1 shows details of the search strategy for MEDLINE. The same search terms were utilised in Korean. Additionally, the reference lists of all identified articles were further inspected for potentially relevant papers. Experts were contacted for any unpublished data ($n=2$).

The present review included all RCTs of any duration that investigated the effect of any type of yoga on any type of addiction without language restriction. Patients of any age and sex were included.

- 1 Yoga.ti,ab. OR yogic.ti,ab. OR yoga.sh OR yoga.tw OR yogic.tw OR yoga.kw OR yogic.kw OR exp alternative medicine/ OR exp Complementary Therapies/
- 2 Substance-Related Disorders. sh OR addict*.ti,ab. OR overdos*.ti,ab. OR intoxicat*.ti,ab. OR abstin*.ti,ab. OR abstain*.ti,ab. OR withdrawal*.ti,ab. OR abuse*.ti,ab. OR use*.ti,ab. OR misuse.ti,ab. OR disorder*.ti,ab. OR dependen*.ti,ab.
- 3 (randomized controlled trial).pt. OR (clin* adj5 trial*).ti,ab. OR ((singl* or doubl* or tripl* or trebl*) adj5 (blind* or mask* or sham)).ti,ab OR random*.ti,ab OR control*.ti,ab. OR prospectiv*.ti,ab. OR exp clinical trial/ OR follow-up studies/or prospective studies/ OR double-blind method/or random allocation/or single-blind method/ OR exp Research Design/
- 4 1 AND 2 AND 3

Box 1 Detailed search strategy for MEDLINE

Studies that included yoga as part of a treatment package were eligible. Any type of control group and any type of outcome measures were admissible also. Non-randomised and/or uncontrolled trials, case studies, pre-clinical and observational studies were excluded.

The data screening and selection process was independently conducted by two reviewers (PP and JC), verified by the third author (MSL) and validated by the fourth (EE). The data extraction and quality assessment processes were conducted by two independent reviewers (PP and JC) with a predefined extraction form. The following information was extracted from the included trials: name of first author, year of publication, study design, type of addiction, sample size, details of experimental and control interventions, primary outcome measures, between-group differences, length of follow-up, author conclusions and adverse effects. The Cochrane tool was used to assess the methodological quality of the RCTs. This tool consists of seven domains: adequate sequence generation, allocation concealment, patient blinding, assessor blinding, addressing of incomplete data, selective outcome reporting and other sources of bias. Each question is scored as follows: H = high risk of bias, L = low risk of bias and U = unclear risk of bias. Any disagreements between the authors were resolved by discussion.

The mean change in addiction symptoms as measured by any validated questionnaire was defined as the primary outcome measure. The post-treatment differences between intervention and control groups were descriptively assessed. Meta-analyses were conducted if permitted by the methodological, clinical and statistical homogeneity of the data.

Results

The search generated a total of 23 624 hits, of which eight met our inclusion criteria.^{19,20,24-29} Figure 1 represents the process of study screening and selection. The key data from the eligible RCTs are summarised in Table 1. Table 2 illustrates the details of the yoga regimen and Table 3³⁰⁻³⁴ presents the definitions of the various yoga styles.

A total of 482 addicts were considered eligible for inclusion, of which 170 were addicted to alcohol,^{20,26,27} 85 to drugs (opiates)^{19,24} and 227 to tobacco.^{25,28,29} Trials conducted in India,^{20,27} Iran,¹⁹ the UK^{25,26} and the USA^{24,28,29} were included. The main findings from the included studies are presented below.

Bock *et al.*²⁹ examined the feasibility and efficacy of vinyasa yoga (VY) plus group-based cognitive-behavioural therapy (CBT) vs. a wellness programme in 55 female tobacco addicts. The participants in the yoga group reported significantly higher rates of smoking cessation as measured by a 7-day

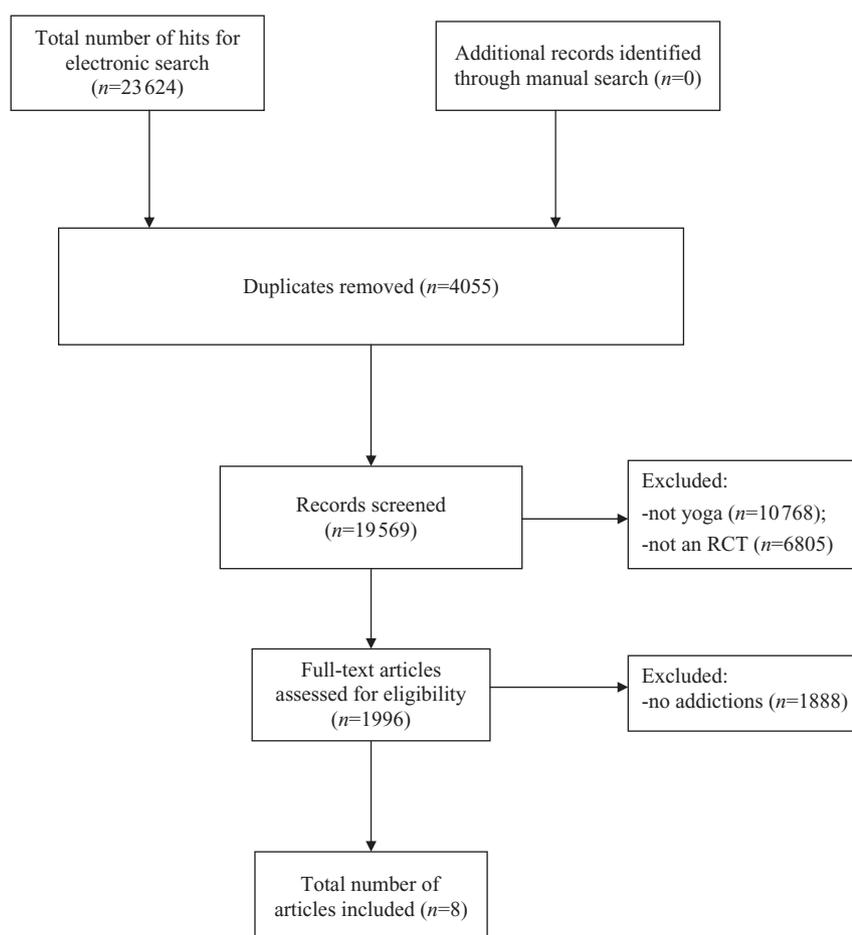


Figure 1 Flow chart diagram of eligibility criteria.

point-prevalence abstinence (7PPA) scale compared to the control group at 8 weeks (although not at 3- and 6-month follow-ups). The authors concluded that yoga may be an efficacious complementary therapy for smoking cessation in women.

Elibero *et al.*²⁸ compared the effects of cardiovascular exercise (CE) or hatha yoga (HY) with non-activity controls on indices of smoking craving in 76 female tobacco addicts. The authors reported significant decreases in the craving to smoke and negative affect, and an increase in positive affect in both the CE and HY groups compared to controls at 30 and 50 min post exercise. The authors concluded that a single session of exercise (CE or HY) can reduce cigarette cravings in ongoing smokers.

Marefat *et al.*¹⁹ investigated how 15, 60-min sessions of yoga exercise affect depression and anxiety in 24 male drug addicts (type of drugs not specified) in rehabilitation. The authors reported significant improvements in depression and anxiety at 5 weeks in the yoga group compared with the wait-list controls. The authors concluded that yoga has a positive effect on both depression and anxiety levels in people undergoing rehabilitation for drug addiction.

Raina *et al.*²⁷ evaluated the efficacy of 48, 40-min sessions of HY plus pranayama yoga (PY) plus nidra yoga (NY) in 50 males with alcohol dependence syndrome (ADS). The authors reported that 80% of subjects in the yoga group improved or recovered from ADS compared with 48% in the control (physical exercise) group at 8 weeks. The authors concluded that the positive effect of yoga therapy continued in mild and moderate cases, while most severe cases had relapsed by follow-up at 24 weeks.

Sareen *et al.*²⁶ determined the effectiveness of 24, 60-min sessions of Iyengar yoga (IY) on QoL improvement in 60 chronic pancreatitis patients, 90% of whom were alcoholics. The authors reported significant improvements in QoL and symptoms of stress, mood, alcohol dependence and appetite in the yoga group compared with controls at 12 weeks. The authors concluded that yoga effectively improves QoL in patients with chronic pancreatitis.

Shahab *et al.*²⁵ evaluated the acute impact of PY breathing exercises (10 min over 24 h for an unspecified number of times) on cravings in 96 abstaining smokers. The authors reported significant reductions in cigarette cravings in the yoga group compared

Table 1 RCTs of yoga in addictions

First author (year)	Study design	Type of addiction (n)	Experimental intervention	Control intervention	Primary outcome measure	Main result (between group differences)	Follow-up(s)	Author conclusions (quote where appropriate)	AEs	Quality score ^e
Bock (2012) ²⁹	RCT with two parallel groups	Tobacco (n=55)	Vinyasa yoga+CBT, twice weekly for 8 weeks	CBT+wellness programme	1. 7PPA 2. 24 h abstinence 3. SST 4. PANAS 5. STAIT 6. CESD-10 7. SF-36	1. S.s. (P=0.03) 2. S.s. (P=0.03) both at 8 weeks 3-8. Significant within-group differences	3 and 6 months	'Yoga may be an efficacious complementary therapy for smoking cessation among women.'	N.m.	L,U,H,H,L,U,U,U
Elibero (2011) ²⁸	RCT with three parallel groups	Tobacco (n=76)	1. HY, 30 min once only 2. CE	No intervention	1. QSU 2. MF 3. Cue reactivity	1. S.s. for HY vs. NE (P<0.05) ^a 2. S.s. for HY vs. NE (P=0.014) 3. S.s. for HY vs. NE (P<0.05)	None	Mild to moderate levels of both CE and HY may confer similar advantages in acute craving reduction.	N.m.	U,U,H,H,H,U,U,U
Marefat (2011) ¹⁹	RCT with two parallel groups	Drugs (n=24)	Yoga, 60-min sessions, three times a week for 5 weeks	WL	1. BDI 2. STAIT	1. S.s. (P=0.048) 2. S.s. (P=0.023) ^b	None	'Yoga has a positive and significant effect both on depression and state anxiety level of addicts in rehabilitation period'	N.m.	U,H,H,H,H,U,H
Raina (2001) ²⁷	RCT with two parallel groups	Alcohol (n=50)	HY, PY, NY+UC ^d , 40 min, 6 days a week for 8 weeks	UC+physical exercises	Percentage of patients who 'recovered', 'improved' or were 'unchanged'	S.s. (P<0.05) at 8 weeks	24 weeks	'The outcome of therapy after 24 weeks showed that in yoga therapy the positive effect of yoga therapy was continuing in mild and moderate cases while severe cases mostly relapsed'	N.m.	L,L,H,H,L,U,U
Sareen (2007) ²⁶	RCT with two parallel groups	Alcohol (n=60)	Iyengar yoga, one hourly session, twice a week for 12 weeks	UC	1. SF-36 2. POMS 3. SSI	1. S.s. (P<0.05) 2. S.s. (P<0.01) 3. S.s. (P<0.001)	None	'Yoga is effective on improving the quality of life in patients of chronic pancreatitis'	N.m.	L,L,H,H,H,L,U
Shahab (2012) ²⁵	RCT with two parallel groups	Tobacco (n=96)	PY, 10 min and within 24 hours ^d	Watching video	1. Strength of urges 2. Cigarette craving 3. Desire to smoke 4. Mood 5. Physical symptoms	1. S.s. (P<0.001) 2. S.s. (P=0.001) 3. S.s. (P=0.012) 4. N.s. 5. N.s.	24 h	'Simple yogic-style breathing exercises can reduce cigarette craving acutely in the laboratory.'	N.m.	L,U,H,H,U,L,U
Shaffer (1997) ²⁴	Crossover RCT with two groups	Drugs (n=61)	HY+MM, 75 min for 22 weeks	MM+psychotherapy	1. SCL-90-R 2. ASI 3. GSI	1-3. N.s.	None	'Alternative methadone treatment is not more effective than conventional methadone treatment, as originally hypothesized.'	N.m.	L,U,H,H,L,U,U
Vedamurthachar (2006) ²⁰	RCT with two parallel groups	Alcohol (n=60)	SKY+NY, ~hourly sessions for 2 weeks	No intervention	1. BDI 2. Plasma cortisol 3. ACTH 4. Prolactin	1. S.s. (P<0.001) 2. S.s. (P<0.001) 3. S.s. (P<0.001) 4. N.s.	None	'Results extend the antidepressant effects of SKY in alcohol dependence subjects.'	No individual developed seizure in either group	U,U,H,H,L,U,U

^aFor QSU global and Factor1.^bFor STAI.^cUsual care consisted of counselling, forced abstinence and benzodiazepines.^dWhen experiencing cravings.

^eDomains of quality assessment based on the Cochrane tools for assessing risk of bias, which are: adequate sequence generation, allocation concealment, patient blinding, assessor blinding, incomplete data addressed, selective outcome reporting, other sources of bias – H = high risk of bias, L = low risk of bias, U = unclear risk of bias.

7PPA, 7-day point-prevalence abstinence scale; ACTH, adrenocorticotrophic hormone; AE, adverse effect; ASI, Addiction Severity Index; BDI, Beck Depression Inventory; CBT, cognitive behavioural therapy; CE, cardio exercise; CESD-10, measures depressive symptoms; GSI, Global Severity Index; HY, hatha yoga; MF, mood form; MM, methadone maintenance; N.m., not measured; N.s., not significant; NY, nidra yoga; PANAS, Positive and Negative Affect Schedule; POMS, Profile of Mood States; PY, pranayama; QSU, Questionnaire of Smoking Urges; SCL-90-R, 90-item revised Symptom Check List; SF-36, 36-item short-form health survey; SKY, sudarshana kriya yoga (pranayama); SSI, Symptoms of Stress Inventory; S.s., statistically significant; SST, temptations to smoke; STAIT, State-trait Anxiety Inventory; UC, usual care; WL, waiting list.

Table 2 Details of yoga regimen

First author (year)	Details of treatment (quote where appropriate)
Bock (2012) ²⁹	'Each class consisted of 5 min of breathing exercises (pranayamas) and seated meditation, followed by 45 min of dynamically linked asanas. Classes concluded with 10 min of closing postures and a final seated meditation.'
Elibero (2011) ²⁸	The instructional DVD started with breathing exercises, followed by a simple HY regime; asanas included bridge, forward bend, table, cow and cobra positions.
Marefat (2011) ¹⁹	Yoga exercises 'included breathing exercises, meditation and relaxation for different physical conditions of clients, then physical exercises were also added.'
Raina (2001) ²⁷	'(1) Asanas: Shavasana (5 min), Bhujangasana (2 min), Dhanurasana (2 min), Paschimothanasana (2 min), Sarvangasana (2 min), Chakrasana (2 min). (2) Pranayama (5 min) (3) Yoganidra (20 min)'
Sareen (2007) ²⁶	'The class started with 15 min of meditation. . . . After meditation, the participants completed a 10-min warm-up of various yoga arm stretches and movements Once warm-ups were completed, each participant attempted to remain in each pose for 1 to 3 min or as tolerated At the end of the last pose, the relaxation pose (Savasana), participants were instructed to slowly awaken the body by opening their eyes and begin to gently stretch various parts of the body such as neck, hands, and feet.'
Shahab (2012) ²⁵	'These rhythmic breathing exercises are based on yogic pranayama recommended by Yoga Guru Swami Ramdev (Ramdev 2010) for use by the general population. After being instructed, participants practised these exercises for 5 min each and, where necessary, were given further instructions.'
Shaffer (1997) ²⁴	'Patients were introduced to yoga postures, breathing, and relaxation during an introductory cycle of 15 weeks. During the next 7 weeks, the lesson plan for each session was as follows: Centering/ breathing 6 min, warm-up exercise 2 min, yoga postures 35 min, breathing 5 min, relaxation 14 min, closing 3 min.'
Vedamurthachar (2006) ²⁰	'The SKY consisted of three distinctive breathing periods (Pranayama): 1. Ujjayi pranayama: Consists of slow deep breathing. Each cycle includes breathing in, holding, breathing out and holding. 2. Bhastrika pranayama consists of forced inhalation and exhalation 20 times. Ujjayi and Bhastrika pranayama requires about 12–15 min. 3. Cyclical breathing consists of slow, medium, and fast cycles of breathing practiced for a total duration of 30 min This was followed by Yoga Nidra (lying in a tranquil state) for about 20 min.'

HY, Hatha yoga; SKY, sudarshana kriya yoga.

Table 3 Definitions of various yoga styles

Type of yoga	Definition (quote where appropriate)
Hatha yoga	A practice of ' <i>asana</i> (postures), practiced along with controlled breathing and meditation.' ³⁰
Iyengar yoga	'a classical form of Hatha yoga focusing on standardized, precisely aligned poses (<i>asanas</i>) that can be tailored for individuals who are elderly, physically unfit, or suffer from chronic illness.' ³¹
Nidra yoga	'a deep relaxation technique.' ³²
Pranayama	'The practice of voluntary regulated breathing while the mind is directed to the flow of breath' ³³
Sudarshan Kriya Yoga	'is based on rhythmic breathing exercise called Sudarshan Kriya (SK), and pranayama involving Ujjayi breathing (breath touching the throat)' ³⁴
Vinyasa yoga	'is a form of Hatha yoga that emphasizes the continuous flow of movement between postures (<i>asanas</i>) and links breath with the movements.' ²⁹

with the video controls at 10 min after the intervention. The authors concluded that yogic-style breathing exercises can reduce acute cigarette craving in the laboratory setting.

Shaffer *et al.*²⁴ investigated whether weekly HY practice (75 min for 22 weeks) among 29 drug addicts receiving outpatient methadone maintenance (MM) treatment in a group setting led to more favourable treatment outcomes when compared to patients who received group psychodynamic therapy plus

MM. The authors reported no significant differences between groups in drug use reduction and criminal activities as measured by the Addiction Severity Index (ASI), Global Severity Index (GSI) and Symptom Check List (SCL) at 22 weeks. The authors concluded that alternative methadone treatment is less effective than conventional MM.

Vedamurthachar *et al.*²⁰ tested the effectiveness of 14, 60-min sessions of sudarshana kriya yoga (SKY) plus NY on mood symptoms and hormone levels in 60

patients with alcohol dependence immediately following an acute detoxification period. The authors reported significant reductions in depression, plasma cortisol and adrenocorticotrophic hormone (ACTH) in the yoga group compared with the controls at 2 weeks. The authors concluded that yoga demonstrated significant antidepressant effects in alcohol-dependent subjects after the acute detoxification phase.

Risk of bias

Three of the included RCTs had an unclear risk of bias (ROB) with regard to adequate sequence generation.^{19,20,28} Six trials had either high or unclear ROB with regard to allocation concealment.^{19,20,24,25,28,29} All eight RCTs had a high ROB in relation to patient blinding. Six RCTs had a high ROB in terms of assessor blinding.^{19,24–28} Five RCTs had either a high or unclear ROB with regard to addressing incomplete data.^{19,20,25,28,29} Six RCTs had an unclear ROB in relation to selective outcome reporting.^{19,20,24,27–29} All eight RCTs had an uncertain ROB from other sources. The overall quality of the RCTs was poor, and no RCT was free of major methodological limitations.

Discussion

The purpose of the present review was to critically evaluate the totality of the evidence from available RCTs regarding the effectiveness of yoga as a treatment for any type of addiction. Seven of the eight RCTs that met the eligibility criteria suggested that various forms of yoga are effective for alcohol, drug and tobacco addiction.^{19,20,25–29} One RCT showed no effect relative to controls.²⁴ The evidence from existing trials of yoga for addiction treatment is encouraging but inconclusive; the reasons for this are discussed below.

The included studies were heterogeneous in terms of addiction type, yoga intervention, control groups, primary outcome measures and length of follow-up. Specifically, the types of addictions varied from alcohol^{20,26,27} and drugs^{19,24} to tobacco.^{25,28,29} Yogic interventions included CBT+VY,²⁹ HY,²⁸ HY+PY+NY+UC,²⁷ HY+MM,²⁴ IY,²⁶ SKY+NY²⁰ and PY.²⁵ The duration and frequency of yogic interventions ranged from one 30-min session²⁸ to 75 min per week for 22 weeks.²⁴ Control groups included CBT + wellness,²⁹ MM + psychotherapy,²⁴ non-intervention,^{20,28} UC,²⁶ UC + physical exercise,²⁷ wait-list control¹⁹ and viewing a video.²⁵ Primary outcome measures included ACTH, cortisol and prolactin levels,²⁰ ASI,²⁴ BDI,^{19,20} cigarette cravings,²⁵ GSI,²⁴ Mood Form,²⁸ percentage of 'recovered', 'improved' or 'unchanged' patients,²⁷ Positive and Negative Affect Schedule,²⁹ Profile of Mood States,²⁶ Questionnaire of Smoking Urges,²⁸ 90-item revised SCL,²⁴ Short-form Health

Survey,^{26,29} Symptoms of Stress Inventory,²⁶ Smoking Situations Temptations Scale,²⁹ STAI^{19,29} and 7PPA.²⁹ The duration of follow-up ranged from 24 h²⁵ to 6 months.²⁹

None of the included RCTs were of high methodological quality, and all RCTs were burdened with a high ROB.^{19,20,24–29} Lack of patient and assessor blinding was the most frequent shortcoming of these trials. None of the included studies controlled for placebo effects, thus limiting the ability to differentiate between specific and nonspecific mechanisms of action. Two of the seven RCTs arrived at positive conclusions and utilised various types of yoga in combination with CBT or usual care.^{27,29} This makes it difficult to identify the effective component in the treatment package. Other limitations included a lack of power and sample size calculations.^{19,20,24,26–29}

Seven RCTs failed to mention adverse effects.^{19,24–29} One RCT reported that none of the individuals developed a seizure during treatment.²⁰ Poor reporting of adverse events in yoga trials has been mentioned multiple times in the literature.^{6,35} We continue to emphasise that interventions that are assumed to be harmless should be rigorously tested for safety, and future studies of yoga should follow commonly accepted standards of trial design and reporting (e.g. STRICTA) to contribute to the evidence base.

The mechanisms of action are purely hypothetical and may involve neuroanatomical, physiological or psychosocial pathways. For instance, yoga might serve as a direct substitute for the reduced arousal that follows the consumption of addictive substances.²⁷ Such a state of reduced arousal can attenuate the presumed tension-reducing capacity of the addictive substance and thereby minimise the reinforcement of addictive behaviours.³⁶ Yoga might also provide immediate relief from distress, and long-term improvements in well-being, self-esteem and personal empowerment.^{24,37} Yoga can potentially increase behavioural control over addiction, improve cognitive flexibility and decrease negative emotions.³⁸ Yoga may also hypothetically induce neuroadaptations in the mesocorticolimbic (corticotropin-releasing factor, dopaminergic, noradrenergic, oxytocin) systems^{39–43} or neuroplastic changes in the hypothalamus–pituitary–adrenocortical axis.⁴⁴ The proposed mechanisms of action of pranayama breathing exercises may include improved immune function and enhanced well-being.^{21,45}

This review has several limitations. First and foremost, while we utilised a broad search strategy, we cannot definitely state that we located all relevant trials. Second, significant study heterogeneity prevented a formal meta-analysis. The paucity of RCTs, coupled with poor methodological quality, also limited the conclusiveness of our review. On the

other hand, the strengths of our review were the comprehensive search strategy, the inclusion of all languages, the absence of time limits and the critical appraisal of included RCTs.

Conclusion

The evidence in support of the effectiveness of yoga for addiction is encouraging but inconclusive. Large RCTs are needed to better determine the benefits of yoga for addiction.

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Conflict of interest None declared.

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Paul Posadzki, PhD, MSc, BSc, Medical Research Division, Korea Institute of Oriental Medicine, 461–24, Jeonmin-dong, Yuseong-gu, Daejeon 305–811, South Korea; Researcher in Alcohol Synthesis Research, Liverpool John Moores University, Centre for Public Health, Henry Cotton Building, L3 2ET Liverpool, UK.

E-mail: paul.posadzki@pcmd.ac.uk

Jiae Choi, PhD, Medical Research Division, Korea Institute of Oriental Medicine, 461–24, Jeonmin-dong, Yuseong-gu, Daejeon 305–811, South Korea.

E-mail: ksjae@kiom.re.kr

Myeong Soo Lee, PhD, Medical Research Division, Korea Institute of Oriental Medicine, 461–24, Jeonmin-dong, Yuseong-gu, Daejeon 305–811, South Korea.

E-mail: drmslee@gmail.com

Edzard Ernst, MD, PhD, FMedSci, FSB, FRCPEd, Editor-in-Chief of *FACT*, Emeritus Professor, Complementary Medicine, Peninsula Medical School, University of Exeter, Veysey Building, Salmon Pool Lane, Exeter EX2 4SG, UK.

E-mail: e.ernst@exeter.ac.uk
