Review

Yoga for Substance Use Disorder in Women: A Systematic Review

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Abstract

It has been suggested that yoga may be an effective adjunct intervention in the management of substance use disorders (SUD). Additionally, women with SUD require different treatment approaches than men. The objective of this study was to critically evaluate the evidence for the effectiveness of yoga, specifically for women, as part of treatment for SUD. Nine electronic databases were searched from inception to January 2020. Randomized controlled trials (RCT) that evaluated any type of yoga, including yoga as a component of mindfulness-based treatment, against any type of control in individuals with any type of addiction were eligible. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Checklist and Statement, methodological quality was appraised using Physiotherapy Evidence Database (PEDro) criteria. Ten RCTs (eight mixed-gender and two female-focused) met the eligibility criteria. Most of these RCTs were small to medium-sized, with various methodological and analytical flaws and deficits. The types of addictions included in these studies were alcohol, drug, and nicotine addiction. Most RCTs suggested that various types of yoga, primarily Hatha Yoga and its components, led to favorable or equivalent results for SUD as an adjunct to control or treatment-as-usual interventions. There are limited results on the impact of yoga for SUD specifically focused on women and their unique needs. Although the results of mixed-gender articles are encouraging, large RCTs with gender-specific subanalyses are required to better determine the benefits specific to women incorporating yoga for SUD. *Brooks et al. Int J Yoga Therapy 2021(31). doi: 10.17761/2021-D-20-00008.*

Keywords: addictions, substance use disorder, randomized controlled trials (RCT) in women, systematic review, yoga

Introduction

The American Society of Addiction Medicine defines addiction as "a treatable, chronic medical disease involving complex interactions among brain circuits, genetics, the environment, and an individual's life experiences. People with addiction use substances or engage in behaviors that become compulsive and often continue despite harmful consequences."[1] Individuals can develop addictions to alcohol, tobacco, illicit drugs, or a variety of other habits or substances. Prevalence of addiction among adults in the United States may range from 15% to 61%, with a plausible 47% of the population suffering from maladaptive signs of an addictive disorder.[2] Conservative estimates posit a national cost of more than $400 billion per year in lost workplace productivity, healthcare costs, law enforcement and criminal justice costs, and motor vehicle accidents due to addiction, with mental and substance use disorders (SUD) cited as the leading causes of years lived with disability worldwide.[3]

The Centers for Disease Control and Prevention[4] reported that more than 130 people in the United States die from opioid overdose daily. This opioid crisis has emerged in a complex arena of protracted pain management and overprescription, resulting in addiction and drug-seeking behaviors. An estimated 1.7 million people are currently suffering from SUD from prescription opioid pain relievers and another 652,000 from heroin use.[4] Currently treatments include medication-assisted therapy (MAT) and behavioral therapies. MAT in combination with behavioral interventions is the standard of care for optimum outcomes and improved quality of life (QOL).[4–10] MAT may present with side-effects and potential for addiction and continued dependence.[11] Therefore, additional considerations for sustainable recovery in concert with standard care may prove beneficial.

Yoga can be defined as the practice of cultivating mindfulness through breathing, postures, and meditation, which can be used for mind and body awareness and healing.[7] Yoga, and its focus on mindfulness and self-inquiry, has been shown to reduce episodes of relapse and may have a longer-lasting effect when combined with traditional treatment methods.[8] Available evidence indicates the practice of yoga increases mindfulness and recognition of one's emotions as they are and has beneficial effects in emotional, stress, and pain responses.[10] Negative body image, anxiety, depression, and decreased self-awareness, including inability to properly manage one's thoughts and emotions, have been found to be related to addiction and relapse.[6,8]

Although there is substantial interest in yoga, evidence for its efficacy in the treatment of SUD is limited. Reviews have shown small positive effects of various yoga therapies on decreases in addictive behaviors.[5] A small number of studies have examined the use of yoga as a complementary therapy in addiction treatment, and a systematic review of randomized clinical trials was undertaken by Posadzki et al.[9] in 2014; however, the review included predominantly male participants. The present review provides updates and specifically examines the impact of yoga on women with SUD.

The U.S. National Institute on Drug Abuse reports that women with SUD require treatment addressing their biological needs,[12,13] and they may have social and environmental influences that differ from those of men.[12,14] For example, physical and sexual trauma and posttraumatic stress disorder (PTSD) are more commonly associated as co-presenting in women than in men with SUD and would require specific intervention in relation to substance use or drug-seeking.[12] Additionally, women experience more systemic health effects of alcohol and drug use and are more vulnerable to side-effects of medication to ameliorate effects of SUD while in MAT.[15] Compared with men, women with SUD have been found to experience worse addiction-related symptoms, such as cravings, anxiety, and depression, but they may also respond more favorably to mindfulness-based treatment options.[16] A growing body of literature on exercise indicates benefit of physical activity as an adjunct for those undergoing SUD treatment; specifically, women potentially experience unique benefit and strong preference for yoga in comparison to other types of physical exercise.[17] Therefore, a systematic review of the existing literature to further investigate yoga as an adjunct to usual care in the treatment of SUD in women was indicated.

Methods

The initial literature search was completed with the following ten databases: CINAHL Complete, Evidence-Based Medicine Reviews—Cochrane (OVID), MEDLINE with Full Text, Physiotherapy Evidence Database (PEDro), PRIMO Metasearch, PsycINFO, PubMed, ScienceDirect, Scopus, and Web of Science. The objective that guided this study was to critically evaluate the evidence for the effectiveness of yoga, specifically for women, as part of treatment for SUD. As closely as possible, the same search terms were used for each database. Where this was not possible due to the database search structure, alterations were made in alignment with the original objective. Appendix A (online only; access through iayt.org) shows details of the search strategy for each database.

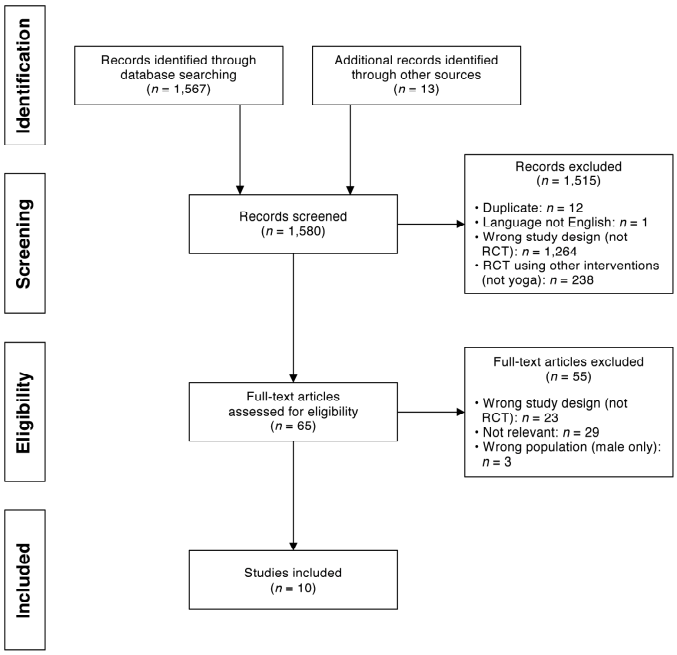
This review included all randomized controlled trials (RCT)/pilot RCTs in which adult participants included females. All-male RCTs were excluded. Only those RCTs that investigated the effect of any type of yoga on any type of SUD were included. RCTs of any duration were included. Also excluded were uncontrolled trials; case studies and series; and preclinical, matched control, retrospective, and observational studies.

Screening and selection process for the initial literature review was conducted by one reviewer (CWG) using PRISMA and verified by the rest of the reviewers.[18] Then, quality assessment and further narrowing of the results were conducted on each article at the eligibility level. Final articles were evaluated using the PEDro scale.[19,20] The methodological quality of the studies was assessed, including their risk of bias, using the PEDro Scale, which is based on the Delphi list.[20] PEDro scores the methodological quality of randomized trials on a scale up to 11, with a cutoff of 5 points used most frequently.[19] Each article was assessed by one pair of two independent reviewers, with any discrepancies verified with the entire team for consensus. PEDro quality scores were tabulated to indicate quality and risk of bias in RCTs using the recommended minimum score of 5.[19,20]

Results

The literature search generated a total of 1,567 hits, of which 10 met our inclusion criteria. Figure 1 represents the process of study screening and selection through the various steps of the assessment process. A total of 65 RCTs were considered eligible for inclusion. These studies were subjected to title and abstract screening, and 23 were excluded because of study design, 29 were excluded because of irrelevant intervention, and 3 were excluded because of population (male only). The main findings and detailed characteristics from the 10 included studies are reviewed below and compiled in Table 1. PEDro quality scores for each individual question are noted in Table 2. Interventions in the RCTs lasted from a 24-hour period to 26 weeks. The most

Figure 1. Literature Flow Diagram



RCT = randomized controlled trial.

prevalent SUDs studied were opioid use and tobacco/smoking, followed by alcohol.

Opioids

Four studies focused on yoga in SUD recovery from opioids. Shaffer et al.[21] studied Hatha Yoga in conjunction with a methadone treatment program compared to traditional psychotherapy through a 6-month period in one treatment facility. No statistical difference was found between psychotherapy and the yoga intervention conducted in group settings, but remaining in either treatment longer reduced drug use and criminal activity. The authors advocated for personalized treatment to optimize outcomes.[21]

Uebelacker et al.[22] conducted a pilot study to examine the effects of weekly yoga for 3 months compared to health education classes on chronic pain in 40 participants with opioid dependency. Participants in the yoga classes had significant reductions in sadness, anxiety, irritability, fatigue, and pain compared to those in the health education classes. Yoga practice did not result in a statistically significant decrease in pain or anxiety either directly after practice or with consistent attendance, with the authors reporting small to medium effect sizes. The yoga intervention was found to be a feasible addition to standard of care.[22]

Wimberly et al.[23] explored the effect of a 12-session, 90-minute weekly yoga program on stress and substance use among people returning from prison and living with HIV and various SUD, with the majority reporting opioid use. At 3 months, the yoga group reported less stress than the treatment-as-usual (TAU) group. Yoga participants reported 50% less substance use at 1, 2, and 3 months, despite the result not reaching statistical significance. However, the control group did not receive an intervention of equal time and intensity. The authors reported small effect sizes on primary outcomes.[23]

Zhuang et al.[24] compared 75 women undergoing inpatient hospital treatment for heroin dependence with an intervention group receiving 6 months of yoga. Profile of Mood States (POMS) and Short Form (SF-36) health survey demonstrated significant improvement in mood and QOL when yoga was included for treatment of heroin dependence.[24]

Smoking/Tobacco

Four studies focused on smoking cessation. Bock et al.'s[25] pilot RCT compared 55 women over 8 weeks, randomized to either cognitive-behavioral therapy (CBT) and twice-a-week group Vinyasa Yoga or CBT with a wellness program including videos and discussions on tobacco smoking cessation. They found nonstatistically significant trends in decreased anxiety, decreased temptation to smoke, and improved well-being in the yoga group. Comparatively, the wellness group only showed reduction in temptation to smoke. Despite no statistically significant findings, the study concluded that yoga may enhance the effect of CBT for women by reducing negative effects of smoking cessation.[25]

Elibero et al.[26] studied the effects of a single 30-minute session of treadmill-based aerobic exercise or Hatha Yoga compared to a no-exercise control on craving, mood, and response to cues in 76 daily smokers. Statistically significant effects of both interventions were identified in decreased cravings and improved positive and negative mood scores. Additionally, Hatha Yoga was cited to be a potentially attractive option for physical activity for those in whom aerobic exercise may be medically contraindicated or less well tolerated.[26]

Shahab et al.[27] studied the effect of a brief 15-minute training in yogic breathing on nicotine cravings compared to a video-based control detailing yogic breathing. Ninety-six participants were asked to use this strategy when feeling cravings over the subsequent 24 hours. Yogic breathing improved cravings immediately compared to the control group, but most participants did not adhere to the breathing exercises after leaving the laboratory.[27]

Vidrine et al.[28] investigated the efficacy of Mindfulness-Based Addiction Treatment (MBAT) versus CBT (with supportive materials) versus usual care only on smoking cessation for 412 people with nicotine addiction. The MBAT intervention involved multiple methods of practice, including "Mindful Yoga" and other yogic components such as breathwork, body scan, and meditation activities. Although

Table 1. Details of Included Studies

First Author (Year)	Study Design	Substance Use (Sample Size)	Proportion Female	Experimental Intervention(s) (Dosage & Duration)	Control Intervention (Dosage & Duration)	Primary Outcome Measures	Between-Group Results of Primary Outcomes	Follow-up(s)	Author Conclusions	Adverse Events
Bock (2012)[25]	Pilot RCT, 2 arm	Tobacco/ smoking (n = 55)	100%	Vinyasa Hatha Yoga + cognitive behavioral therapy (60 min, 2 x wk for 8 wk)	General health and wellness program + cognitive behavioral therapy (60 min, 2 x wk for 8 wk)	1. STAI 2. CES-D 10 3. SF-36	1. p = 0.09 2. NSS 3. NSS	3 & 6 mo	"Yoga appears to enhance the effects of [cognitive behavioral therapy] on short-term smoking cessation outcomes."	Not reported
Elibero (2011)[26]	RCT, 3 arm	Tobacco/ smoking (n = 76)	37%	1. Aerobic exercise/treadmill (30 min, 1 x) 2. Hatha Yoga DVD (30 min, 1 x)	DVD on exercise principles/no exercise (30 min, 1 x)	1. QSU brief 2. Mood form (brief) 3. Cue reactivity	1. Hatha Yoga vs. no exercise, p < 0.05 2. Hatha Yoga vs. no exercise, p = 0.002 3. Hatha Yoga vs. no exercise, p < 0.05	None	"The present findings suggest that both [Hatha Yoga] and [aerobic exercise] have the potential to provide immediate relief from urges. . . . [Hatha Yoga] may be a particularly attractive option when aerobic exercise is medically contraindicated or not well tolerated."	Not reported
Hallgren (2014)[29]	Pilot RCT, 2 arm	Alcohol (n = 18)	Not reported	Medically assisted therapy + cognitive behavioral therapy & motivational interviewing + Hatha Yoga (90 min, 1 x wk for 10 wk)	Medically assisted therapy + cognitive behavioral therapy & motivational interviewing	1. DSM-IV criteria 2. SADD 3. GT 4. CDT 5. HAD 6. SDS 7. PSS 8. TLFB	1. NSS 2. NSS 3. NSS 4. NSS 5. NSS 6. NSS 7. NSS 8. NSS	6 mo	"Stress reduction and mood enhancement appear to be the primary mechanisms for changes." The "willingness of patients to embrace yoga as part of routine clinical care . . . may motivate an overall lifestyle change that discourag[es] routine heavy drinking."	Not reported
Sareen (2007)[30]	RCT, 2 arm	Alcohol (n = 60)	14%	Treatment as usual + Iyengar Yoga (60 min, 3 x wk for 12 wk)	Treatment as usual	1. SF-36 2. POMS 3. SOSI	1. p < 0.05 2. p < 0.05 to 0.001 3. p < 0.05 to 0.001 in multiple subsets	None	"A relatively brief mindfulness meditation and exercise based stress reduction programme could improve QOL, mood disturbance and stress related symptoms in patients with chronic pancreatitis . . ."	Not reported

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Table 1. *continued*

First Author (Year)	Study Design	Substance Use (Sample Size)	Proportion Female	Experimental Intervention(s) (Dosage & Duration)	Control Intervention (Dosage & Duration)	Primary Outcome Measures	Between-Group Results of Primary Outcomes	Follow-up(s)	Author Conclusions	Adverse Events
Shaffer (1997)[21]	RCT, 2 arm	Opioids (n = 59)	41%	Medically assisted therapy + Hatha Yoga (75 min, 1 x wk for 22 wk)	Medically assisted therapy + group psychotherapy (50 min, 1 x wk for 22 wk)	1. SCL-90-R 2. ASI	1. NSS 2. NSS	6 mo	"Perhaps the most important issue is that prescriptive treatment (i.e. matching treatments to patients) is essential to maximize clinical outcomes."	Not reported
Shahab (2013)[27]	RCT, 2 arm	Tobacco/ smoking (n = 96)	46%	Pranayama instruction and practice (15 min, 1 x)	Pranayama video and survey on views (15 min, 1 x)	1. Craving strength 2. Withdrawal symptoms	1. Strength of urges & cigarette craving, both $p < 0.001$; desire to smoke $p < 0.05$ 2. NSS	24 h	"[T]his study showed that yogic-style breathing exercises can reduce cravings for cigarettes acutely in the laboratory, but we were unable to demonstrate an effect when practiced over 24 h of abstinence."	Not reported
Uebelacker (2019)[22]	Pilot RCT, 2 arm	Opioids (n = 40)	58%	Medically assisted therapy + Hatha Yoga (60 min, 1 x wk for 12 wk	Medically assisted therapy + health education (= 60 min, 1 x wk for 12 wk)	1. NRS for mood (sadness, anxiety, irritability, fatigue, pain) 2. BPI-I	1. Anxiety $p < 0.05$; pain $p < 0.001$ 2. NSS: Cohen's d = 0.03	3 mo	"Persons who attended yoga sessions, on average, showed improved pain and anxiety immediately following the class. . . . Persons in the yoga condition had moderate improvement in pain interference over 3 months if they attended at least half of the 12 intervention sessions."	1 adverse event Hatha Yoga arm
Vidrine (2016)[28]	RCT, 3 arm	Tobacco/ smoking (n = 412)	55%	1. Group mindfulness-based addiction treatment with "mindful yoga" component* (120 min, 1 x wk for 8 wk) 2. Group cognitive behavioral therapy (120 min, 1x wk for 8 wk)	4 brief individual counseling sessions	1. Abstinence (biochemically verified) 2. Lapse recovery	1. NSS 2. Mindfulness-based addiction treatment vs. cognitive behavioral therapy, p = 0.014, effect size 0.81; mindfulness-based addiction treatment vs. treatment as usual, p = 0.023, effect size 0.87	4 & 26 wk	"Our results suggest that incorporating mindfulness based techniques into existing smoking cessation treatments could potentially improve the recovery of abstinence after lapses."	Not reported

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Table 1. *continued*

First Author (Year)	Study Design	Substance Use (Sample Size)	Proportion Female	Experimental Intervention(s) (Dosage & Duration)	Control Intervention (Dosage & Duration)	Primary Outcome Measures	Between-Group Results of Primary Outcomes	Follow-up(s)	Author Conclusions	Adverse Events
Wimberly (2018)[23]	RCT, 2 arm	Crack, heroin, alcohol, etc. (n = 75)	29%, 3% transgender	Hatha Yoga (90 min, 1 x wk for 12 wk)	Treatment as usual	1. PSS 2. TLFB assessed frequency of drug and alcohol use	1. $p < .05$, controlling for baseline PSS; Cohen's d = 0.13 2. NSS; Cohen's d = 0.07	3 mo	"While more studies are needed to understand the mechanism behind the effects and to replicate the results, these findings are promising. At the same time, it is important to note that yoga will not fully address problematic substance use and stress for this population, who confront many barriers that require both individual and structural interventions."	Not reported
Zhuang (2013)[24]	RCT, 2 arm	Heroin, inpatient (n = 75)	100%	Treatment as usual + yoga + yoga videos[a] (50 min, 5 x wk for 26 wk)	Treatment as usual	1. POMS 2. SF-36	1. $p < 0.01$ 2. NSS	3 & 6 mo	"The main finding was that yoga significantly improved mood and [quality of life] in women undergoing detoxification for heroin dependence and may offer a promising new treatment for this population."	Not reported

[a]Yoga style not specified; however, best matched Hatha Yoga based on description.

ASI = Addiction Severity Index; BPI-I = Brief Pain Inventory–Pain Interference Scale; CDT = carbohydrate-deficient transferrin; CES-D 10 = Center for Epidemiological Studies–Depression Scale 10; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders, 4th Ed.;* GT = gamma-glutamyl transferase; HAD = Hospital Anxiety & Depression Scale; NRS = Numerical Rating Scale; NSS = not statistically significant; POMS = Profile of Mood States; PSS = Perceived Stress Scale; QSU = Questionnaire of Smoking Urges; RCT = randomized controlled trial; SADD = Short Alcohol Dependence Data; SCL-90-R = Symptom Checklist-90–Revised; SDS = Sheehan Disability Scale; SF-36 = Medical Outcomes Survey Short Form-36; SOSI = Symptoms of Stress Inventory; STAI = State-Trait Anxiety Inventory; TLFB = Timeline Followback.

Table 2. Physiotherapy Evidence Database (PEDro) Scale Results for Methodological Quality and Risk of Bias

	Question[a]											
Study	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Total**
Bock et al.[25]	1	1	0	1	0	0	0	0	1	1	1	6
Elibero et al.[26]	1	1	0	1	0	0	0	1	1	1	1	7
Hallgren et al.[29]	1	1	0	0	0	0	0	1	1	1	1	6
Sareen et al.[30]	0	1	1	1	0	0	0	1	0	1	1	6
Shaffer et al.[21]	1	1	0	1	0	0	0	1	1	1	0	6
Shahab et al.[27]	1	1	0	1	0	0	0	1	1	1	1	7
Uebelacker et al.[22]	1	1	1	1	0	0	0	0	1	1	1	7
Vidrine et al.[28]	1	1	1	1	0	0	0	1	1	1	1	8
Wimberly et al[23]	1	1	1	1	0	0	0	1	1	1	1	8
Zhuang et al.[24]	1	1	1	1	0	0	1	1	1	1	1	9

[a]Individual questions addressed the following elements: (1) eligibility criteria specified; (2) randomized allocation; (3) concealment of allocation; (4) similarity of groups at baseline; (5) participant blinding; (6) therapist blinding; (7) assessor blinding; (8) at least 85% retention rate for one major outcome; (9) intention-to-treat analysis; (10) Between-group differences reported; (11) point measures and variability reported for one major outcome. All questions graded and weighted equally, with 1 = yes and 0 = no, for a maximum of 11 points.

there were no significant findings in terms of abstinence between groups, MBAT demonstrated significant benefit, with a large effect size, in facilitating recovery from a lapse, which may have long-term benefit.[28]

Alcohol

Two studies addressed participants recovering from alcohol. In a pilot RCT study authored by Hallgren et al.,[29] 18 participants with alcohol dependence were randomized to receive either TAU or TAU plus group yoga weekly for 10 weeks with yoga home practice once per day. Both arms of the study included CBT and MAT. The yoga intervention was feasible and found to reduce alcohol consumption over the TAU group; however, the reduction was not statistically significant.[29]

Another study, by Sareen et al.,[30] included participants undergoing treatment for chronic pancreatitis, with 90% of the participants suffering from alcohol dependency. The intervention group received Iyengar Yoga sessions three times a week for 12 weeks for chronic pain, with the control group receiving TAU.[30] Based in Hatha Yoga, Iyengar Yoga focuses on alignment through the extensive use of props to achieve holding of poses for a longer period.[31] At the study conclusion, the yoga group showed improved results in QOL (SF-36), POMS (decreased mood disturbances), stress scores (Symptoms of Stress Inventory [SOSI]), and general well-being. The authors concluded that adding yoga to a routine-care program for patients with chronic pancreatitis can improve QOL, mood disturbances, and stress.[30]

Discussion

The purpose of this systematic review was to critically evaluate the evidence from available RCTs and pilot RCTs regarding the effectiveness of yoga as a treatment for any type of addiction in females. Studies were published from 1997 through 2019. Using the PEDro analysis, all included studies met the minimum benchmark criteria for cutoff for risk of bias, with a range of 6–9/11; seven of the studies scored either 6 or 7, indicating a relatively higher risk of bias.[19,20] Of the 10 RCTs that met the eligibility criteria, eight suggested that various forms of yoga have minimal to moderate significance for treatment of alcohol, opioid, tobacco/nicotine, and mixed addictions.[21–28,30] Hallgren et al.[29] and Shaffer et al.[21] found no significant differences; however, both studies' authors felt yoga may help to drive positive, sustainable change as indicated in a 6-month follow-up. The evidence from existing RCTs of yoga for SUD treatment in women is encouraging as a potentially valuable adjunct, with the following considerations.

Heterogeneity of Studies

Heterogeneity was noted throughout regarding addiction type, sample size, control group, yoga protocol, primary outcome measures, dosage, duration, and length of follow-up. Additionally, control groups varied greatly, from no treatment to TAU. The types of addictions varied and included alcohol,[29,30] tobacco/nicotine,[25–28] and opioid (prescription and/or illicit).[21–24] Only one study setting was conducted in an inpatient detoxification facility,[24] with the remaining studies in outpatient venues.[21–23,25–30] Seven studies occurred in the United States, with three situated in other countries,[24,29,30] which may represent cultural differences in SUD and treatment. Population spanned 18 to 412 participants, with six studies featuring 55 to 75 participants.[21,23–25,27,30] Only one study conducted a power analysis,[23] and only three reported any type of effect size.[22,23,28]

Study Intervention Attributes

Yogic interventions included elements of *pranayama* breathing, *asana* (postures), and meditation. Hatha-based yoga

was the most common type of intervention (nine total),[21–29] followed by Iyengar Yoga.[30] One study utilized only the pranayama component of Hatha Yoga. Four of the studies included adequate intervention descriptions, such as a specific order of poses with timing, which contributes to reproducibility and consistency for future studies.[22,24,27,28] Five studies used registered or "experienced" yoga instructors to guide in-person yoga interventions.[21–23,25,29] One study reported fidelity to the treatment protocol,[22] with nine studies failing to report on fidelity to the yoga treatment protocol altogether.

Dosage, Frequency, Duration, and Length of Follow-up

The most common dosage of the yogic interventions was between 60 and 90 minutes.[21–23,25,29,30] Five of the studies used weekly sessions[21–23,28,29]; however, frequency ranged from a single session[26,27] to five times a week.[24] Six studies featured intervention durations between 8 and 12 weeks.[22,23,25,28–30] The length of follow-up varied, with one 24-hour yogic breathing intervention,[27] two pre/post single sessions with no follow-up,[26,30] two studies with 3-month follow-ups,[22,23] and five studies with 6-month follow-ups.[21,24,25,28,29]

Quality of Gender Specificity

This systematic review focused on evidence for yoga-based interventions for women undergoing SUD treatment. Two studies featured female-only participants, with results directly applicable to the research question at hand.[24,25] Seven studies represented 14% to 58% females,[21–23,26–28,30] with one study not reporting gender representation.[29] Of the eight mixed-gender studies, none offered subanalysis based on gender, which potentially decreases knowledge transfer to women with SUD. Males may have intrinsic negative bias toward yoga, as there is evidence that yoga is not a preferred or self-selected exercise,[17] which may skew results in studies focused on the benefit of yoga for SUD.

Outcomes Measures

Primary outcome measures included the Addiction Severity Index, Brief Pain Inventory–Pain Interference Scale, Center for Epidemiological Studies–Depression Scale 10, Hospital Anxiety & Depression Scale, Numerical Rating Scale, Profile of Mood States,[24,30] Perceived Stress Scale,[23,29] Questionnaire of Smoking Urges-brief, Short Alcohol Dependence Data, Symptom Checklist-90-Revised, Sheehan Disability Scale, Medical Outcome Survey Short Form-36,[25,29,30] Symptoms of Stress Inventory, State-Trait Anxiety Inventory, and Timeline Follow Back (TLFB).[23,29] Physiological measures included carbohydrate-deficient transferrin and gamma-glutamyl transferase.

Variables Studied

Despite the limited consistency in the selection of outcome measures, there is a pattern in the variables assessed. The majority of studies specifically assessed stress, mood, physical function, and addiction-related features. Seven studies assessed mood, with POMS as the most commonly used outcome measure.[21,22,24–26,29,30] Five studies investigated stress/anxiety, with PSS most frequently used.[21,23,25,29,30] Six studies considered cravings, urges, and strength of addiction, with TLFB selected by two.[21,23,26,28–30] Five studies used measures of physical function, with SF-36 appearing three times.[22,24,25,29,30] Due to lack of consistency in the selected outcomes measures, a meta-analysis was not feasible.

Issues Related to Bias

RCTs reviewed were burdened with a moderate to high rate of bias despite meeting the minimum PEDro cutoff, and none were of high methodological quality according to the guidelines.[19,20] Lack of assessor and patient blinding was the most frequent issue in these studies, in addition to lack of power and sample size.[21–30]

Six of the 10 RCTs arrived at mixed conclusions and used various types of yoga in combination with CBT and/or TAU as appropriate.[21,24,25,28–30] Two RCTs showed minimal effects relative to controls; however, both intervention and TAU groups included CBT,[25,29] with another study using CBT as a separate intervention arm with minimal effects between treatment and control conditions.[28] Three studies used CBT as a control group,[25,28,29] with two studies noting no significant difference in long-term abstinence between control and intervention groups.[28,29] Four of six TAU[21,23,24,28–30] and one of two educational video[26,27] control group studies also demonstrated no significant differences specifically for addiction-, severity-, or abstinence-based outcomes. Using CBT or TAU as a comparator intervention to a novel yoga intervention with no significant findings may indicate equivalent treatment options for women in recovery to buffer cravings and mood.

No studies controlled for placebo effects, which limits the ability to identify mechanisms of action. Future designs that represent alternatives to the classical placebo-controlled randomized trial design can be considered.[32] Adopting new methods for the statistical analysis of placebo and treatment effects to be implemented after the data have been collected may also control for placebo effects.[32]

Quality of Life

Three studies explored QOL using the SF-36, a generic QOL scale that demonstrated improvement in the studies reviewed.[24,25,30] In addition, cravings, urges, and management of withdrawal symptoms, not captured in QOL scales and unique to this population, were quantified in multiple

studies and may be important to capture given the acuity of addiction in the trajectory of recovery.[21,23,26,28–30] Operational definitions are needed to specifically measure withdrawal, offset, novel, and indefinite abstinence effects. One study captured data on lapses and abstinence recovery, which is also of interest in this population; Vidrine et al.[28] theorized that mindfulness-based addiction treatment including yogic components may uniquely prevent lapses from converting to full relapse in comparison to CBT or TAU. No single measure appears superior in capturing withdrawal symptoms; therefore, the choice of measures with complex SUD is important in prospective studies. Further research is needed to explore these symptoms with unidimensional scales.

Safety of Yoga

People with serious acute or chronic illnesses should seek medical advice before practicing yoga. Five of the studies reviewed included some form of screening prior to intervention,[21,22,24–26] with two studies specifically using the Physical Activity Readiness Questionnaire to screen for underlying health issues.[25,26] Nine RCTs failed to specifically mention adverse events. One RCT specifically reported one (moderate) adverse event.[22] A recent epidemiological study noted that a considerable proportion of yoga practitioners had experienced injuries or other adverse events; however, most were mild and transient, and risks were comparable to those of nonyoga practitioners.[33] Therefore, given comorbidities associated with SUD, yoga-based interventions should be rigorously tested for safety, and future studies of yoga should follow accepted standards of trial design and reporting to contribute to the evidence base.

Synthesis of Physiological Underpinnings

Several mechanisms of action may be purported and may include various psychological and physiological pathways specific to the SUD population; however, they are speculative. There is evidence for yoga being a potent antidepressant, with a shift in underlying cognitive physiology.[34–36] Certain components of yoga have demonstrated neurobiological effects similar to those of vagal stimulation, indicating this possible mechanism of its action.[37] Yoga can potentially increase behavioral control over addiction, improve cognitive flexibility, and decrease negative emotions.[9] Asana and pranayama increase oxygen flow to the cells, and meditation reduces stress by modulating the hypothalamic-pituitary-adrenal axis.[37,38] Recent research shows that practice of asana, pranayama, and meditation can help to maintain genomic integrity and could therefore be of key importance to human health and lifestyle disorders.[38]

Based on our findings, yoga may provide relief from stress and improvements in well-being and may be suggested for SUD. Treatment including yoga appears to be superior to no treatment or TAU and may benefit mood and anxiety symptoms associated with medical illness.[39] Stress acts through the immune-neuroendocrine axis and affects cellular processes of immune and other physiological functions, leading to addiction and substance abuse. The impact of stress on SUD fits with an allostatic model and represents a challenge to brain circuit regulatory mechanisms that underpin emotional state. Stress can result in changes in the corticotropin-releasing factor in the brain, which affects addiction. Stress is further argued to impact all three stages of the addiction cycle: binge/intoxication, withdrawal/negative affect, and preoccupation/anticipation.[40] Rhythmic breathing processes are known to reduce stress and improve immune functions.[41] Four of the studies reviewed mentioned stress reduction and mood enhancement as a finding compared to controls.[23,24,29,30]

Limitations

This review has several limitations. Although we used a broad search strategy, it cannot be definitively stated that all relevant trials were located and included in this systematic review. Search results were limited to English language only, which may have excluded relevant studies available in other languages. Significant study heterogeneity prevented a formal meta-analysis. Few RCTs specific to women, in addition to methodological constraints and issues with bias, also limit the conclusions of our review.

Additionally, a possible negative intrinsic bias of males included in yoga research for SUD[17] may influence results in the mixed-gender studies in this review. Without gender-based subanalysis, the specific effect of yoga on SUD in females is unclarified despite representation.

Strengths of our review were the comprehensive search strategy, the absence of time limits, and the critical appraisal of included RCTs. Further studies should include intentional design for women in recovery, given the unique needs of this population, and strong consideration of gender-based subanalyses for optimization of individualized care.

Conclusions

There are limited results on the impact of yoga for SUD specifically focused on women and their unique biological needs and societal and environmental influences. Women with SUD have been found to experience more severe addiction-related symptoms and are more vulnerable to side-effects of medication, indicating unique benefit from mindfulness-based treatment options.[15,16] Although the results of mixed-gender articles are encouraging, they are inconclusive and require greater methodological rigor to reduce bias. RCTs with gender-specific subanalyses are needed to better determine the benefits specific to women

incorporating yoga for SUD. Attending to the strong preference for yoga by women in comparison to other types of physical activity,[17] large RCTs are necessary to determine the effectiveness of yoga as a component of SUD recovery.

Conflict-of-Interest Statement

The authors have no conflicts of interest to declare.

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Appendix A. Search Methodology

DATABASE SEARCHED AND TIME PERIOD COVERED
MEDLINE with Full Text: January 1, 1965–November 30, 2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 5)

DATABASE SEARCHED AND TIME PERIOD COVERED
CINAHL Complete: January 1, 1965–November 30, 2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 3)

DATABASE SEARCHED AND TIME PERIOD COVERED
PubMed: January 1, 1965–November 30, 2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 6)

DATABASE SEARCHED AND TIME PERIOD COVERED
PsycINFO: January 1, 1965–November 30, 2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 5)

DATABASE SEARCHED AND TIME PERIOD COVERED
ScienceDirect: 1965–2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 438)

DATABASE SEARCHED AND TIME PERIOD COVERED
EBM Reviews–Cochrane (OVID): 1965–2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR substance ADJ1 abuse OR drug ADJ1 abuse) AND (women OR female) AND yoga AND (randomized ADJ1 controlled ADJ1 trial* OR rct OR randomised ADJ1 controlled ADJ1 trial*))
RESULTS (*n* = 28)

DATABASE SEARCHED AND TIME PERIOD COVERED
PRIMO Metasearch: January 1, 1965–November 30, 2019
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 1,046)

DATABASE SEARCHED AND TIME PERIOD COVERED
PEDro: All available dates
SEARCH STRATEGY
Abstract & Title: (yoga abuse) OR (yoga addict*) OR (yoga substance) OR (yoga drug)
RESULTS (*n* = 26)

DATABASE SEARCHED AND TIME PERIOD COVERED
Scopus: 1960–2019
SEARCH STRATEGY
((addiction OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial" OR rct))
RESULTS (*n* = 10)

DATABASE SEARCHED AND TIME PERIOD COVERED
Web of Science: All years (1992–2019)
LANGUAGE
English
SEARCH STRATEGY
((addiction* OR "substance abuse" OR "drug abuse") AND (women OR female) AND yoga AND ("randomized controlled trial*" OR rct OR "randomised controlled trial*"))
RESULTS (*n* = 4)